



Rwanda Education Board

Mathematics Teacher's Guide



Primary 4



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Mathematics

Teacher's Guide

Primary 4

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This publication is made possible by the support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Education Development Center (EDC) and do not necessarily reflect the views of USAID or the United States Government.

FOREWORD

This Mathematics teacher guide has been designed for teachers of Mathematics in Primary 4. It was written in 2015 by Education Development Centre (EDC) / Literacy, Language and Learning (L3) project in collaboration with Rwanda Education Board (REB) and funded by USAID.

This guide is in line with the competence-based curriculum that REB has produced in 2015. The aim of the new curriculum is to help teachers and learners move from a knowledge-based approach to a competence-based one.

The competence-based curriculum focuses on 3 aspects of learning which are: knowledge, skills and attitudes/values. It aims at shaping a learner who can apply with confidence what he/she has learnt. Thus the learner is prepared for life beyond school.

The Primary 4 Math teacher guide has integrated in Math teaching some cross cutting issues such as peace and values education, gender, financial education, environment and sustainability, inclusive education, standardisation culture, etc, which help pupils embrace holistic education and be able to solve problems in everyday life.

It has also included generic competences such as critical thinking, problem solving, creativity/innovation, communication, cooperation / interpersonal management and life skills which pupils need to develop all along their studies.

The different lessons provided in this teacher guide give pupils an opportunity to discover the new learning through a scenario or a learning situation. The pupil has to discuss that scenario with his/her colleagues in pairs or in group. Then the teacher will draw conclusions basing on pupils' findings. This is to allow learners to participate in their learning.

We recommend teachers to refer to this book when preparing and delivering their lessons.

We sincerely thank all the people who have contributed in the writing, reviewing and editing of the book. We then take this opportunity to request users (teachers) to make suggestions on how to improve the book for the benefit of the future users.

GASANA I. Janvier

Director General of Rwanda Education Board (REB).

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Introduction

Welcome to the Primary 4 Teacher Guide. This guide aims to provide teachers with the necessary skills and knowledge to implement the revised P4 competence based Math curriculum. The emphasis of the curriculum has switched from a more knowledge-based approach to one that offers pupils challenging and stimulating learning experiences through which they learn mathematical concepts by doing and critical thinking.

This teacher guide is a reference book and has no corresponding pupils' book. You need to use it as a resource when preparing your lessons. The book provides some activities to be used in different lessons, but you need to complement them using other books which are available in your school.

By the end of the P4 math curriculum, pupils will be able to:

- Read, write, compare and calculate whole numbers up to 100 000.
- Solve mathematical problems related to daily life involving time, length, mass, capacity, money, area or perimeter.
- Solve simple problems involving fractions, decimals.
- Collect, represent and interpret data using bar graphs and tables.
- Use numerical patterns and relations to solve problems.
- Explain the concept of probability by playing games of chance and deciding on whether they are fair or not.

I. Presentation of the guide

1) Structure of the Guide

The curriculum is divided into **18 independent units** as shown in the table below. In this teacher guide each unit is covered through a number of lessons, which are further broken down into periods. A lesson can cover one or more periods.

Unit Number	Unit Name	Number of periods
1	Mathematical operations on whole numbers up to 100 000	40
2	Positive and negative integers	14
3	Classifying numbers by their properties	10
4	Fractions of same denominator	26
5	Decimal fractions/ numbers	15
6	Length measurements	16
7	Capacity measurements	7
8	Mass measurements	7
9	Area and land measurements	20
10	Time	10
11	Money and its financial application	8
12	Number patterns	10
13	Filling in missing numbers	14
14	Types of lines and angles	8
15	2D Shapes and properties	15
16	Area of 2D shapes	16
17	Elementary statistics	12
18	Introduction to probability	4

2) Structure of a unit

Each unit is made up of the following elements: Unit at glance, Unit warm-ups and games, Unit lessons subdivided into different periods including an end unit assessment.

a) Unit at glance

At the beginning of each unit there is a **table** called **Unit at a glance** that shows how the content of a unit has been subdivided into different lessons and lessons have been subdivided into periods. It shows what needs to be covered in each period. Note that all the periods that appear in this table have not been prepared in this guide. The ones which have not been prepared are mainly the periods on exercises, revisions, feedback and remediation. Therefore, many of the periods in the teacher guide do not follow each other in normal order, eg, Period 3 may be followed by Period 5 because Period 4 was not provided. The teacher has to prepare these periods himself/herself.

b) Unit warm-ups and games

Here we provide a list of titles of **Math games and warm-ups** as well as their brief explanation. These **Math games and warm-ups** are used in the introduction of each period.

Note: In the introduction of every period we only provide the title of the game/warm-up to be played. The teacher needs to refer to the description of the game/warm-up, provided after the unit at glance for explanation on how to play the game/warm-up.

c) Unit lessons

Each lesson starts with a table including the topic area, unit name, key unit competence and learning objectives (including knowledge, skills and attitudes) taken from the P4 Math Syllabus. The table also includes key words that are introduced during the lesson; cross cutting issues that are integrated into math problems, competences that are developed; and a reminder to take into account any special needs.

Note: The cross cutting issues and competences are also taken from the P4 Math Syllabus. Their names are the same throughout the book but they are developed differently according to the lesson content.

d) End unit assessment and remediation activities

Every unit ends with a lesson on assessment which is based on the assessment criteria provided in the curriculum. Here the teacher needs to assess the competences learnt in a unit. The assessment is meant to be done in one period and the next period needs to be on feedback and remedial activities. Basing on pupils' results the teacher prepares remedial activities to reinforce the competences that were not well mastered. And he/she provides more explanation on how to do those activities. Where possible, each assessment needs to be preceded by a revision period.

3) Structure of a lesson

a) Sample periods

The first period in every unit is called a sample period. It introduces a new concept. It is provided in REB format. It appears in a table which includes the following:

- **Instructional objectives**

These are specific to a period and are not as broad as the learning objectives (which are for a lesson). Instructional objectives should be well stated by showing 5 elements: conditions, who,

content, action, standard for performance. The conditions, content and action should also be linked to the way the assessment is done.

- **Class setting**

Here we give advice to the teacher on how to organize the class room. In most cases we advise the teacher to arrange desks so as to allow pair/group work. We also specify if a lesson is to take place outside or indoor.

- **Materials**

Here we mention all the teaching aids needed for delivering a period content. For every period the teacher needs to look at the list of materials provided at the beginning of every period and prepare them in advance. These materials are very useful for the understanding of the period (lesson). Therefore the teacher should try and find them and whenever they need to be brought by pupils, they need to be told in advance.

- **References**

Here we have included the resources (books and articles from websites) that we have used to produce each period. When the teacher is preparing her/his lessons she/he is advised to mention all the references (resources) he/she used, following the models provided in this teacher guide.

- **Steps/Timing**

In this column we provide the main parts of a lesson and time allocated to each part. These parts are: Introduction (5 minutes), Development (25 minutes) and Conclusion (10 minutes).

- **Teacher's activities**

In this column we provide all the steps/activities that the teacher has to follow/do in order to facilitate the period (lesson).

- **Pupils' activities**

This part includes activities that the pupils have to do in response to teacher's guidance.

- **Generic competences and cross cutting issues to be addressed**

In this column we provide cross cutting issues and competences developed in each part of the period (lesson) with a brief explanation on how they have been integrated in the different parts of the period/ lesson.

b) Other periods

Each sample period is followed by other periods which are in different formats:

- **Periods introducing new concepts**

They are not in a table like the sample period. They are not as detailed as the sample periods. But they follow the same main parts of a lesson as the sample period. They provide the teacher with examples of problems (activities) and some suggestions on how to go about teaching the period, but the teacher should develop it further according to the needs of the pupils in the class and write it up in the sample period format as all the lessons in class have to be taught following the format provided by Rwanda Education Board (REB). In the development part of these periods we have provided **Math facts** whose meaning is the same as the summary used for the sample period.

- **Periods on exercises and word problems**

The title of these periods are planned in the unit at glance table but are not developed in this guide.

II. Methodological note (advice to teachers)

1) Steps of a lesson

In this teacher guide every period (lesson) introducing new a concept follows the following steps:

a. Introduction

The warm-ups and games introduce a period. However, a period can also be introduced by another type of activity or correction of the homework. It is good to vary ways of introducing a lesson.

b. Development

i. Presentation /Discovery

This is the first part of the development of a lesson. In learner centered approach, it includes activities that lead to pupils' discovery of concepts as presented below:

• Devolution of the task

A period introducing a new concept always starts with a scenario/situation instead of an exercise that is a straight calculation. Pupils are engaged in learning activities in groups or individually. At this step, the teacher helps learners to form groups, provides clear instructions and required materials so that they are facilitated to discover the new learning either through observations and discussions, manipulations, problem solving, etc.

• Didactic situation (Sharing/communication)

One pupil (pair/group representative) shares the findings/answers with the whole class.

Note:

- At the end of every activity used in presentation, we have provided answers to help the teacher see how it should be done.
- When a period (lesson) requires the use of teaching aids the teacher needs to avail them before the lesson starts.

ii. Summary/Math facts

Institutionalization: this step is closely linked to the previous ones. After pupils have done activities and shared their findings (after discovering the new learning) the teacher needs to facilitate them to draw conclusions/ to make a summary of what has been learnt. He/she can for example proceed by asking them questions which lead them to making conclusions. Then finally he/she leads them to make a synthesis from what they have said.

iii. Application

This is the third part of the development of a lesson. In this part we provide different activities to reinforce the learning. For every activity provided in this part it is good to indicate if the activities are to be done individually, in pairs or in groups – vary to avoid monotony!

Whenever you give an activity, give clear guidance on how to do it.

Where activities provided in this guide are few, you are advised to increase them using available resources in your school as well as your creativity.

c) Conclusion

i. Assessment

This is the first part of the conclusion. In this part we provide activities meant to check if the instructional objectives have been achieved.

ii. Homework

This is the second part of conclusion. Here the teacher provides homework activities and pupils copy

them in order to do them at home.

2) Developing competences

Competences are acquired over time through cumulative effect of a competence approach to learning. We should bear in mind what competences are. They are rarely developed in isolation. They are interconnected and developed simultaneously.

To develop competences in math lessons, the teacher needs to use different methods and techniques to develop pupils' competences both generic and subject competences. Developing all competences requires math teachers to adopt approaches that encourage and enable pupils to think critically, to carry out research, to solve problems, to be creative and innovative, to communicate and to co-operate.

You need for example to help pupils develop their **communication skills** by making sure they discuss in English in pair/group work. Besides, when pupils are answering questions you need to encourage them to answer by using complete sentences. This will enhance their language skills.

You also need to help them develop their **interpersonal and management skills** by encouraging them to choose a chair person, a secretary/ group representative while working in groups. After each group work, a representative/secretary has to share findings /answers with the whole class. This also helps them develop their communication.

The activities included in this guide aim to develop pupils' **critical thinking** skills. The teacher is advised to follow this model and avoid activities which are all similar.

So whenever you provide activities try and find activities which are challenging, which require pupils to think deeply in order to develop their critical thinking.

Also try and give them activities which require **research and problem solving**. When preparing word problems try to give ones related to real life. This helps pupils see the importance of learning Math and hence like it. You can also follow models provided in this teacher guide and improve them where necessary.

Here are some of the techniques to be used:

a) Unit warm-ups and games

The teacher is advised to ease into a lesson/period by facilitating chanting, playing mental math games or doing review activities for 5 minutes. (Note : each warm-up/game is explained at the beginning of a unit). Chanting can be used for enhancing counting by following a certain rhythm. The rhythm may be done through clapping, thumping, beating on the desk, etc.

When facilitating playing the games/warm-ups, the teacher should engage the pupils in learning the games and make it fun. And when the activity seems too easy, it can be made more difficult. When pupils are familiar with a particular game/warm-up, it is better to let one pupil leads the game. This motivates pupils as they participate more in their learning.

b) Group/pair work and discussion

Teachers are advised to increase group work and presentations by a team member to help pupils support each other and develop interpersonal and management skills, cooperation, communication as well as peace and values education.

3) Inclusion of cross cutting issues

When preparing /delivering a period (lesson) the teacher needs to consider the cross cutting issues suggested and make sure they are fully developed in the period(lesson). For example, for **gender balance** the teacher needs to make sure groups are well mixed with boys and girls. And when choosing a pupil to answer a question or to present on the board the teacher needs to balance between girls and boys.

When pupils are working in groups, you need to encourage each group to discuss peacefully and reach consensus. By doing this you develop **peace and values education**.

For the other cross cutting issues such as: **financial education, environment and sustainability, standardization culture** (the mostly used in this teacher guide) pupils need to be given enough time to discuss them so that they can understand them fully and be ready to apply them in their daily life. When preparing lessons, try to integrate as many **cross cutting issues** as possible so that pupils can link Math with other aspects of life and be able to use them to solve their daily life problems.

For **inclusive education**: It is really important to find ways to accommodate and include pupils with physical or mental challenges. If for example, a pupil cannot see well, make sure you are giving clear verbal instruction and having another pupil help him or her out. If a pupil cannot walk easily, make sure you do not exclude him or her from activities that require movement. Find a way to involve them – as a recorder of results, a timer, etc.

4) Assessing competences

Competences are developed over time and assessed through end unit assessment. To ensure their progressive development, each period is assessed. It is advised to encourage peer assessment. After pupils have done the assessment, they exchange notebooks then the teacher facilitates correction on the board, or a volunteer shows the answer on the board. Finally pupils correct each other and give feedback to the teacher. The homework is normally corrected in the next period.

Note: For assessment and homework the teacher can sometimes vary the method and allow pupils to correct themselves, after correction on the board.

Unit 1: Mathematical Operations on whole numbers up to 100 000

Unit at Glance

Topic area: Numbers and Operations

Key competence: To be able to read, write, compare and calculate whole numbers up to 100 000.

	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
Lesson 1: Reading and writing numbers up to 100 000	Reading and writing a two and three digit number in figures and words using place value and its application to daily life	Reading and writing a four digit number in figures using place value and its application to daily life	Reading and writing a four digit number in figures and in words using place and its application to daily life	Exercises on reading and writing a four digit number in figures and in words using place value and its application to daily life	Reading and writing a five digit number (and 100 000) in figures using place value and its application to daily life	Reading and writing a five digit number (and 100 000) in figures and words using place value and its application to daily life	Exercises on reading and writing a five digit number (and 100 000) in figures and words using place value (and its application to daily life)
Lesson 2: Place value in a five digit number	Period 1 Place value in a five digit number	Period2 Exercises on place value in a five digit number					
Lesson 3: Comparing five digit numbers	Period 1 Comparing two 5 digit numbers using place value and its application to daily life	Period2 Exercises on comparing two 5 digit numbers using place value and its application to daily life					
Lesson 4: Ordering numbers	Period1 Ordering numbers in ascending order (and its application to daily life)	Period 2 Ordering numbers: descending order (and its application to daily life)					
Lesson 5: Addition of five digit numbers	Period 1 Addition of two 5 digit numbers without carrying (the sum doesn't exceed 99 999) and its application to daily life	Period 2 Exercises and problems on addition of two 5 digit numbers without carrying, the sum doesn't exceed 99 999.	Period 3 Addition of two 5 digit numbers with carrying (the sum doesn't exceed 99 999) and its application to daily life	Period 4 Exercises and problems on addition of two 5 digit numbers with carrying, the sum doesn't exceed 99 999.	Period 2 Ordering numbers in ascending order (and its application to daily life)		
Lesson 6: Subtraction of five digit numbers	Period1 Subtraction of two 5 digit numbers without borrowing and its application to daily life	Period 2 Exercises and problems on subtraction of two 5 digit numbers without borrowing	Period 3 Subtraction of two 5 digit numbers with borrowing and its application to daily life	Period4 Exercises and problems on subtraction of two 5 digit numbers with borrowing	Period 3 Subtraction of two 5 digit numbers with borrowing and its application to daily life		

Lesson 7: Exercises on addition and subtraction	Period 1 Exercises and problems on addition and subtraction of five digit numbers			
Lesson 8: Revision of unit 1 (part 1)				
Lesson 9: Assessment of unit 1 (part 1)	Period 1 Assessment	Period 2 Feedback and remediation		
Lesson 10: Multiplication of 4 digit numbers by 2 digit numbers	Period 1 Multiplying a four digit number by a two digit number (the product doesn't exceed 99 999) and its application to daily life	Period 2 Exercises and problems on multiplying a four digit number by a two digit number, the product doesn't exceed 99 999)	Period 3 Problems involving addition and multiplication and problems involving subtraction and multiplication (using a four digit number by a two digit number) the product doesn't exceed 99 999	
Lesson 11: Multiplying by 10, 100, 1000, 10000 (the product does not exceed 99 9999)				
Lesson 12: Division of five digit number by one digit number	Period 1 Division of a five digit number by a one digit number without remainder and its application to daily life	Period 2 Exercises and problems on division of a five digit number by a one digit number without remainder	Period 3 Division of a five digit number by a 1 digit number with remainder and its application to daily	Period 4 Exercises and problems on division of a five digit number by a 1 digit number with remainder.
Lesson 13: Dividing number by 10, 100, 1000, 10 000	Period 1 Dividing a whole number by 10, 100, 1000, 10 000 and its application to daily life	Period 2 Exercises and problems on multiplying a whole number by 10, 100, 1 000, 10 000, the product doesn't exceed 99 999. Exercises and problems on division of a whole number by 10, 100, 1000, 10 000.		
Lesson 14: Revision of unit 1 (part 2)				
Lesson 15: Assessment of unit 1 (part 2)				
Lesson 16: Revision of the unit				
Lesson 17: assessment of the unit	Period 1 Assessment	Period 2 Feedback and Remediation		

Unit warm-ups and games

10 less than

Say numbers between 10 and 100 and pupils say the number that is 10 less than the number said, e.g., when you say 586, pupils say 576.

Pairs to 100

Say a number and pupils say what number you need to add to that number to make 100, e.g., when you say 40, pupils say 60; 70 pupils say 30, etc.

20 more than

Say numbers between 0 and 80 and pupils say the number that is 20 more than the number, e.g., when you say 1 230, pupils say 1 250.

50 more than

Say numbers between 0 and 9 900 (use numbers ending in zeros or 50). Pupils say the number that is 50 more than the number said, e.g., when you say 4 450, pupils say 4 500.

100 more than

Say numbers between 0 and 99 900 and pupils say the number that is a hundred more than the number, e.g., when you say 2 832, pupils say 2 932.

100 less than

Say numbers between 0 and 1000 and pupils say the number that is 100 less than the number given, e.g., when you say 1 923, pupils say 1 823.

Greater thanand less than....

Say a number (or show pupils a number on a flash card) then pupils say a number which is greater than the number given but less than a specific number (use numbers less than 100 000) e.g., when you say 135 pupils say a number which is greater than 135 and less than 150, they may say for example 145.

Which number comes after or before?

Say a number then pupils say a number which comes before or after the number given (use numbers less than 100 000), e.g., when you say 358, pupils may say 357 or 359.

1000 more

Say a number and pupils say the number they find after adding 1000 to the number (use numbers which do not exceed 98 900), e.g., when you say 1 123, pupils say 2 123.

Number journey

Say a number and tell pupils another number to add on. Continue in that way and see if they will end up at the same number. e.g. Start with 5. Add 9, add 4, add 10. "What number do you end up with (28)?" Continue the game with other numbers.

1000 less than

Say a number or show it on a flash card and pupils tell you the number they get after deducting 1000 from it (use numbers less than or equal to 99 999), e.g. when you say 13 607, pupils say 12 607.

Triples

Say a number and pupils say the number which they get after multiplying it by 3 (use numbers ending in 0 and in 5 from 0 to 50). You can also vary it by having pupils multiply by 2, 4 or 5.

Multiply by 10

Say a number not exceeding 10 000 and then pupils multiply that number by 10, example e.g. 1 242:

the answer will be 12 420.

Halves

Say a number between 2 and 100 (e.g.20, 40, 60, 80), pupils divide the number by 2.

Divide by 3

Say a number and pupils say the number they get after dividing it by 3 (use numbers which are multiples of 3 and which are between 0 and 100).

Divide by 5

Say a number and pupils say the number they find after dividing it by 5(use numbers which are multiples of 5 and which are between 0 and 100).

Unit Lessons

Lesson 1

Reading and writing numbers up to 100 000

Topic area	Numbers and Operations
Unit1	Mathematical operations on whole numbers up to 100 000
Key Unit competence	To be able to read, write, compare and make calculations on whole numbers up to 100 000.
Learning objectives	At the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Name all place values through 100 000 in spoken and written form. Identify the place values in written numerals. Read and written numerals correctly in English. Skills: <ul style="list-style-type: none"> Use place value to read and write numbers. Correctly translate between written numerals and spoken numerals in English. Attitude and values: <ul style="list-style-type: none"> Develop personal confidence in the use of numbers.
Key words	A digit, abacus, a place value table, Ones(O), Tens(T), Hundreds(H),Thousands (TH),Ten Thousands (TTH), One hundred Thousands (HTH)
Cross cutting issues	- Financial education developed through filling cheques and bills, and interpreting them. - Environment and Sustainability integrated through number problems and discussion related to tree planting.
Competences developed	- Communication developed through presentations, reading, writing and speaking activities - Cooperation developed through working in pairs and groups. - Critical thinking and problem solving skills enhanced through applying knowledge gained to real-life situations as well as through predicting (e.g. figuring out how a 5 or 6 digit number might be read and represented on an abacus). - Life skills developed through activities such as reading and filling in cheques, and reading and interpreting bills.
Attention to special educational needs	When preparing the lesson and materials needed and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives	Given Rwandan Francs, numbers on flashcards and an abacus, pupils will be able to read and write 2 and 3 digit numbers in figures and words confidently, accurately and in a given time.		
Class setting/ organization	<ul style="list-style-type: none"> – Pupils sit in a way to facilitate them to work in groups of 4 and in pairs. – Make sure each group is mixed in terms of gender and ability. 		
Materials	<ul style="list-style-type: none"> • Different Rwandan coins of (10Frw, 20Frw, 50Frw, 100Frw) • Notes of 500Frw • Bus tickets of 200Frw, 500Frw and 700Frw drawn on flash cards • Abacus • Place value table 		
References:	Mwungeri, E. et al.2008. Mathematics, Pupils’ book, Primary Four. P2.		
Steps / Timing	Teachers’ activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5minutes)	<p>Counting in tens Ask pupils to count in tens from 0 to 100.</p> <p>Introduce the new lesson: Ask pupils in which situations they use or have used numbers in real life.</p>	<p>Count aloud in tens from 0 to 100 and back to zero.</p> <p>Pupils’ answer:</p> <ul style="list-style-type: none"> - In buying and selling - In counting money - In telling age, birthday 	<p>Communication through counting loudly and answering questions</p>
Development (25 minutes)	<p>Presentation</p> <p>Activity 1: Distribute different coins (10Frw, 20Frw, and 50Frw, 100Frw) and notes of 500Frw to pupils. Facilitate them to observe numbers written on each of them and do the related tasks.</p>	<p>Activity 1: Writing and reading numbers</p> <p>In groups of 4, pupils observe numbers written on the Rwandan coins and notes, and then do the following :</p> <ol style="list-style-type: none"> 1) Write the observed numbers in figures and in words. 2) Read the written numbers aloud. 3) Mention the number of digits composing/ making each number and indicate the place value of each digit. 4) Represent each number using abacus. <p>Group representatives present the group work/findings by providing clear explanations.</p>	<p>-Cooperation/ and interpersonal management developed through working in group</p> <p>-Developing reading and writing skills</p>

		<p>Answers:</p> <p>1) 10; 20; 50; 100; 500.</p> <p>2) <i>The numbers are read and written as follows: 10: ten; 20: twenty; 50: fifty; 100: one hundred; 500: five hundred</i></p> <p>3) <i>10: is made of 2 digits; 20: is made of 2 digits; 50: is made of 2 digits; 100: is made of 3 digits; 500: is made of 3 digits).</i></p>	Communication developed through reading activities and answering questions
		<p>4)</p>	
	<p>Activity 2: Facilitate pupils to make a 2 digit number, then a 3 digit number which does not end in zeros. Help pupils to write those numbers in figures and in words.</p> <p>Summary Facilitate pupils to use the activities done above to identify the rule on how to read and write a 2 and 3 digit number in words and figures. Then help them to summarize and write summary in their notebooks.</p>	<p>Activity 2: Making a 2 digit number and writing it in figures and words Using flash cards on which there are digits 1, 2, 3; make a 2 digit number and a 3 digit number of your choice. Then write each of the numbers in figures, then in words.</p> <p>From the activities done above, pupils find out that:</p> <p>1) A number of 2 digits is read from Tens (T) to Ones (O). It is read from left to right.</p> <p>2) A number of 3 digits is read from Hundreds (H) to Tens (T) and Ones (O). It is read from left to right: eg, 101: one hundred one, 110: one hundred ten.</p>	Communication (summarizing and speaking skills) developed through reconstructing the rules.

- 3) Numbers of 2 or 3 digits are written in figures according to the place value of their digits (they are also written from left to right).
- 4) Normally, 2 and 3 digit numbers are written in words as they are spoken.
- a) The Ones (from 1 to 9) are written in words differently from the tens (from 10 to 19) where the suffix 'teen' is added to the ones except for 10, 11 and 12. e.g. thirteen, fourteen, fifteen...)
- b) When you are writing numbers from twenties to nineties (20 to 99), the pattern is to write the Tens and then bring in the Ones. e.g. twenty one, thirty two, sixty three...)
- c) For 3 digit numbers:
- We write Hundreds and bring in the Units (101: one hundred one; 909: nine hundred nine...)
 - We write Hundreds and bring in the Tens from 10 to 19 (eg 110: one hundred ten; 315: three hundred fifteen)
 - We write Hundreds and bring in Tens and Ones (eg 231: two hundred thirty one; 642: six hundred forty two).

Application activities:

- 1) Put pupils into small groups. Distribute flash cards on which are drawn bus tickets of 200Frw, 500Frw, 700Frw. Ask pupils to write the numbers written on each ticket in words.
- 2) Put pupils in pairs. Draw 2 abaci on board, or on manila paper, and facilitate pupils to write the number represented by each of them in figure and in words.

- 1) Pupils in small groups observe the tickets and write the numbers written on them in words.

- 2) In pairs, pupils observe the abacus representing a 2 digit number and then an abacus representing a 3 digit number. They write the numbers represented by each of them in figures and words.

a)



Figure: _____ Word: _____

b)

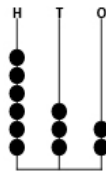


Figure: _____ Word: _____

- 3) Pupils do the following activities:
 - a) On your own, make 3 two digit numbers and 2 three digit numbers using the digits: 3; 4;9. Compare your answers with a partner.
 - b) In small groups, find examples where and when writing 2 or 3 digit numbers in words or in figures can be used or found in everyday life. Share your examples with the whole class.
- 4) Why do you think we need to know how to write and read numbers?

Critical thinking developed through making their own numbers

<p>Conclusion (10 minutes)</p>	<p>Assessment Put pupils in 3 groups. Explain that there will be a contest. All members of each group have to answer every question. The group with the most correct answers wins. Say the question, give pupils time to answer and continue to the next question.</p> <ol style="list-style-type: none"> 1) Make 3 sets of flashcards with 4, 5, and 6 written on them. Give each group a set of cards. 2) Give each group a set of Rwandan coins (10Frw, 20Frw, 50Frw, 100Frw). 3) Draw 2 abaci on the board, one showing 45 and the other showing 862. 4) Facilitate correction on board and peer assessment. The group with the most correct answers all together wins. 	<ol style="list-style-type: none"> 1) Pupils look at the flashcards with the numbers 4, 5, and 6 on them and write two 2-digit numbers and two 3-digit numbers in figures and words. 2) Write in figures and words the numbers on the coins. 3) Write the numbers represented by the abaci in figures. 4) Pupils provide answers on board and exchange notebooks to correct each other. Groups add up their total correct answers. The group with the most correct answers wins! 	
	<p>Homework Write homework on board. Ask pupils to copy in their notebook and do at home.</p>	<p>Pupils copy the following activities in their notebooks and do them when they reach home:</p> <ol style="list-style-type: none"> 1) Write the following numbers in words: <ol style="list-style-type: none"> a) 11, 12, 13, 14, 15, 16, 17, 18, 19, 20. b) 50, 89, 111, 651, 800, 999. 2) Think of situations where the numbers you have learnt can be used in real life (e.g. in buying, selling; in census, on a calendar, in textbooks; labelling room numbers in hospitals) 	

Period 2

Reading and writing a 4 digit number in figures

Instructional objectives

Given Rwandan Francs or other materials, pupils will be able to read and write a 4 digit number in figures confidently, accurately and in a given time.

Class setting/organization

- Pupils sit in a way to facilitate them to work individually, in pairs, and in small groups (of 4 for example).
- Make sure each group is mixed in terms of gender and ability.

Materials

- Abacus
- Rwandan franc notes: 1 000Frw, 2 000Frw, 5 000Frw
- Place value table
- A sample bill

References

Mwungeri, E. et al.2008. **Mathematics, Pupils' book, Primary Four, P2.**

Introduction/Review

Correction of homework.

Game: **10 less than.**

Chant in hundreds from 100 to 1 000 forward and backward.

Development**Presentation****Activity 1: Reading, writing and representing 4 digits numbers**

Write the following situation on board:

Kalisa, Kamana and Kamariza went to register in a higher school. **Kalisa** was registered under the number 999, **Kamana** was registered under the next number and **Kamariza** under the following number.

Pupils read carefully the above situation and answer related questions in small groups (e.g. groups of 4):

- Discuss Kalisa, **Kamana** and **Kamariza's** registration numbers.
- Write them in figures.
- Read them.
- Represent them on abacus.

Pupils present their answers on board. Class to read the numbers written on board (select a few pupils to read).

Answers:

- Kalisa, Kamana and Kamariza's** registration numbers:

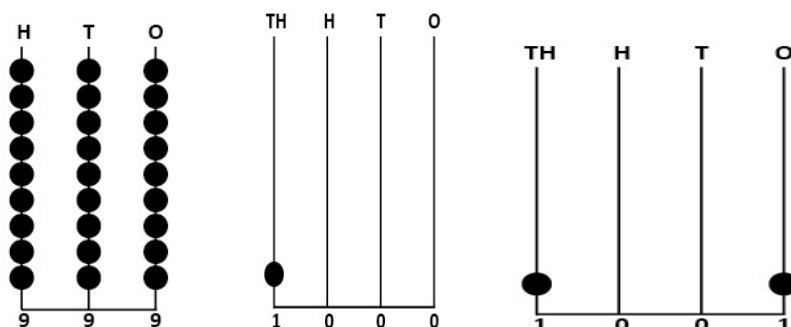
Kalisa: 999

Kamana: 1 000

Kamariza: 1 001

Note: Questions: (a) and (c) do not require written answers.

- Representation of **Kalisa, Kamana and Kamariza's** registration numbers on abaci:



Pupils answer the following questions:

- 1) How do the figures you have written for Kamana and Kamariza differ from that of Kalisa? (*Kalisa's number has 3 digits while the other two have 4 digits.*)
- 2) When you read the numbers, what difference do you hear between that of Kalisa and that of Kamana and Kamariza? (*Both Kamana and Kamariza' numbers have the word "thousand" while Kalisa's has hundred.*)
- 3) When you read a number, where do you start? (Start on the left and move to the right.)
- 4) How do the abaci you have drawn for 1 000 and 1 001 differ from the abacus that represents 999? (*There is one more rod added to the left of the Hundreds place to represent Thousands.*)

Explain that the one bead drawn on the Thousands rod represents one thousand.

Ask pupils to explain the position of the beads for 1 001. (*There is a bead to represent one thousand, no beads for the Hundreds and Tens because the digits are zero, and one in the Ones column to represent one.*)

Activity 2: Writing and representing 4 digit numbers in figures

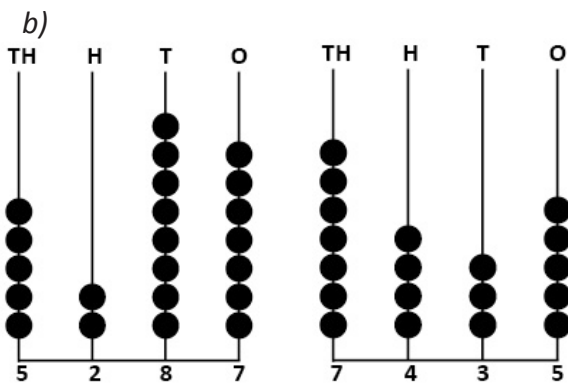
Say the following numbers: 7 435 (seven thousand four hundred thirty five; 5 287 (five thousand two hundred eighty seven). Individually, pupils:

- a) Write them in figures
- b) Represent them on an abacus.

Some pupils present their answers on board.

Answers:

a) 7 435; 5 287



Math Facts!

- 4 digit numbers are read from left to right according to the place value of their digits (from Thousands (Th) to Hundreds (H), Tens (T) and Ones (O)).
e.g.: 1 001: one thousand one; 1 011: one thousand eleven; 1 111: one thousand one hundred eleven; 3 456: three thousand four hundred fifty six

- In a 4 digit number, the new rod is the Thousands (Th) place value.
- 4 digit numbers are written in figures from left to right according to the place value of their digits eg: 1000 (one represents thousands, the first zero represents hundreds, the second zero represents tens and the last zero represents ones). For other four digit numbers, you write units representing thousands followed by a 3 digit number.

Note:

- When writing a 4 digit number in figures, the thousands are separated from the hundreds by either a comma or space, e.g. 2,458 or 2 458. In this teacher guide we have chosen to leave a space between the thousands and the hundreds.
- When writing years do not use a comma or space between the thousands digit and the hundreds digits, e.g., Mugisha was born in 1999.

Application

- 1) Show pupils different Rwandan franc notes (1 000Frw, 2 000Frw, 5 000Frw) and in pairs they read the numbers written on them and write them in figures.
- 2) Pupils individually solve the following:
 - a) Think of two 4 digit numbers and write them in figures.
 - b) Make 4 different numbers of 4 digit numbers using the following numbers: 9, 8, 6, 7

Conclusion**Assessment**

Pupils do the following activities, individually and then they exchange their work for peer assessment.. Review the answers together and explain as necessary.

- 1) Teacher will say a number. Pupils write it in figures.
 - a) 6 666
 - b) 1 278
 - c) 2 003
- 2) Write in figures and words the year in which you were born.
- 3) Teacher will show Rwandan franc notes. Pupils write them in figures and words.
 - a) 1 000Frw
 - b) 2 000Frw
 - c) 5 000Frw

Homework

- 1) Think of 3 four digit numbers and write them in figures.
- 2) Make 3 four digit numbers using the following digits: 3,1,9,0.
- 3) Think of where a 4 digit number can be used/found in real life situations (e.g. in buying, on a calendar, in textbooks, on number plates).

Period 3**Reading and writing a 4 digit number in figures and words****Instructional objectives**

Given bills or other materials, pupils will be able to read and write 4 digit numbers in figures and words confidently, accurately and within a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs, and in small groups of 4.

Materials

Drawing of bill, abacus, place value chart, drawing of tree table, flash cards with numbers written on them

References

Mwungeri, E. et al. 2008. Mathematics, Pupil's Book, Primary 4, P2.

Introduction/Review

Correction of homework.

Game: **Pairs to 100**

Chant in five thousands from 0 to 50 000(forward and backward).

Development**Presentation**

Activity 1: Reading and writing 4 digit numbers

Pupils observe the following bill that was given to one pupil after buying some school objects in a shop and do related activities in groups of 4:

- Read the numbers written on the bill.
- Write those numbers in words.
- Represent the numbers on an abacus.
- Indicate the place value of each digit using a place value table.
- Identify the different parts of the bill.
- What is the difference between unit price and total price?

Name of the shop: Terimbere Shop.....

DateJanuary 2nd, 2015.....

Bill number: ... 394.....

Customer:.....Mutoni Ange..... owes

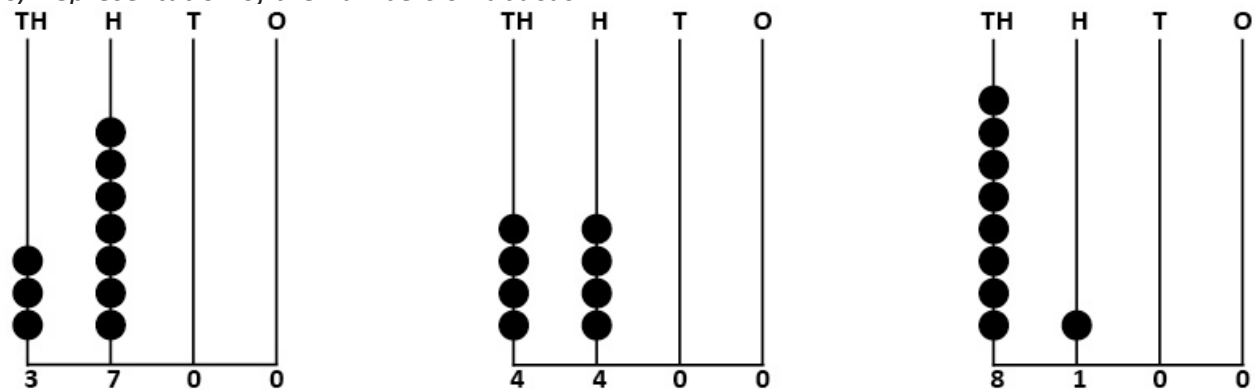
Quantity	Item	Unit price	Total price
1	School bag	3 700Frw	3 700Frw
1	School uniform	4 400Frw	4 400Frw
Total:			8 100Frw.....

Signature:.....

Some pupils present on board.

Answers:

- Pupils read numbers
- 3 700: three thousand seven hundred; 4 400: four thousand four hundred; 8100: eight thousand one hundred
- Representation of the numbers on abacus:



d) Representation of the numbers in place value table:

TH	H	T	O
3	7	0	0

TH	H	T	O
4	4	0	0

TH	H	T	O
8	1	0	0

- Different parts include the name of the shop date, bill number, name of the customer, quantity (number of a particular item being bought), unit price (how much it costs for one of the items), total price, total, signature
- The unit price is the price for one of the items. The total price is the unit price multiplied by the number of the items bought.

Activity 2: Reading and writing 4 digit numbers

In groups of 4, pupils read the following information and table, and answer the questions. Many schools are trying to help the environment by planting trees. The following table shows the number of trees planted by different schools:

School Name	Number of Trees Planted
Musanze Primary School	1 256
Kigali Primary School	3 448
Butare Primary School	2 903
Total	7 607

- Write in figures and words the number of trees planted by Butare Primary School.
- Write in figures and words the total number of trees planted by all three schools.
- Does your school plant trees? If so, how many trees have been planted? If no, how could you start a tree planting program?
- Why are trees important to people and the environment?
Some pupils present on board.

Answers:

- 2 903: two thousand nine hundred three
- 7 607: seven thousand six hundred seven
- To be discussed in groups / class
- Possible answers: Trees produce oxygen, improve air quality, provide food, provide shade, provide a place to live for birds and animals, provide wood, help to stop soil erosion, provide a place for people to meet (unity)...

Application

- Give 4 pupils flash cards with one of the following numbers on each: 7, 6, 9, 2. The 4 pupils stand in front of the class (in a horizontal line) showing their numbers to class. Class to suggest different ways the 4 pupils can stand (exchanging places) to make different numbers. Each time they make a number, pupils write the number in figures and in words in their notebooks, with one pupil doing it on board each time. (Continue the game by changing the pupils who hold the flashcards).
- Write the year when you were born in figures and words.
- Pupils individually look at the following invoice that was given to Mugeni during shopping and write the numbers written on it (total price and grand total) in words:

Name of the shop: Unguka shop.....

DateJuly 21st, 2105.....

Bill number:328.....

Customer: EmilyMugeni.....owes:

Quantity	Item	Unit price	Total price
3kg	Maize flour	500Frw	1 500Frw
2kg	Sugar	700Frw	1 400Frw
4 bars	Soap	500Frw	2 000Frw

Grand total:.....4 900Frw.....

Signature:.....

Conclusion

Assessment

Pupils do the following activities, individually and then they exchange their work for peer assessment. Review the answers together and explain as necessary.

1) Read and write the following numbers in words:

- a) 4 763
- b) 6 074

2) Read and write the following numbers in figures:

- a) Eight thousand four hundred
- b) Nine thousand nine hundred ninety nine

Name of the shop: Unguka shop.....			
DateMay 2 nd , 2105.....			
Bill number: 132.....			
Customer: Mary Kamanzi.....owes:			
Quantity	Item	Unit price	Total price
3kg	Beans	500Frw	1 500Frw
2kg	Sugar	800Frw	1 600Frw
5kg	Rice	700Frw	3 500Frw
Grand total:.....6 600Frw.....			
Signature:			

- a) Write the total price of sugar in figures and words.
- b) Write the total amount it costs for all three items.

Homework

- 1) Write the following numbers in words: 7 231; 9 334; 9 999.
- 2) Write the following number in figures:
 - a) Four thousand nine hundred ninety nine
 - b) Seventy thousand three hundred two
- 3) Fill the following table showing important events in your life:

Name	Important years	Year
My name is:.....	The year when you were born	I was born in.....
	The year when you started P1	I started P1 in
	The year when you started P2	I started P2 in
	The year when you started P3	I started P3 in.....
	The year when you started P4	I started P4 in.....

Period 5

Reading and writing a 5 digit number and 100 000 in figures

Instructional objectives

Using place value tables and abacus pupils will be able to read and write a 5 digit number and 100 000 in figures confidently, accurately and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs, and in small groups of 4.

Materials

- Place value table drawn on manila paper.
- Abaci drawn on manila paper or on board.

References

- Mwumvaneza, E. et al (2008). Mathematics Teacher's Guide, Primary Four, P3.
- Byamukama, J & Mulisa, L (2010). New Upper Primary Maths, Pupil's book for Grade 4, P5.

Introduction/Review

Correction of homework.

Game: **50 more than:** Say numbers between 0 and 9 900. Pupils say the number that is 50 more than the number said.

Chant

Pupils chant in thousands from 0 to 9 000. Can also vary it as in previous period.

Development**Presentation****Activity 1: Reading and writing 5 digit numbers**

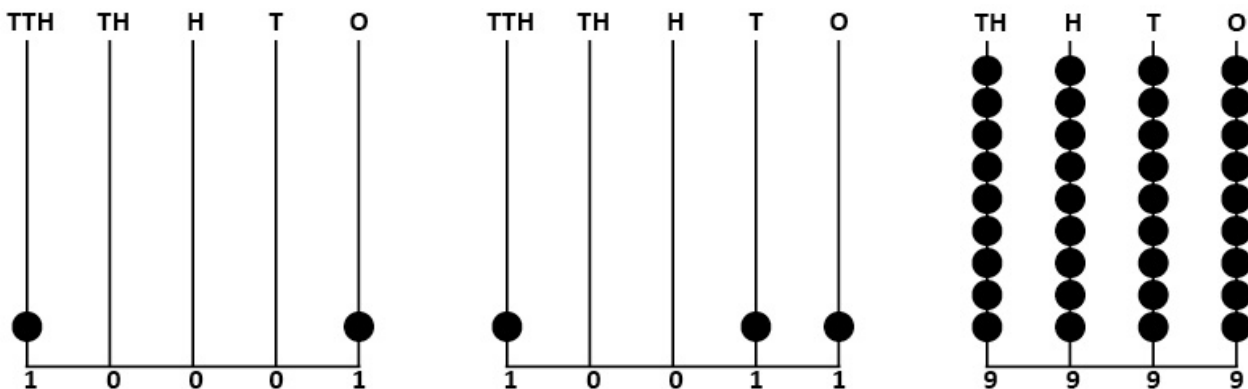
Show to pupils 3 drawn abaci (on manila paper or on board) which show the following numbers: 10 001; 10 011; 9 999.

- In pairs pupils observe the abaci, draw them in their notebooks and write the corresponding numbers under each abacus. Some pupils present on board.
- Put pupils in small groups of 4 and have them discuss the following questions:
 - How do 10 001 and 10 011 and their representation on the abaci differ from 9 999? (9 999 has 4 digits while 10 001 and 10 011 have 5 digits. *There is another rod on the abaci for the 5 digit numbers called Ten Thousands (TTH)*)
 - How are five digit numbers similar to 3 or 4 digit numbers? (*We still read and write them from left to right,*)
 - What happens if we add another rod to the abacus of a 5 digit number? What would we call the rod? Give an example. (*The next rod is called Hundred Thousands (HTH) and the number would be a six digit number. eg: 100 000.*)

Some pupils present on board.

Answers:

Representation of the numbers: 10 001; 10 011; 9 999 on abaci:



Activity 2: Representing numbers in a place value table and reading them.

Pupils read the following numbers and put them in a place value table:

- a) 43 567
- b) 20 081
- c) 17 962

Answers:

TTH	TH	H	T	O
4	3	5	6	7

forty three thousand five hundred sixty seven

TTH	TH	H	T	O
2	0	0	8	1

twenty thousand eighty one

TTH	TH	H	T	O
1	7	9	6	2

seventeen thousand nine hundred sixty two

Math Facts!

- 5 digit numbers are read from left to right from Ten thousands (TTH) to Thousands (TH), Hundreds (H), Tens (T) and Ones (O). eg. 10 000 is read “ten thousand”
- 5 digit numbers are written in figures also from left to right from Ten thousands (TTH) to Thousands (TH), Hundreds (H), Tens (T) and Ones (O).
- The same pattern holds true for 6 digit numbers. They are read and written from left to right from Hundred thousands to Ten thousands (TTH) to Thousands (TH), Hundreds (H), Tens (T) and Ones (O).
- 100 000 is read (one hundred thousand) and written (1 followed by 5 zeroes) from left to right.

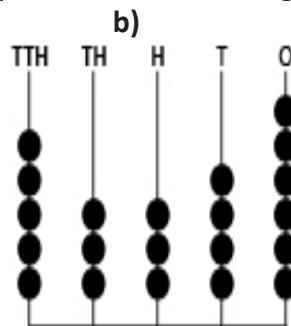
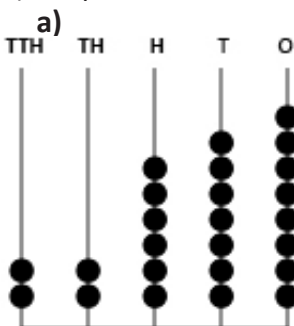
Note: In a 5 digit number the new rod is: Ten Thousands (TTH). In a 6 digit number such as 100 000 the new rod is Hundred Thousands (HTH).

Application

1) Teacher says the following numbers and pupils in small groups write them in figures:

- a) 10 094
- b) 34 782

2) Pupils write the numbers represented by the abaci below in figures and in words.



3) Pupils write and read 4 five digit numbers using the digits given: 8,7,1,6, 2.

Conclusion

Assessment

Pupils do the following activities, individually and then in pairs. Review the answers together and explain as necessary.

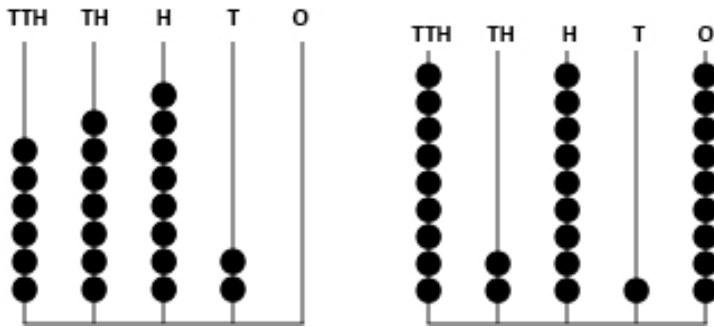
- 1) Think of 2 five digit numbers and:

- a) write them in figures and words.
 - b) write the numbers in a place value table.
- 2) With a partner, write as many five digit numbers as you can using the following digits: 3,7,9,0,1.

Congratulate the pair who wrote the most 5 digit numbers.

Homework

- 1) Write the numbers represented by the following abaci in words and in figures.



- 2) Think of 3 five digit numbers and write them in figures and words.

Period 6

Reading and writing a 5 digit number and 100 000 in figures and words

Instructional objectives:

Using cheques, bills and place value tables, pupils will be able to read and write a 5 digit number and 100 000 in figures and words confidently, accurately, and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs, and in 3 teams.

Materials

- Cheque drawn on manila paper or board
- Real sample of a cheque
- Abacus drawn on manila paper
- Place value table drawn on manila paper.
- Table of family budget on manila paper or board
- Sample bill

References

- Mwumvaneza, E. et al (2008). Mathematics Teacher's Guide, Primary Four,P3,4.
- Byamukama, J& Mulisa, L(2010).New Upper Primary Maths, Pupil's book for Grade 4,P5.

Introduction/ Review

Correction of homework.

Game: **100 more than.**

Chant in ten thousands from 0 to 100 000.

Development

Presentation

Activity 1: writing and representing 5 digit numbers on abacus

Draw the following cheque on board (and pass a real example around the room so that pupils can see what a real cheque looks like).

BWIZA COMMERCIAL BANK
BANQUE COMMERCIALE BWIZA

Head Office
12 Avenue Ubuhoro
P.O. Box 333 Berwa

RWF

DATE _____

AMOUNT / UMUBARE
99 999

Pay / Payez: _____ Or order / à l'ordre de
SIGNATURE(S)

The sum of / la somme de: _____

KANAKUZE GONZAGUE 661-2221111-66

00345844

Do not write or stamp before this line / Ne pas écrire ou cacheter en dessous de cette ligne

Pupils observe it and in pairs they:

- Write the number written on it in words. They should identify where on the cheque they write the amount.
- Represent that number on an abacus.
- Identify the different parts of the cheque.
- Discuss why and where one would use a cheque.

Some pupils present on the board. Discuss answers with class.

Answers:

- The number: 99 999 written in words on the cheque.

BWIZA COMMERCIAL BANK
BANQUE COMMERCIALE BWIZA

Head Office
12 Avenue Ubuhoro
P.O. Box 333 Berwa

RWF

DATE _____

AMOUNT / UMUBARE
99 999

Pay / Payez: _____ Or order / à l'ordre de
SIGNATURE(S)

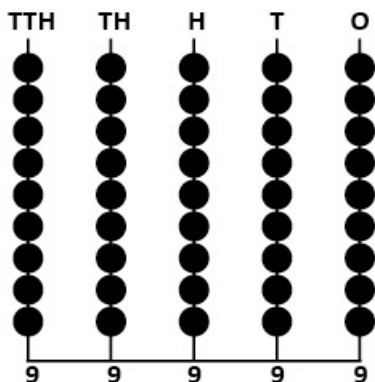
The sum of / la somme de: *Ninety-nine thousand
nine hundred ninety nine francs*

KANAKUZE GONZAGUE 661-2221111-55

00345844

Do not write or stamp before this line / Ne pas écrire ou cacheter en dessous de cette ligne

- Representation of the number: 99 999 on abacus:



- Name of bank and address, date, amount to be paid (in numbers), name of person to be paid, the sum of (amount written in words)
- People can use cheques in some shops to buy items, people may get a pay cheque from their employer, people can use cheques to pay other individuals when they do not have the cash in hand but it is in their bank account, etc. People can cash or deposit a cheque at the bank...

Application

- 1) In pairs write down in figures any three numbers between:
 - a) 17 276 and 18 000
 - b) 29 000 and 30 000
- 2) Individually write the following numbers in figures:
 - a) Sixteen thousand six hundred sixty six
 - b) Ten thousand seven hundred sixty four
- 3) In pairs look at the following family budget and write the price of every item and the total price in words:

Item	Price
Public Insurance	15 000Frw
School uniforms	10 500Frw
Notebooks	3 600Frw
School bags	15 500Frw
Total	44 100Frw

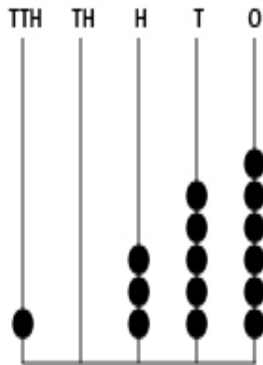
Conclusion

Assessment

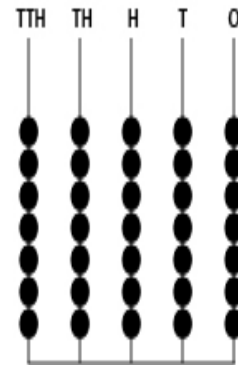
Divide the pupils into 3 teams. They are going to have a competition. The team whose members answer the most questions correctly wins. Note: All team members have to answer the questions in their notebooks.

- 1) Write the numbers represented by the following abaci in words and in figures .

a)



b)



- 2) Read and write the following numbers in words: 32 678; 94 093;.
- 3) Read and write the following numbers in figures:
 - a) One hundred thousand
 - b) Forty eight thousand nine hundred two
 - c) Sixty six thousand, eight hundred twenty two

Homework

- 1) Write the following numbers in figures:
 - a) Nineteen thousand seven hundred six
 - b) Two hundred eight thousand six hundred one
- 2) Kankindi is going to get married. She went to town for shopping. She was given the following bill after buying things at the bridal shop:

Name of the shop: BerwaShop.....

DateApril 3rd 2015.....

Bill number:...123.....

Customer:.....Kankindi Jane.....:

Quantity	Item	Unit price	Total price
1	Hiring a wedding dress	60 500Frw	60 500Frw
1	A handbag	25 450Frw	25 450Frw
1	pair of shoes	14 000Frw	14 000Frw

Total:.....99 950Frw.....

Signature:.....

Write the numbers written on the bill in words.

Lesson 2 Place value in five digit numbers

Topic area	Numbers and Operations
Unit1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and make calculations on whole numbers up to 100 000.
Learning objectives	<p>At the end of this lesson, pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Name place values in a five digit number, in spoken and written form. Identify the place values in written numerals (five digit number). <p>Skills:</p> <ul style="list-style-type: none"> Correctly translate between written numerals and spoken English using place values. <p>Attitude and values:</p> <ul style="list-style-type: none"> Develop personal confidence in the use of numbers. Appreciate the importance of working out numbers quickly and accurately.
Key words	See lesson 1

Competences developed	<ul style="list-style-type: none"> - Communication developed through presentations and answering questions. - Cooperation and interpersonal management developed through working in groups and pairs. - Critical thinking and problem solving developed through discovering how to write numbers in expanded form and solving problems with missing numbers.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1**Place value in a five digit number****Instructional objectives**

Using an abacus and a place value table, pupils will be able to identify the place value of a digit in a five digit number; represent and expand a five digit number confidently, correctly and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups (e.g. groups of 4).

Materials

Abacus, place value table

References

- Mwumvaneza, E. et al. 2008. Mathematics Teacher's Guide, Primary Four, P5.
- Byamukama, J&Mulisa, L. 2010. New Upper Primary Maths, Pupil's book for Grade 4, P7.
- Websites: <http://www.mathgodies>; <http://www.mathisfun.com>

Introduction/Review

Correction of homework.

Game: **Pairs to 100.**

Chant in five thousands from 0 to 50 000 (forward and backward). Vary by chanting in two, three or four thousands.

Development**Presentation****Activity 1: Finding place value of a 5 digit number**

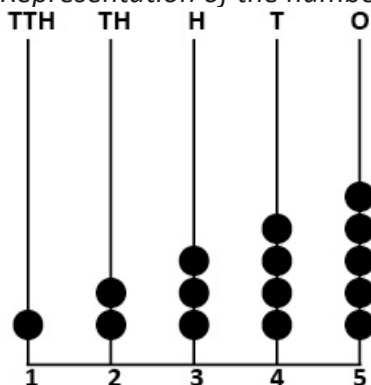
Pupils in groups of four represent the number 12 345 on an abacus and a place value table.

- One pupil represents the number 12 345 on abacus on board and explains its place value.
- Another pupil represents the number 12 345 using a place value table and explains its place value.

Answers:

1)

- Representation of the number 12 345 on abacus:



b) Representation of the number: 12 345 in a table:

TTH	TH	H	T	O
1	2	3	4	5
$1 \times 10\,000 = 10\,000$	$2 \times 1\,000 = 2\,000$	$3 \times 100 = 300$	$4 \times 10 = 40$	$5 \times 1 = 5$

Activity 2: Finding place value of a 5 digit number

In pairs, pupils answer the following questions about the place value of each digit in the number 12 345:

- Which digit is in the place value of ten thousands?
- Which digit is in the place value thousands?
- Which digit is in the place value of hundreds?
- Which digit in the place value of tens?
- Which digit is the place value of in the ones?

Some pupils present on the board.

Answers:

In the number 12 345:

- 1 is in the place value of Ten Thousands (TTH). It means ten thousand (10 000).
- 2 is in the place value of Thousands (TH). It means two thousand (2000).
- 3 is in the place value of Hundreds (H). It means 3 hundred (300).
- 4 is in the place value of Tens (T). It means forty (40).
- 5 is the place value of Ones. It means five (5).

Activity 3: Finding place value of a 5 digit number

Ask pupils how they would express 12 345 as the sum of its place values. (Hint: How many 10 000's are there? How many thousands? How many hundreds...tens...ones? When written this way, what form is it in? When written as a number, what form is it called?)

Answer:

$$12\,345 = 10\,000 + 2\,000 + 300 + 40 + 5$$

This is called **expanded form**.

As a number, 12 345, it is in short or **simplest form**.

Activity 4: Finding place value of a 5 digit number

In groups of 4, pupils use flash cards with digits: 1, 2, 0, 3, 4 to:

- Make the smallest number and explain the value of zero in that number.
- Make the biggest number and explain the value of zero in the number.
- Explain what would happen if we start by zero?

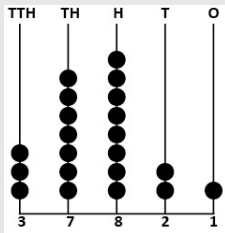
Some pupils present on the board and discuss answers with class.

Answers:

- The smallest number that can be made with the digits: 1, 2, 0, 3, 4 is 10 234. In this number zero is in the place value of Thousands)
- The biggest number that can be made with the digits: 1, 2, 0, 3, 4 is: 43 210. In this number zero is in the place of Ones.
- When zero starts a number it has no value.

Math Facts!

- The **place value** of a number can be represented by an **abacus** or place value table.
- On an **abacus**, beads are used to represent the digits of numbers, including ones, tens, hundreds, thousands, ten thousands, hundred thousands, etc.



- In a **place value table**, each digit is put under the corresponding column.

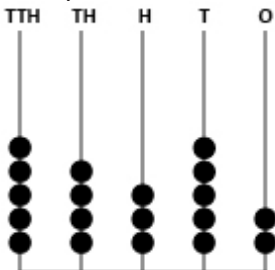
TTH	TH	H	T	O
3	7	8	2	1

- 3 is in the place value of Ten Thousands(TTH). 3 stands for 30 000.*
 - 7 is in the place value of Thousands(TH). 7 stands for 7 000.*
 - 8 is in the place value of Hundreds (H). 8 stands for 800*
 - 2 is in the place value of Tens(T). 2 stands for 20*
 - 1 is in the place value of Ones (O). 1 stands for 1.*
- A zero at the beginning of a number has no value (e.g. We do not write 0453. We write 453.)
 - Expanded form is when we express a number as the sum of its place values. So 37 821, which is in its simplest form, can be written in expanded form: $30\ 000 + 7\ 000 + 800 + 20 + 1$.

Application

Pupils, in small groups, answer the following questions:

- 1) What number does this abacus show?



- 2) Using an abacus and a place value table, represent the following numbers:
 - a) 37 821
 - b) 75 490
- 3) Write the following numbers in expanded form:
 - a) $22\ 317 =$
 - b) $67\ 393 =$
- 4) Write the following expanded numbers in short (or simplest) form:
 - a) $10\ 000 + 2\ 000 + 300 + 40 + 5 =$
 - b) $60\ 000 + 0 + 0 + 7 =$
- 5) Fill in the blank lines with the missing number.
 - a) $36\ 213 = 30\ 000 + \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + 10 + \underline{\hspace{2cm}}$
 - b) $88\ 470 = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + 400 + \underline{\hspace{2cm}} + 0$
- 6) Why do you think we need to know the place value of a number?

Conclusion

Assessment

Pupils solve the following:

- 1) Represent the following numbers on an abacus and place value table:
 - a) 77 900
 - b) 37 236
- 2) Observe the following number and write it in expanded form:
 - a) 59 123
 - b) 92 078
- 3) Give the place value of each underlined digit as in the example below:
23 670: 6 is in the place value of hundreds.
 - a) 17 586
 - b) 20 000
 - c) 42 097
- 4) Fill in the blank lines with the missing numbers:
 $77\ 306 = 70\ 000 + \text{—————} + 300 + 0 + \text{—————}$

Homework

Pupils copy the following activities in their notebooks and do them when they reach home:

- 1) Give the place value of each digit in the following numbers:
 - a) 3789
 - b) 79 056
- 2) Represent the following numbers on an abacus and place value table:
 - a) 12 895
 - b) 77 777
- 3) Write the following numbers in expanded form:
 - a) 23 819
 - b) 45 983
- 4) Write the following expanded numbers in short (or simplest) form:
 - a) $30\ 000 + 8\ 000 + 200 + 90 + 8$
 - b) $40\ 000 + 5\ 000 + 300 + 10 + 9$

Lesson 3

Comparing 2 five digit numbers

Topic area	Numbers and Operations
Sub-topic area/ Unit	Mathematical operations on whole numbers up to 100 000
Key unit competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	By the end of this period pupils will be able to: Knowledge: <ul style="list-style-type: none">• Compare 2 five digit numbers using $<$, $=$ and $>$. Skills: <ul style="list-style-type: none">• Use place value to compare numbers.• Apply comparison of numbers in daily life. Attitude: <ul style="list-style-type: none">• Use numbers confidently.
Key words	Greater than, less than, equal to, further than, nearer than

Cross cutting issues	<ul style="list-style-type: none"> - Financial education developed through raising learners' awareness about the importance of comparing prices before paying and the factors to consider when deciding where to buy an item; concept of exporting goods. - Gender: developed when assigning tasks in group work and presentation. - Standardisation Culture: developed through discussion on producing high quality goods for the local market or export market.
Competences developed	<ul style="list-style-type: none"> - Communication developed through using comparison terms in reading, writing and speaking activities - Cooperation developed through working in pairs, groups. - Critical thinking and problem solving developed through reading and analyzing data in tables.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Comparing two 5 digit numbers

Instructional objectives

Using place value pupils will be able to compare 5 digits numbers confidently, correctly and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Flash cards with different five digits numbers.

References:

- Mwumvaneza, E. et al.2008. Mathematics Teacher's Guide, Primary Four,P6&7.
- Byamukama, J& Mulisa, L.2010.New Upper Primary Maths,Pupil's book for Grade 4,P9.
- EDC/Akazi Kanoze. 2011. Accelerated Learning Program Mathematics Teacher's Manual, P35.
- Food and Agriculture Organization. <http://faostat.fao.org/desktopdefault.aspx?pageid=342&lang=en&country=184>. September 6, 2015.

Introduction/ Review

Correction of homework.

Game: **Greater than or less than.**

Chant in ten thousands from 0 up 100, 0000(forward and backward). Vary by starting at 15 000.

Development

Presentation

In groups pupils read carefully the following situation and answer the related questions.

Kamaliza went to buy different items. She found that the items had different prices in two shops as shown in the table below:

Item	Shop1	Shop 2
500g of Tea	1 300Frw	1 200Frw
500g of Coffee	1 500Frw	1 450Frw
25 kg of maize flour	10 000Frw	10 500Frw
25kg of rice	16 000Frw	16 050Frw
100kg of beans	30 000Frw	30 000Frw
A tin of milk	25 500Frw	25 000Frw

Activity 1: Comparing 5 digit numbers

- a) Compare the prices of tea in the two shops using: **greater than**, **less than** or **equal to** . Do the same for the price of maize, flour, beans.
- b) In which shop would you buy tea, maize, flour and beans? Why?
Why would one ever consider buying an item that has a higher price?

Answers:

- a)
 - (i) The price of tea in shop 1 is **greater than** the price of tea in shop 2.
 - (ii) The price of maize flour in shop 1 is **less than** the price of maize flour in shop 2.
 - (iii) The price of beans in shop 1 is **equal to** the price of beans in shop 2.
- b)
 - (i) I would buy tea in shop 2 because it is less expensive.
 - (ii) I would buy maize flour in shop1 because it is less expensive.
 - (iii) I would buy milk in shop1 or shop 2 because the price is the same (equal).
- c) Possible answers: The quality of the higher priced item might be better; the buyer might already have a good relationship with one shop and remain committed to shopping there.

Activity 2: Comparing 5 digit numbers

Pupils continue using the table to answer the questions:

- a) Compare the prices of maize in each shop using numbers and the following signs<,>=
- b) Compare the prices of tea in the 2 shops using numbers and the following signs<,>=
- c) Compare the prices of milk in the 2 shops using numbers and the following signs<,>=
- d) Explain the process you used to compare numbers.

Some pupils present on the board and discuss answers with class.

Answers:

- a) maize: 10 000 < 10 500
- b) tea: 1 300 > 1 200
- c) milk: 25 500 > 25 000
- d) When comparing numbers, first count the digits in each number. The number with more digits will be greater. If the digits are the same, compare the digits of each number starting at the left and moving right. e.g. 1 300 and 1 200 have the same number of digits. Look at left side of the number in the thousands place. They are both 1. Move to the right to the hundreds place. 3 is greater than 2 so 1 300 > 1 200.

Math Facts!

- When comparing two numbers, the number with the most digits will always be greater, e.g., 10 851 is greater than 1 851.
- When comparing two numbers, the number with less digits will always be smaller, e.g., 1 851 is less than 10 851.
- When comparing two numbers with the same number of digits, we compare digit of the same place value from left to right.
e.g. 21 851.....20 786 (in the Ten thousands place value the digits are the same, in the Thousands 1 is greater than 0 so 21 851 is greater than 20 786 or 20 786 is less than 21 851.
 “...Is greater than.....” is represented by the symbol “>” eg. 21 851 > 20 786
 “...Is less than.....” is represented by the symbol “<” eg. 20 786 < 21 851
 “...Is equal to”” is represented by the symbol “=” eg. 21 851 = 21 851

3) Observe the following table of clothes and their prices in two shops and answer the question below.

Item	Shop 1	Shop 2
Pants	12 000Frw	11 500Frw
Shoes	14 500Frw	15 000Frw
Hat	2 000Frw	1700Frw
T-shirt	3 000Frw	3400Frw
Dress	10 800Frw	12000Frw
Skirt	4 000Frw	3 800Frw

a) For each item, compare the prices in each shop using the symbols: <, > or =.
e.g. pants: 11 500 < 12 000

b) In which shop would you buy your dress, hat and shoes? Why?

Lesson 4 Ordering numbers

Topic area	Numbers and Operations
Unit	Mathematical operations on whole numbers up to 100 000
Key Unit competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Order numbers in ascending and descending order. Skills: <ul style="list-style-type: none"> • Order numbers in ascending and descending order using place value and comparison. Attitude: <ul style="list-style-type: none"> • Use numbers confidently.
Key words	Order, Ascending order, Descending order Less, More, Least, Cheap, Cheapest Most, Expensive
Cross cutting issues	- Financial education developed through discussion on how families can try to save money to be able to pay school fees. - Gender developed through analyzing enrollment figures for S1 – S6 and discussing why more girls do not complete secondary school compared to boys, despite having higher enrollment in S1.
Competences developed	- Communication developed through explaining processes used to order numbers. - Cooperation developed through working in pairs, groups. - Problem solving skills developed through applying concepts of ordering to information found in tables.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Ordering numbers in ascending order

Instructional objectives

Using the concept of place value and given a list of numbers, pupils will be able to order numbers in ascending order confidently, correctly and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually and then in pairs or small groups.

References

- Mwumvaneza, E. et al. 2008. Mathematics Teacher's Guide, Primary Four, P7, 8.
- Byamukama, J& Mulisa, L.2010. New Upper Primary Maths, Pupil's book for Grade 4, P23.

Introduction/ Review

Correction of homework.

Game: **Which number comes after or before?**

Chant in ten thousands from 0 up 100 000(forward and backward). Vary by starting at different numbers such as 2 000 or 3 000.

Development**Presentation****Activity 1: Ordering numbers**

First individually and then in groups, pupils observe the table showing the termly school fees for 5 schools.

Schools	School fee per term in Rwandan francs (Frw)
School 1	57 000
School 2	45 450
School 3	69 000
School 4	50 000
School 5	39 000

- Write the school fees of all schools in a place value table.
- Order the numbers in ascending order.
- Explain the process you used to order the fees from the cheapest to the most expensive. (What did you do first? What did you do next?)
- How might parents / guardians / families save money so they can pay school fees?

Some pupils present on board.

Answers:

a)

TTH	TH	H	T	O
5	7	0	0	0
4	5	4	5	0
6	9	0	0	0
5	0	0	0	0
3	9	0	0	0

- b) Ordering numbers in ascending order, we have: 39 000Frw; 45 450Frw; 50 000Frw; 57 000Frw; 69 000Frw.
- c) When ordering numbers, first compare the number of digits each number has. The fewer the digits, the smaller the number. Next, when the number of digits is the same, look at the first digit on the left. The smaller the digit, the smaller the number. If the number is the same, move to the column to the right. Again, compare in the same way.
- d) There are different ways to try to save money. One example is to reduce spending on items that are not necessary such as sweets and drinks. Figure out areas where spending could be decreased. For example, mobile phone calls, entertainment, etc.

Activity 2: Ordering numbers

Put the following numbers in ascending order:

- a) 90 320; 90 659; 43 876; 53 010
 b) 6 439; 65 220; 67 981; 65 223

Ask few pupils to share their answers and explain how they ordered them from smallest to greatest/

Answers:

- a) 43 876; 53 010; 90 320; 90 659
 b) 6 439; 65 220; 65 223; 67 981

Math Facts!

- When ordering numbers we use the knowledge of comparison and place value. This helps identify the lowest number and we start ordering from it. When ordering numbers, the number with the most digits will always be greater (e.g 23 081 is greater than 2301).
- When ordering numbers with the same number of digits, we look at the first digit of the numbers which are being ordered: the number which has the lowest first digit will be placed at the first level. If the first digit (in the case of a five digit number it would be the ten thousand digits) are the same, then you consider the next digit to the right –the thousand place value, then the hundreds place value, then tens place value and then the ones place value in order to identify the lowest number. You go progressively until you reach the highest number.

eg. Put in ascending order (from lowest to highest): 45 298; 43 987; 43 964

The first digits are all the same, 4. Move to the right. 5 is greater than 3 so we know the highest number is 45 298. Move again to the right in the 2 numbers that start with 43. Both have a 9 in the hundreds place. Move again to the right. $8 > 6$ so we know the lowest number is 43 964. Written in ascending order, it is 43 964; 43 987; 45 298.

Application

- 1) In small groups, pupils write the following numbers in ascending order:
 - a) 11 000; 10 456; 19 001; 10 546
 - b) 25 468; 25648; 35 648; 25038
 - c) 52 648; 25 648; 45678, 56784; 69874.
- 2) In small groups, pupils solve the following:

The Virunga Mountains are a chain of volcanoes the borders of Rwanda, the Democratic Republic of Congo (DRC) and Uganda. Observe the table showing heights of the volcanic mountains and:

 - a) indicate the shortest and the tallest volcanic mountains
 - b) order the heights of all the volcanic mountains in ascending order.

Name of volcanic mountain	Height in meters
Muhabura	4 127
Mikeno	4 437
Karisimbi	4 507
Bisoke	3 711
Nyiragongo	3 470
Gahinga	3 474
Nyamuragira	3 058
Sabyinyo	3 674

Conclusion

Assessment

- Write the following numbers in ascending order: 8 768; 66 745; 90 124; 17 355; 11 1231.
- Observe the following table showing a school's monthly payments for electricity consumption. Order the amounts in ascending order and identify the month in which the school paid the least amount of money.

Month	Amount to be paid
January	17 800Frw
February	15 000Frw
March	21 500Frw
April	19 000Frw
May	18 900Frw
June	17 000 Frw

Homework

- In four different carpentry workshops, a shelf costs 34 550Frw; 28 000Frw; 24 000Frw; and 34 000Frw respectively. Order the above prices by ascending order and choose the cheapest book shelf.
- The following table shows the amount of maize harvested by a cooperative between 2010 and 2014.

Year	Harvest
2010	36 000 kg
2011	12 689Kg
2012	45 678Kg
2013	18 000 kg
2014	27 698 kg

- Order the amounts harvested in ascending order
 - In which year did the cooperative have the smallest harvest?
 - In which year did the cooperative have the greatest harvest?
- Identify examples of when they use ascending order in real life situations (On a **calendar**: months represented by numbers (1 – 12) are written in ascending order; on a **watch or clock**: numbers are written in ascending order; when ranking pupils in a competition;...).

Instructional objectives

Using the concept of place value and give n a list of numbers pupils will be able to order numbers in descending order confidently, correctly and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually and in small groups progressively.

Materials

Flash cards with different five digit numbers.

References

- Mwumvaneza, E. et al.2008. Mathematics Teacher’s Guide, Primary Four, P7, 8.
- Byamukama,J&Mulisa, L.2010.New Upper Primary Maths, Pupil’s book for Grade 4, P23.

Introduction/ Review

Correction of homework.

Games: **Greater thanand less than....; 1 000 more than....-**

Chant in 5 000 from 5 000 to 50 000 (eg 5 000; 10 000; 15 000; 20 000....50 000) forward and backward.

Development

Presentation

Activity 1: Ordering numbers

Individually and then in groups, pupils observe the table below and:

- 1) Say the name of the pupil who got the highest mark and the one who got the lowest mark.
- 2) Order the pupils’ marks from the highest to the lowest.
- 3) Explain how ordering in descending order (from highest to lowest) is different from ordering in ascending order (from lowest to highest).

Names	Marks per pupil out of 100
Abimana	79
Beza	92
Cyusa	89
Gatesi	57
Mutima	62
Ntaganda	90
Teta	97
Uwimana	99
Uwera	100

Some group representatives present on the board.

Answers:

- 1) *Uwera got the highest mark (100) and Gatesi got the lowest mark (57).*
- 2) *100; 99; 97; 92; 90; 89; 79; 62; 57.*
- 3) *When putting numbers in descending order, start with the highest number first (number with the most digits or if the number of digits is the same, the number with the highest value in the left-side digit. If those digits are the same, move to the right and choose higher number, etc.). When putting numbers in ascending order, you would use the same process except you would start with the lowest number first.*

Activity 2: Ordering numbers

Individually and then in groups, pupils observe the table below that shows the number of male and female secondary school students enrolled in S1 – S6 in 2013.

Grade Level	Male	Female
S1	68 371	79 176
S2	54 886	65 115
S3	43 944	50 030
S4	37 621	40 679
S5	36 798	36 228
S6	26 961	26 561

- 1) What year has the highest enrollment for both girls and boys?
- 2) What year has the lowest enrollment for both girls and boys?
- 3) Looking at S1 – S6 enrollment for males and for females, would you say the numbers are in ascending or descending order? Explain the meaning of your answer by discussing what happens to enrollment.
- 4) Why do you think enrollment decreases more for girls than for boys from S1 to S6? How could this be prevented?

Some group representatives present on the board.

Answers:

- 1) S1 has the highest enrollment for boys (68 371) and for girls (79 176).
- 2) S6 has the lowest enrollment for boys (26 961) and for girls (26 561).
- 3) The numbers are in descending order for both males and females. They start high and get lower each year. This means that each year from S1 – S6, enrollment decreases for both males and females.
- 4) Enrollment for girls starts out higher than for boys in S1 but by S6 there are more boys enrolled than girls. This could be for different reasons. Sometimes girls are not encouraged to continue further with their education and end up having to work, take care of others or start their own families. To prevent this, it would be good to encourage girls to finish secondary school and go further if they can. Boys and girls should have equal opportunities.

Math Facts!

When ordering numbers in descending order use the rules of comparison and place value by following the same process used for ordering numbers in ascending order, except that **for descending order from the highest number to the lowest. In ascending order we order numbers from the lowest to the highest.**

e.g. descending order: 5, 4, 3, 2, 1

ascending order: 1, 2, 3, 4, 5

Application

In small groups, pupils solve the following:

- 1) In the last lesson we put the volcanoes in the Virunga Mountain chain in ascending order. This time put the heights of the volcanoes in descending (highest to lowest) order.

Name of mountain	Height in meters
Sabyinyo	3 674
Mikeno	4 437
Nyamuragira	3 058
Bisoke	3 711
Karisimbi	4 507
Gahinga	3 474
Muhabura	4 127
Nyiragongo	3 470

- 2) Write the following numbers in descending order: 10 000; 11 111; 10 010; 10 100; 10 001.
- 3) In pairs write three numbers of 5 digits and give them to your partner to arrange them in ascending and descending order.
- 4) In four different shops, 25kg of rice costs respectively: 17 500Frw; 17 050Frw; 17 000Frw; 17 550Frw.
 - a) Order the above prices in descending and ascending order.
 - b) Say the cheapest rice and the most expensive one.
- 5) In which situation can we use ordering numbers.

Conclusion

Assessment

Answer the following questions:

- 1) Write the following numbers in ascending and descending order: 68 768; 45 667; 19 240; 17 355; 11 231.
- 2) Observe the following table showing the amount paid by a school for water consumption per month (from January to June 2014):

Mont:	Amount paid in Frw
January	17 800
February	15 000
March	21 500
April	19 000
May	18 900
June	17 000

- a) Order the numbers above in ascending in descending order.
- b) Identify the month during which the school has paid less money.
- c) Identify the month during which the school has paid more money.

Homework

- 1) Write four 5 digit numbers on your choice and order them in descending and ascending order. Then compare the greatest and the smallest numbers using comparison sym
- 2) Observe the table that shows different harvests of beans for Hinga Cooperative and respond to the questions. below:

Year	Harvest of beans in kg
1999	67 000
2010	36 000
2011	12 689
2012	45 678
2013	18 000
2014	27 698

- a) Order the above harvests in descending order.
- b) In which year did the Cooperative harvest the most kg of beans?
- c) In which year did the Cooperative harvest the least kg of beans?
- 3) Identify examples of when you use ascending and descending order in real life situations.

(A. On a **calendar**: months are written in ascending order; B. On a **watch**: numbers are written in ascending order. C. When you are counting the number of days remaining for an activity to happen you count the days in descending order: e.g. 4 days until I travel...3days until I travel... D. When you climb stairs or a ladder you ascend and when you go down stairs or a ladder you descend).

Lesson 5

Addition of five digit numbers

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and make calculations on whole numbers up to 100 000.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the process of addition of 2 five digit numbers with or without carrying. Skills: <ul style="list-style-type: none"> Carry out addition of 2 or more five digit numbers. Attitude and values: <ul style="list-style-type: none"> Appreciate the importance of addition.
Key words	Plus (+), equal (=), add, addition symbol (+), addition without carrying, altogether, sum.
Cross cutting issues	<ul style="list-style-type: none"> Financial education developed through solving problems related to money. Environment developed through raising environmental awareness (using problems related to protection of the environment).
Competences developed	<ul style="list-style-type: none"> Communication developed through presentations and speaking activities. Cooperation and interpersonal management developed through working in pairs and small groups. Critical thinking developed through using addition to solve real life problems.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Addition of two 5 digit numbers without carrying

Instructional Objectives

Using vertical arrangement (as in a place value table) of two five digit numbers and practical examples, pupils will be able to add numbers confidently, correctly and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually and then in pairs or small groups.

Materials

Flash cards with different numbers not exceeding 99 999.

References

- Mwumvaneza, E. et al. 2008. Mathematics Teacher's Guide, Primary Four, P9,10.
- Byamukama, J& Mulisa, L. 2010. New Upper Primary Maths, Pupil's book for Grade 4, P10 - 12; 14-15.
- EDC/Akazi Kanoze. 2011. Accelerated Learning Program Mathematics Teacher's Manual, P 44.

Introduction/Review

Correction of homework.

Games:

- **Greater than or smaller than.**
- **1000 more than.**

Chant in 5 000 from 5 000 to 50 000 (eg 5 000; 10 000; 15 000; 20 000 ...50 000) forward and backward. Vary the chant by starting with other numbers such as 3 000, 4 000, 6 000, ...

Development

Presentation

Activity 1: Adding 3 and 4 digit numbers without carrying

Pupils do the following 3 and 4 digit number addition exercises as a review:

- a) $125 + 143 =$
b) $1\,242 + 1\,753 =$

At least two pupils do the problems on the board and explain to the class how they arrived at their answers.

- c) In pairs, give an example and discuss how one would add 5 digit numbers.

A few pairs show their example on the board and explain how they add 5 digit numbers.

Answers:

a)

$$\begin{array}{r} 125 \\ + 143 \\ \hline 268 \end{array}$$

b)

$$\begin{array}{r} 1242 \\ + 1753 \\ \hline 2995 \end{array}$$

- c) *The same rules apply for adding numbers of 5 digits. Line the numbers up vertically. Start with the right side (one's column). Add and write the answer below the line. Move to the left (ten's column) and repeat the process. Continue moving to the left until all numbers have been added. For example:*

$$\begin{array}{r} 15359 \\ + 74630 \\ \hline 89989 \end{array}$$

Activity 2: Adding 5 digit numbers without carrying

Pupils work individually and then in small groups to solve the following word problem:

Last week Kalisa's shop sold 11 353 kg of maize flour. This week the shop sold 13 234 kg of maize flour. How many kg of maize flour did the shop sell altogether?

One pupil solves the word problem on board and explains the adding process to the class.

Answers:

Calculations:

$$\begin{array}{r} 11353 \\ + 13234 \\ \hline 24587 \end{array}$$

Solution: Kalisa sold 24 587 kg of maize flour

Math Facts!

When adding numbers of five digits without carrying, present them vertically, with the digits of the units (one's) aligned in the same column, the digits of the tens in the same column, etc. Start on the right (one's column) and add the numbers in the column. Move left to the next column (ten's) and add those numbers. Keep moving left until all columns are added.

Application

Pupils solve the following:

1)

$$\begin{array}{r} 3 \quad 3 \quad 4 \quad 5 \quad 6 \\ + 2 \quad 6 \quad 5 \quad 1 \quad 3 \\ \hline \end{array}$$

2) Arrange the following numbers vertically and calculate the sum:

a) $43\,945 + 23\,023 =$

b) $62\,346 + 37\,301 =$

c) $35\,000 + 24\,000 =$

d) Arrange the answers you have found in ascending and descending order.

3) A baker sold 14 200 cakes in January and 23 345 cakes in February. How many cakes did she sell altogether?

4) Last year people planted 11 245 trees in community work in order to protect the environment. This year they are planning to plant 15 000 trees. How many trees will they have planted by the end of this year?

Conclusion**Assessment**

1) Arrange the following numbers vertically and calculate the sum:

a) $43\,000 + 43\,000 =$

b) $54\,495 + 32\,203 =$

2) Solve the following problem:

Mugisha paid 27 000 Frw for the first term school fees. He paid 22 500 Frw for the second term school fees. How much money did he pay for the two terms?

Homework

Pupils copy the following questions in their notebooks and do them when they reach home:

1)

$$\begin{array}{r} 3 \quad 7 \quad 4 \quad 8 \quad 5 \\ + 2 \quad 2 \quad 5 \quad 1 \quad 4 \\ \hline \end{array}$$

2) Arrange the following numbers vertically and calculate the sum:

a) $43\,704 + 30\,004 =$

b) $54\,425 + 32\,203 =$

c) $61\,623 + 16\,303 =$

d) Arrange the answers you have found in ascending and descending order.

3) Solve the following problem:

On Monday, a shop keeper sold 12 000 kg of rice. On Tuesday he/she sold 13 456 kg of rice. How many kg of rice did he/she sell altogether?

4) For his graduation party, Rugwiro received of 23 000 Frw from her mother and 35 000 Frw from his father.

a) How much money did he get altogether?

b) Who gave him more money? Explain your answer.

Instructional objectives

Using vertical arrangement of two five digit numbers, pupils will be able to add 5 digit numbers involving carrying confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials

Flash cards with different five digit numbers not exceeding 99 999 (to be used in mental math activities).

References:

- Mwumvaneza, E. et al.2008. Mathematics Teacher’s Guide, Primary Four, P9, 10.
- Byamukama, J& Mulisa, L.2010. New Upper Primary Maths, Pupil’s book for Grade 4, P10- 11.
- EDC/Akazi Kanoze. Teacher’s Manual (non published), P49.

Introduction/Review

Correction of homework.

Games:

- **Greater and less than**
- **1000 more than**

Chant in 5 000 from 50 000 to 100 000 (eg 50 000; 55 000; 60 000; 65 000.....100 000) forward and backwards.

Development

Presentation

Activity 1: Adding 5 digit numbers with carrying

Pupils work in groups and solve the following word problem:

Inkunga firm produces 27 426 liters of Soja oil on Wednesday and 20 557 liters on Thursday. How many liters of oil did Inkunga firm produce in the two days?

One pupil solves the word problem on board with the help of the teacher and other pupils if needed.

Answer:

a) *Calculations:*

	TTH	TH	H	T	O	
				1		
	2	7	4	2	6	
+	2	0	5	5	7	
	4	7	9	8	3	→ Write down the ones and carry over tens to the next column on the left.

b) *Solution: In two days Inkunga firm produced 47 983 litres of soja oil.*

Pupils answer the following questions:

- a) How do we arrange numbers before adding them? (before adding numbers we arrange them vertically in a place value table).
- b) What order do we follow when adding 5 digit numbers? (when adding numbers we start

from the ones to tens, hundreds, thousands and ten thousands).

- c) What do we do when the sum we have found in one columns (in the above example it is the ones column) is a two digit number, eg $6+7= 13$? (we write down the 3 and carry over the 1 to the next column on the left, in the example given the 1 is carried over to tens).
- d) Where do we write the 1 carried over? (We write the 1 carried over the above number in the next column. In the example given it is the column of tens).

Activity 2: Adding 5 digit numbers with carrying

Pupils calculate the following addition problem that requires carrying more than once. They first work individually and then they compare their answers with a partner:

TTH	TH	H	T	O
1	9	5	7	6
+3	4	8	8	3

Answer:

TTH	TH	H	T	O
¹ 1	¹ 9	¹ 5	7	6
+3	4	8	8	3
5	4	4	5	9

Pupils explain how this problem is different from the previous one and what they did to solve it. (This problem requires carrying over three times instead of once. The same process applies).

Math Facts!

- In addition, numbers are arranged vertically according to their place value.
- 5 digit numbers are added from the ones, to tens, hundreds, thousands and ten thousands.
- When **adding numbers of 5 digits and you find that the sum of the numbers in a column is a 2 digit number (greater than 9), write down the ones and carry over the tens to the next column on the left.** In the example above, the right column is $6 + 7 = 13$. Write the 3 and carry over the 1 to the next column and so on. Add that 1 to the other numbers in the column to the left.

Application

1) Individually, add the following numbers and circle the correct sentence:

a) $39\ 329 + 11\ 418 =$

- (i) The sum of these two numbers is: 47 700
 (ii) The sum of these two numbers is: 50 747.

b) $45\ 571 + 33\ 589 =$

- (i) The sum of these two numbers is: 79 600
 (ii) The sum of these two numbers is : 79 160.

2) In pairs arrange the following numbers vertically and calculate the sum:

a) $55\ 647 + 24\ 782 =$

b) $61\ 945 + 18\ 067 =$

3) Individually, then in pairs solve the following problem:

A Cooperative sold their harvest of sorghum to 2 different retailers. The 1st retailer paid 27 780 Frw, the second retailer paid 35 550Frw. How much money did the Cooperative receive from the two retailers?

Conclusion

Assessment

1) Arrange the following numbers vertically and calculate the sum:

a) $57\,057 + 38\,097 =$

b) $45\,945 + 32\,589 =$

2) Solve the following problem:

A seller was paid by 2 customers as follows:

- Kalisa paid 15 000Frw for 25 kg of rice.
- Kampire paid 17 500Frw for 25 kg of sugar.

(i) How much money did the seller receive altogether?

(ii) Which customers paid the greatest amount of money?

Homework

Solve the following problems:

1) Higiro spent 25 000 Frw on buying a mattress and 40 000 Frw on buying a bed. How much money did he pay altogether?

2) A newspaper company produced 15 000 newspapers on Monday and 20 780 newspapers on Friday. How many newspapers did the company produce that week?

3) A Cooperative harvested 24 567kg of black beans and 37 895 kg of red beans from two different fields respectively.

(i) How many kg of beans did the Cooperative harvest altogether?

(ii) For which type of beans did the Cooperative get less harvest?

(iii) Compare the numbers for the two harvests using comparison symbols.

Lesson 6

Subtraction of 5 digit numbers

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and make calculations on whole numbers up to 100 000.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none">• Explain the process of subtraction of 2 numbers or more of 5 digits without borrowing. Skills: <ul style="list-style-type: none">• Carry out subtraction of 2 or more whole numbers without borrowing• Solve daily life mathematical problems involving subtraction. Attitude: <ul style="list-style-type: none">• Appreciate the importance of subtraction.
Key words	Minus (-), equal (=), subtract, subtractions without carrying, subtract with carrying, the difference.
Cross cutting issues	Financial education developed through solving problems related to money, especially saving money, keeping money in the bank, planning and budgeting, etc.

Competences developed	<ul style="list-style-type: none"> – Communication developed through presentations and speaking activities. – Cooperation and interpersonal management developed through working in pairs, groups. – Critical thinking developed through solving word problems on subtraction especially those requiring budgeting, planning.....
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1**Subtraction of two 5 digit numbers without borrowing****Instructional objectives:**

Using vertical arrangement of two five digit numbers, pupils will be able to subtract numbers without borrowing confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials: Flash cards on which some numbers (between 0 and 99 999) are written.

References:

- Mwumvaneza, E. et al.2008. Mathematics Teacher's Guide, Primary Four, P.12, 13.
- Byamukama, J &Mulisa, L.2010. New Upper Primary Maths, Pupil's book for Grade 4, P.18.
- EDC/Akazi Kanoze. Teacher's Manual (non published), P.44.

Introduction/ Review

Correction of homework.

Game: **1 000 less than.**

Chant in 4 000 from 0 to 100 000(forward and backward).

Development**Presentation****Activity 1: Subtracting 5 digit numbers without borrowing**

In pairs pupils solve the following review exercises and present their findings on board (teacher can make a sample of few pupils to present on board):

- a) $248 - 123 =$
- b) $2\,465 - 1\,313 =$
- c) In pairs, pupils discuss how they would subtract 5 digit numbers. Give an example to share with the class. A few pairs show their example on board and explain how they subtracted 5 digit numbers.

Answers

1)

a)

<i>H</i>	<i>T</i>	<i>O</i>
2	4	8
- 1	2	3
1	2	5

$$\begin{array}{r}
 \text{b)} \\
 \text{TH} \quad \text{H} \quad \text{T} \quad \text{O} \\
 2 \quad 4 \quad 6 \quad 5 \\
 -1 \quad 3 \quad 1 \quad 3 \\
 \hline
 1 \quad 1 \quad 5 \quad 2
 \end{array}$$

c) The same rules apply for numbers of 5 digits. Line the numbers up vertically. Start with the right side (one's column). Subtract and write the answer below the line. Move to the left (ten's column) and repeat the process. Continue moving to the left until all numbers have been subtracted. For example:

$$\begin{array}{r}
 2 \quad 8 \quad 7 \quad 6 \quad 9 \\
 + \quad 1 \quad 4 \quad 6 \quad 3 \quad 0 \\
 \hline
 1 \quad 4 \quad 1 \quad 3 \quad 9
 \end{array}$$

Activity 2: Subtracting 5 digit numbers without borrowing

In pairs pupils/in small groups solve the following word problem:

Last week a milk factory produced 26 778 liters of milk, it sold 15 225 liters of milk. How many liters of milk did the factory remain with?

Teacher makes a sample of pupils to present on board, explaining how they came up with the answer.

Answers:

(i) Calculations:

$$\begin{array}{r}
 \text{TTH} \quad \text{TH} \quad \text{H} \quad \text{T} \quad \text{O} \\
 2 \quad 6 \quad 7 \quad 7 \quad 8 \\
 -1 \quad 5 \quad 2 \quad 2 \quad 5 \\
 \hline
 1 \quad 1 \quad 5 \quad 5 \quad 3
 \end{array}$$

(ii) Solution: The factory remained with 11 553 litres.

Math Facts!

When subtracting numbers of more than one digit without borrowing present them vertically, with the digits of the units (one's) aligned in the same column, the digits of the tens in the same column, etc. Start on the right (one's column) and subtract the numbers in the column. Move left to the next column (ten's) and subtract those numbers. Keep moving left until all columns are subtracted.

Note: The biggest number is always placed on top.

Application

In pairs/ small groups pupils do the following:

1) Arrange the following numbers vertically and calculate the difference:

a) $67\,000 - 35\,000 =$

b) $86\,346 - 23\,301 =$

2) Fill in the missing digits:

$$6\,5\,8\,9\,7$$

$$- 3\,1\,7\,\square\,\square$$

$$3\,4\,\square\,7\,6$$

3) Solve the following problem:

a) Kagabo's family earns 95 000 Frw per month. In January 2015, they spent 64 000Frw on family needs. The balance was saved in the bank.

- (i) How much money did they save in January 2015?
 (ii) They are planning to spend 65 000Frw on family needs in February and save the remaining amount of money. How much money will they save in February?
 (iii) If they continue saving 30 000Frw in the bank every month, how much money will they have saved in the bank from January to June?
 (iv) What is Kagabo's purpose of saving the money?
- b) A shopkeeper bought 5 sacks of 25kg of sugar for 77 500Frw and sold them for 87 000Frw. What was his/her profit?

Conclusion

Assessment

- 1) Arrange the following numbers vertically and find the difference:
 a) $67\ 000 - 35\ 000 =$
 b) $54\ 943 - 32\ 023 =$
- 2) Solve the following problem:
 Musoni's salary is 98 000Frw. He pays 25 500Frw on house rent. How much money does Musoni remain with after paying house rent?

Homework

- 1) Arrange the following numbers vertically and calculate the difference :
 a) $67\ 000 - 35\ 000 =$
 b) $98\ 000 - 35\ 230 =$
 c) $59\ 873 - 23\ 340 =$

Period 3

Subtraction of two 5 digit numbers with borrowing

Instructional objectives:

Using vertical arrangement of two five digit numbers, pupils will be able to subtract numbers involving borrowing confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials

Flash cards on which some numbers (between 0 and 99999) are written to be used in mental math activities. .

References:

- Mwumvaneza, E. et al.2008. Mathematics Teacher's Guide, Primary Four, P.12, 13.
- Byamukama,J &Mulisa,L. 2010. New Upper Primary Maths, Pupil's book for Grade 4, P.19.
- EDC/Akazi Kanoze. Teacher's Manual (non published), P.54.

Introduction/ Review

Correction of homework.

Game: **1 000 less than** (use numbers which do not exceed 10 000).

Chant in ten thousands from 10 000 up 10 0000(forward and backward).

Development

Presentation

Activity 1: Subtracting 5 digit numbers with borrowing

In group pupils solve the following problem and some pupils present it on the board:

A farmer earned 13 254Frw after selling vegetables for a week. She spent 11 598Frw for buying some new tools. How much did she have remaining?

Answers:

1)

i) Calculations:

TTH	TH	H	T	O
	2	11	14	14
1	3	2	5	4
- 1	1	5	9	8
0	1	6	5	6

ii) Solution:

The farmer remained with: $13\ 254\ \text{Frw} - 11\ 598\ \text{Frw} = 1\ 656\ \text{Frw}$.

Pupils answer the following questions:

- a) How do we arrange numbers before subtracting them? (we arrange them vertically in a place value table).
- b) What order do we follow when subtracting 5 digit numbers? (when subtracting numbers we start from the ones to tens, hundreds, thousands and ten thousands).
- c) What do we do when in one column the top number is less than the bottom number?, eg $4 - 8$? (we borrow 1 from the next column on the left, in the example given, we have borrowed 1 from the tens and we got 14).

Activity 2: Subtracting 5 digit numbers with borrowing

A Cooperative harvested 24 345kg of soya beans. It sold 23 267kg of soya beans. How many kg of soya beans were left?

Some group representatives present on board.

(i) Calculations

TTH	TH	H	T	O
		2	13	15
2	4	3	4	5
- 2	3	2	6	7
0	1	0	7	8

In the example above, you cannot subtract 7 from 5. Borrow 1 from the tens column, making the 4 a 3. Put a 1 in front of the 5 in the ones column making the 5 a 15. Subtract $15 - 7$ in the ones column. Move on to the next column. You cannot subtract 6 from 3. Borrow one from the column to the left, using the same process.

(ii) Solution

The number of kg of soya beans that were left is 1 078 kg.

Math Facts!

When subtracting numbers vertically and you find that the top number is less than the bottom number, you need to borrow one from the column to the left and then subtract from the top number.

Note: When subtracting numbers with borrowing more than one time, you continue borrowing from the left column until the process is ended.

Application

In small groups, pupils work out the following:

1)

- a) $1\ 875 - 1\ 319 =$
- b) $66\ 957 - 63\ 829 =$

2) Solve the following problems:

- a) A juice factory bought two boxes of bottle caps. Each box contained 11 500 bottle caps. The factory used 16 040 bottle caps. How many bottle caps were not used?
- b) A teacher went to the market with 70 000Frw and she/he bought boxes of chalk. After counting money she/he remained with, she/he found 30 550Frw. How much money did she/he use to buy chalks?

Conclusion**Assessment**

- 1) Arrange the following numbers vertically and calculate:
 - a) $86\,940 - 86\,939 =$
 - b) $28\,561 - 15\,092 =$
- 2) Solve the following problems:
 - a) A printing house has to print 11 500 books. It has already printed 10 056 books. How many books are still to be printed?
 - b) Francine went to the grocery and bought meat for 19 050 Frw. She paid 20 000 Frw. What was her balance?

Homework

- 1) Work out the following:
 - a) $59\,134 - 40\,086 =$
 - b) $96\,947 - 78\,829 =$
- 2) Solve the following problems:
 - a) Arthur bought dinner for his friends and the bill was 20 500Frw. He gave the waiter 25 000 Frw. How much money will the waiter give him back (balance)?
 - b) Manzi purchased a drawer for 37 700 Frw and a bed for 48 000 Frw he handed to the seller 90 000 Frw. What was the balance?

Lesson 9**Assessment 1 (part 1)**

Topic area	Numbers and operations
Unit 1 (part 1)	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and make calculations on whole numbers up to 100 000.
Assessment criteria	Pupils are able to accurately, confidently and in required: <ul style="list-style-type: none"> • Write up to a 5 digit number and 100 000 in figures and words. • Solve daily life mathematical problems involving comparison, ordering, addition and subtraction.
Competences developed	– Communication – Cooperation and interpersonal management – Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing take into consideration different abilities and needs of : slow, gifted and talented pupils, pupils with disabilities, eg, pupils with writing problems, pupils with visual impairments, pupils with hearing impairments...

Assessment questions**20 marks****Question 1****Solve the following:**

- 1) Mutoni went for shopping in the market and bought different items. Observe the following bill that the shopkeeper, Muhire Emile , is preparing for her and answer related questions:

Name of the vendor: Muhire Emile.....

DateSeptember 20th 2015.....

Bill number:...367.....

Customer:..... Mutoni Mary.....

Quantity	Item	Unit price	Total price
25 kg	Beans	500 Frw	12 500 Frw
10 litres	Cooking oil	1 850 Frw	18 500 Frw
25kg	Sugar	700	17 500 Frw

Grand Total:.....

Signature:.....

- Calculate the total price for the items and write it in figures.
- Represent the total price using an abacus.
- Write the total price in words.
- Which item cost more money?
- If Mutoni pays 50 000 Frw, how much money will the shopkeeper give her as balance?

Question 2:

Solve the following:

An employee earns 95 000Frw per month. She/he spent 10 500Frw on transport, 20 000Frw on house rent. s She/he paid 15 800Frw on school fees for her/his son ,9 700Frw for water and electricity and 20 000 Frw for other needs, the remaining money was saved.

- Make a table showing expenses for each item.
- How much money did he/she spend altogether?
- How much money did he/she save after all those expenses?
- For which item did he/she spend less money?
- Order the prices of the different items from the smallest to the greatest.

Lesson 10

Multiplication of a four digit number by a two digit number

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none">Explain the process of multiplication of 2 numbers or more with or without carrying. Skills: <ul style="list-style-type: none">Carry out multiplication of 2 or more whole numbers whose product does not exceed 100 000.Solve mathematical problems involving multiplication of numbers. Attitude and values: <ul style="list-style-type: none">Develop personal confidence in the use of numbers.Appreciate the importance of multiplication in daily life.

Key words	Multiply, multiplier, multiplicand, product, carrying...
Cross cutting issues	Financial education developed through solving problems related to money especially budgeting and saving.
Competences developed	<ul style="list-style-type: none"> – Communication developed through presentations and speaking activities. – Cooperation and interpersonal management developed through working in pairs, groups. – Critical thinking developed through solving word problems which require using 2 different operations.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Multiplying a four digit number by a two digit number

Instructional objectives

Given some numbers, pupils will be able to solve mathematical problems involving multiplication confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials

Multiplication by 2 table on manila paper.

Reference

Mwumvaneza, E. et al.2008. Mathematics Teacher's Guide, Primary Four, P. 15 & 16.

Introduction/Review

Multiplication by 2 chant.

Development

Presentation

Activity 1: Multiplying a four digit number by a two digit number

- Pupils work in small groups to solve the following review exercise:
 $124 \times 34 =$
 One pupil presents on board how they came up with the answer.
- In pairs pupils discuss how they would multiply a four digit number by a 2 digit number and give an example. A few pairs show their examples on board and explain how they multiplied a four digit number by a 2 digit number.

Answer:

a) $124 \times 34 = 4\ 216$

	TH	H	T	O
		1	2	4
		×	3	4
		1	1	<u>6</u>
		4	8	
¹	¹			
+3	6	2		
	4	2	1	6

Teacher to explain the terms used in multiplication using the following example:

	TH	H	T	O	
		1	2	4	→ The multiplicand
		×	3	4	→ The multiplier
		1	1		
		4	8	<u>6</u>	
¹	¹				
+3	6	2			
	4	2	1	6	→ The product

- a) Pupils explain the process of multiplying a 3 digit number by a 2 digit number (through answering the following questions):
- How do we arrange numbers when we want to multiply them?(we arrange them vertically)
 - Which order do we follow when we are multiplying a 3 digit number by a 2 digit number?(we start from the ones, then we move to tens , finally to move to hundreds.
 - Where do we write the partial answers when we are multiplying a 3 digit number by a 2 digit number?(we write the first partial answer in the corresponding columns – under the Ones, Tens and Hundreds; we write the second partial answer under the columns of Tens, Hundreds, and the Thousands)
 - What do we do after we have all the partial answers? (We add the partial answers and write the final answer under the corresponding column, starting from the tens. Note: the ones in the first partial answer is just moved down to the final answer).
- b) The same rules apply for multiplying a four digit number by a two digit number, except that in the table we have to add a Ten Thousand column (see the example below).

Activity 2: Multiplying a four digit number by a 2 digit number

Pupils work individually then they go in pairs, then they go in groups of 4 to solve the following problem:

Mutesi bought 23kg of oranges. How much money did she pay if one kilo of oranges costs 1 250Frw?

Pupils correct together on board with the assistance of the teacher if necessary.

Answer

(i) Calculations:

	TH	H	T	O
	1	2	5	0
	×		2	3
		¹		
	3	6	5	<u>0</u>
	¹			↓
+2	4	0	0	
2	8	7	5	0

ii) Solution: If one kilo of oranges costs 1 250 Frw, she will pay 1 28 750 Frw.

Math Facts!

When we multiply a number (multiplicand) of 3 or 4 digits with a number (multiplier) of 2 digits:

- We line up the 2 numbers vertically (write the multiplier under the multiplicand) and draw a line.
- We multiply the multiplicand by each digit of the multiplier starting on the right to the left:
 - We multiply ones of multiplier with all digits of multiplicand move left to the next column (tens) and multiply tens of multiplier with all digits of multiplicand.
 - We keep moving left until all digits of multiplier are multiplied by multiplicand.
- We place the *ones* digit of each partial product in the same column as the multiplying digit.
- Then we add the partial products.

Application

Pupils solve the following problems:

- 1) Gakire made a profit of 3 250 Frw per day.
 - a) How much money did he get in 30 days?
 - b) If from that amount he paid 5 000 Frw for district taxes, 2 000 Frw for electricity, 62 000 Frw for family needs, make a table showing how Gakire spent the money. What is the total money he has spent?
 - c) If Gakire saved the remaining amount of money in the bank, how much money did he save in the bank?
 - d) What could be the purpose of his saving?

- 2) A salesman sold 12 maize sacks last week. He earned 5 000 Frw for each sack sold. What is the total amount he earned for the 12 sacks?

Conclusion

Assessment

- 1) Solve the following:
 - a) $2\,645 \times 26 =$

 - b) Butera has delivered 1 288 boxes of soap. Each box contained 16 soaps. How many soaps has he delivered altogether?

 - c) A passion fruit seller sold 17 small sacks of passion fruits. How much money did the seller get if he/she sold each sack at 5 500 Frw?

Homework

Pupils copy down exercises:

Solve the following exercises:

- a) $7\,134 \times 12 =$
- b) A factory makes 6 421 mobile phones every day. How many mobile phones will the factory make in 14 days?
- c) A printer ordered 1230 boxes of paper. If each box contains 12 reams of paper how many reams did the printer order?

Lesson 11

Multiplying a whole number by 10, 100, 1 000, 10 000.

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	<p>By the end of this lesson, pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain the process of multiplying numbers by 10, 100, 1 000, 10 000. <p>Skills:</p> <p>By the end of this lesson, pupils will be able to:</p> <ul style="list-style-type: none"> • Carry out multiplication by 10, 100, 1 000, 10 000. • Solve mathematical problems involving multiplication of numbers by 10, 100, 1 000, 10 000. <p>Attitude and values:</p> <ul style="list-style-type: none"> • Appreciate the importance of working out numbers quickly and accurately.

Key words	Multiply, multiplier, multiplicand, product.
Cross cutting issues	Financial education developed through solving problems related to money.
Competences developed	<ul style="list-style-type: none"> – Communication developed through presentations and speaking activities – Cooperation and interpersonal management developed through working in pairs, groups. – Critical thinking developed through solving problems.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives:

Given some numbers, pupils will be able to solve mathematical problems involving multiplying by 10, 100, 1 000, 10 000 accurately, confidently and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials

Multiply by 10 table.

References:

- Mwumvaneza, E. et al. 2008. Mathematics Teacher's Guide, Primary Four, P. 19.
- Byamukama, J & Mulisa, L. 2010. New Upper Primary Maths, Pupil's book for Grade 4, P.3.

Introduction/ Review

Correction of homework.

Games:

Multiplication by 10 chant.

Development

Presentation

Activity: Multiplying a number by 1, 100, 1 000, 10 000

Pupils work in groups to solve the following activity:

- 1) $6 \times 10 =$
- 2) $43 \times 100 =$
- 3) $92 \times 1\,000 =$
- 4) $8 \times 10\,000 =$

Some pupils present on board explaining how they came up with their answers.

Answers:

- 1) $6 \times 10 = 60$
- 2) $43 \times 100 = 4\,300$
- 3) $92 \times 1\,000 = 6\,000$
- 4) $8 \times 10\,000 = 80\,000$

Pupils explain (state the rule on) how they multiply a number by 10, 100, 1 000 and 10 000.

Math Facts!

- When multiplying a number by 10, add one zero at the end of the number.
- When multiplying a number by 100, add two zeros at the end of the number.
- When multiplying a number by 1 000, add three zeros at the end the number.
- When multiplying a number by 10 000, add four zeros at the end of the number.

Application

In small groups, pupils solve the following:

- $12 \times 1\,000 =$
- $21 \times 100 =$
- $9 \times 10\,000 =$
- One kilogram of peas costs 1 000Frw. How much money will 29 kg of peas cost?
- Muhirwa bought 10 plates at 1250Frw each. How much money did Muhirwa pay for the 10 plates?
- One textbook costs 2 200Frw. How much will a school pay for 10 textbooks?

Conclusion

Assessment

Pupils do the following exercises:

- $2 \times 100 =$
- $4 \times 10\,000 =$
- $17 \times 1\,000 =$
- Mukundwa contributed 24 bottles of soda for a wedding party. His friend Murekezi contributed 10 times those of Mukundwa. How many bottles of soda did Murekezi contribute?
- One kilogram of fish costs 2 500Frw. How much money will a mother pay for 10 kg of fish?

Homework

Pupils do the following exercises:

- $16 \times 10 =$
- $2 \times 10\,000 =$
- $78 \times 1000 =$
- One kilogram of maize costs 500Frw. How much will a school pay for 100 kg of maize?
- A farmer bought 180 empty sacks for storing his harvest in. How much money did he pay if one sack costs 100Frw?

Lesson 12

Division of a five digit number by a one digit number without remainder

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	<p>By the end of the lesson, pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Explain the process of division of a five digit number by one digit number with or without remainder. <p>Skills:</p> <ul style="list-style-type: none"> Solve daily life mathematical problems involving division of a five digit number by one digit number. <p>Attitude and values:</p> <ul style="list-style-type: none"> Appreciate the importance of division in daily life.
Key words	Divide, division, divisor, dividend, quotient

Cross cutting issues	<ul style="list-style-type: none"> – Financial education developed through solving problems related to money especially saving, investing, etc.. – Standardisation culture (quality control) developed through word problems including this aspect (eg, increase quality control in order to get more customers; using mosquito nets for people’s welfare, using fertilisers in order to increase productivity, etc....) – Gender developed through sensitizing the teacher to give equal opportunities for both girls and boys to answer questions or to present on board.
Competences developed	<ul style="list-style-type: none"> • Communication developed through presentations and speaking activities • Cooperation and interpersonal management developed through working in pairs , group • Critical thinking developed through solving word problems requiring to use 2 different operations. • Gender balance developed through giving same opportunities to boys and girls to present on board..
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 **Division of a five digit number by one digit number without remainder**

Instructional Objectives

Using long division pupils will be able to solve mathematics problems involving division of a five digit number and a one digit number confidently.

Class setting / organization

Arrange desks so that pupils can work in pairs and individuals can work at blackboard.

Materials

Multiplication by 6 table.

References

Byamukama,J &Mulisa, L.2010. New Upper Primary Maths, Pupil’s book for Grade 4, P.28-29.

Introduction/Review

Correction of homework.

Game: **Halves.**

Chant the multiplication by 6 table.

Pupils do the following review exercises in pairs:

- a) $840 \div 8 =$
- b) $4\,620 \div 4 =$

Then they correct on board.

Answers:

a)

$$\begin{array}{r}
 105 \\
 8 \overline{) 840} \\
 \underline{-8} \\
 04 \\
 0 \\
 40 \\
 \underline{-40} \\
 0
 \end{array}$$

b)

$$\begin{array}{r}
 924 \\
 5 \overline{) 4620} \\
 \underline{-45} \\
 012 \\
 \underline{-10} \\
 020 \\
 \underline{-20} \\
 00 \\
 \underline{-0} \\
 0
 \end{array}$$

Development

Presentation

Pupils solve the following problem in group of four:

A parent shared equally an amount of 12 450Frw her 5 children. How much money will each child get?

One pupil comes to the board and shows others how his/her group did the work (Note: Boys and girls should be given same opportunities to present on board).

Answers

a) Calculations

$$\begin{array}{r}
 2\ 490 \text{ — quotient} \\
 \text{divisor } 5 \overline{) 12450} \text{ — dividend} \\
 \underline{-10} \\
 024 \\
 \underline{-20} \\
 045 \\
 \underline{-45} \\
 00 \\
 \underline{-0} \\
 0
 \end{array}$$

There is another way of presenting a long division:

$$\begin{array}{r}
 12\ 450 \quad | \quad 5 \\
 \underline{-10} \quad | \quad 2\ 490 \\
 24 \\
 \underline{-20} \\
 45 \\
 \underline{-45} \\
 00 \\
 \underline{-0} \\
 0
 \end{array}$$

b) Solution:

Each child will get: 2 490Frw.

Teacher helps pupils to discover the terms used in long division (divisor, dividend, quotient) using the example on board.

Pupils explain (helped by the teacher if necessary how to divide a five digit number by a one digit number). They can focus on the following:

- Where to write the divisor, the dividend and the product (show it using example on board)
- The process of dividing a 5 digit number by a one digit number (we start from left to right, ie, from ten thousand place value).

Math Facts!

- When dividing a five digit number by one digit number, start by ten thousand place value.
- If the number on the ten thousand place value is less than the dividend combine the ten thousand place value with the thousand place value.
- If the number on the thousand place value is less than the dividend combine the thousand place value with the hundreds place value. Go on like that until reach the ones.

Application

Solve the following:

- 1) A salesman sold 5 maize sacks last week at 75 000 Frw. What is the price of one sack of maize?
- 2) A dairy produces 28 000 yogurts boxes in 7 days.
 - a) How many yogurts does the factory make per day, if each day it produces the same number of yogurts boxes?
 - b) What could the dairy do in order to have more customers of yogurts?
- 3) A box of 5 bottles of cooking oil costs 42 000Frw.
 - a) How much does 1 bottle of cooking oil cost?
 - b) How much oil do you use to cook food at home per month?
 - c) What are the consequences of consuming much oil?

Conclusion

Assessment

- 1) 9 parents bought 9 pairs of school uniforms at the same price. They paid 99 000 Frw altogether. How much did each parent pay?
- 2) Five blankets were sold at 98 000 Frw in an auction. How much does one blanket cost if all of them cost the same amount?
- 3) Four sacks of rice cost 66 000Frw. How much does one sack cost?

Homework

- 1) Solve the following exercises:
 - a) $73\,450 \div 5 =$
 - b) A factory makes 20 090 hand bags in seven days. How many hand bags does the factory make per day if the factory makes the same number of bags per day?

Period 3

Division of a five digit number by a 1 digit number with a remainder

Instructional Objectives

Using long division pupils will be able to solve mathematics problems involving division with a remainder of a five digit number by a one digit number with remainder confidently, accurately and in required time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Materials

Manila paper with an example of long division exercise (division of five digit number by one digit number).

References

Byamukama, J & Mulisa, L.2010. New Upper Primary Maths, Pupil's book for Grade 4, P.28-29.

Introduction/ Review

Correction of homework.

Game: **Halves.**

Chant the multiplication table by 8.

Development**Presentation**

Pupils solve the following in groups:

A factory sold 38 989 kg of maize flour in four weeks. How many kg did the factory sell in one week, if the factory sold the same quantity of kg of maize flour per week?

One pupil to come to the board and show others how his/her group did the work.

Answer:

a) *Calculations:*

$$\begin{array}{r}
 9\ 747 \\
 4 \overline{) 38\ 989} \\
 \underline{-36} \\
 029 \\
 \underline{-28} \\
 018 \\
 \underline{-16} \\
 029 \\
 \underline{-28} \\
 1
 \end{array}$$

$38\ 989\ \text{kg} \div 4 = 9\ 747\ \text{kg}$ with 1 (kg) as a remainder.

Solution: In one week the factory sold 9 747 kg with 1 kg as a remainder.

*Pupils explain how they call the number that is left in long division (it is called a **remainder**).*

Math Facts!

- When we are given a long division to do, it will not always work out to a whole number.
- Sometimes there will be numbers left over. These are known as **remainders**.
- The process for a division with remainder is the same as the one for division without remainder.

Application

Using long division, work out the following exercises:

- $14\,585 \div 2 =$
- If you have to share equally 19 000 books in 3 schools, how many books will each school get? How many books will remain in the store?
- 25 337 kg of sorghum are dispatched in 8 same sized sacks. How many kg are put in each sack? How many kg remained?
- A publisher distributed equally 14 567 books in 5 sectors. How many books did each sector get? How many books did the publisher remain with?

Conclusion

Assessment

Using long division, pupils solve the following:

- $31\,124 \div 5 =$
- $36\,386 \div 3 =$
- 20 000 litres of water were taken from a big tank and were divided equally into 7 small tanks. How many litres were put in each tank? How many litres remained in the big tank?

Homework

Solve the following:

- $32\,433 \div 8 =$
- $31\,256 \div 9 =$
- A Health Regional Centre distributed equally 80 250 mosquito nets to 4 sectors. How many mosquito nets did each sector get? How many mosquito nets remained in the stock? What is the importance of using mosquito nets?

Lesson 13

Dividing a number by 10; 100; 1 000; 10 000

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Learning objectives	<p>By the end of this lesson, pupils will be able to:</p> <p>Knowledge: Explain the process of dividing numbers using quick division (dividing numbers by 10,100, 1 000, 10 000).</p> <p>Skills:</p> <ul style="list-style-type: none">Carry out quick division (dividing number by 10, 100,1 000, 10 000).Solve mathematical problems involving quick division (dividing numbers by 10, 100, 1 000, 10 000). <p>Attitude and values:</p> <ul style="list-style-type: none">Appreciate the importance of working out numbers quickly and accurately.
Key words	Divide, division, divisor, dividend, quotient
Cross cutting issues	Financial education developed through solving problems related to money.

Competences developed	<ul style="list-style-type: none"> – Communication developed through presentations and speaking activities. – Cooperation and interpersonal management developed through working in pairs, groups. – Critical thinking developed through solving word problems which require to use 2 different operations or more.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives:

Given some numbers ending in zeros, pupils will be able to solve daily mathematical problems involving dividing a number by 10; 100; 1 000; 10 000 accurately, confidently and in required time.

Class setting / organization

Arrange desks so that pupils can work and individually, in pairs or in groups.

Materials

Manila papers with exercises on multiplication a whole number by 10, 100, 1 000, 10 000.

References:

- Mwumvaneza, E. et al.2008. Mathematics Teacher's Guide, Primary Four, P. 19.
- *Byamukama, J & Mulisa, L.2010. New Upper Primary Maths, Pupil's book for Grade 4,P.31.*

Introduction/Review

Correction of homework.

Game: **Halves.**

Chant the multiplication table by 9.

Development**Presentation****Activity 1: Review exercises**

Pupils do the following review exercises:

- a) $4 \times 10 =$
- b) $9 \times 100 =$
- c) $13 \times 1000 =$
- d) $4 \times 10\,000 =$

Four pupils, one by one, present on board.

In pairs pupils do the following exercises:

Activity 2: Division of a number by 10, 100, 1 000, 10 000

- a) $150 \div 10 =$
- b) $2\,400 \div 100 =$
- c) $3\,000 \div 1\,000 =$
- d) $50\,000 \div 10\,000 =$

Note: Some pupils may use normal ways of division and others may use quick ways (adding zeros at the end of the number) of dividing numbers by 10; 100; 1000, 10000.

Pupils from different pairs come on board, one by one, and show others how they did their work.

Answers:

- a) $150 \div 10 = 15$
- b) $2\,400 \div 100 = 24$
- c) $3\,000 \div 1\,000 = 3$
- d) $50\,000 \div 10\,000 = 5$

Pupils explain(state the rule on) how to divide a number by 10, 100, 1 000, 10 000.

Math Facts!

- When dividing a number by 10, remove one zero from the end of the number.
- When dividing a number by 100, remove two zeros from the end of the number.
- When dividing a number by 1 000, remove three zeros from the end the number.
- When dividing a number by 10 000, remove four zeros from the end of the number.
- So unlike in multiplication where we add zero(s) when we multiply by 10; 100; 1 000 and 10 000, in division we remove the corresponding number of 0's from the end of the number when we divide a number by 10; 100; 1 000 and 10 000, eg, $3000 \div 100 = 30$.

Application

- 1) Play the following game with pupils: A pupil says a number ending in zeros and the other pupils divide it by either 10, or 100 or 1 000 or 10 000.
- 2) Solve the following problems
 - a) There are 50 000 sheets of paper in 100 reams of paper. How many sheets of paper are there in each ream of paper?
 - b) A farmer sold 1kg of oranges at 1 000Frw. She sold a total amount of 40 000Frw. How many kg of oranges did she sell?
 - c) Kalisa bought 10 kg of beans at 6 500Frw. What is the price of one kg?
- 3) Complete with the missing numbers:
 - a) $430 \div \dots = 43$
 - b) $78\,500 \div \dots = 785$

Conclusion

Assessment

- 1) Work out the following exercises:
 - b) $60\,000 \div 1000 =$
 - c) $80\,000 \div 10000 =$
 - d) There are 350 chairs at Kamaro primary school. If they have to share them equally to 10 classes, how many chairs will each class get?
 - e) In a warehouse there are 70 000 kg of maize flour packed in 100 sacks. How many sacks of maize flour are there in the warehouse?
- 2) Complete with the missing numbers:
 - a) $510 \div \dots = 51$
 - b) $99\,700 \div \dots = 997$

Homework

- 1) Fill in the missing numbers:
 - a) $76\,000 \div \dots = 76$
 - b) $\dots \div 10\,000 = 9$
- 2) A company which sells rice has packed 50 000 kg of rice in 10 000 small sacks equally. How many kg were packed in each small sack?
- 3) Mrs Kamana wants to pay 99000Frw to his 10 employees. How much will each employee be paid if they all get the same amount?

Lesson 15

Assessment (Part 2)

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.

Assessment criteria	Pupils are able to accurately, confidently: <ul style="list-style-type: none"> Carry out multiplication of 4 digit number by a 2 digit number and a whole number by 10,100,100,10 000 as well as division of a 5 digit number by one digit number and a whole number by 10,100,1 000, 10 000. Solve daily life mathematical problems involving multiplication and division.
Attention to special educational needs	When preparing assessment, materials needed and when assessing take into consideration different abilities and needs of : slow, gifted and talented pupils, pupils with disabilities, eg, pupils with writing problems, pupils with visual impairments, pupils with hearing impairments...

Assessment questions

Question 1

Work out the following exercises:

- $(36 \times 100) \div 10 =$
- $25\,685 \div 5 =$
- $1234 \times 23 =$

Question 2

Solve the following problems:

- Mutesi earns 2 500 Frw per day.
 - How much money does she get per month if she gets the same amount of money every day?
 - If she uses 63 000Frw for family needs, how much money does she save per month?
- A Cooperative planted 5 255 plants of coffee in 5 fields.
How many plants did they plant in each field if they planted the same number of plants in each field?
- In community work people planted 10 325 trees in 9 months.
How many trees did they plant each month?

Lesson 17

Assessment of the Unit

Topic area	Numbers and Operations
Unit 1	Mathematical operations on whole numbers up to 100 000
Key competence	To be able to read, write, compare and calculate whole numbers up to 100 000.
Assessment criteria	Pupils are able to accurately and confidently: <ul style="list-style-type: none"> Read and write numerals up to a 5 digit number and 100 000 in figures and words. Represent numbers up to a 5 digit number on abacus and table. Solve problems involving ordering numbers, comparison, addition, subtraction, multiplication and division.
Competences developed	Critical thinking.
Attention to special educational needs	When preparing assessment, materials needed and when assessing take into consideration different abilities and needs of: slow, gifted and talented pupils, pupils with disabilities, eg, pupils with writing problems, pupils with visual impairments, pupils with hearing impairments...

Question 1

Think of one five digit number and write it in figures, in words and represent it on abacus and in a table.

Question 2

1) Observe the following consumption of water of a factory per month:

Month	Amount to be paid
January	15 560 Frw
February	14 000Frw
March	20 000Frw
April	16 000 Frw
May	16 000 Frw
June	18 000 Frw

- Order the above numbers in ascending order.
- Compare the consumption of January and the one of June using:
 - Comparisons symbols: $<$, $>$, or $=$
 - The expressions: Greater than or less than
- Identify the month in which the factory paid more money.
- If they have 100 000 Frw to pay for the total bill (from January to June), how many notes of 1 000 Frw do they have?
- If they pay 100 000Frw, how much money will they get as balance?

Question 3

Solve the following problems:

- In a library there are 1250 shelves. On each shelf there are 30 books.
How many books are there in the library altogether?
- Musoni bought 5 books for 85 500Frw.
 - How much money did he pay for each book if he paid the same amount for each book?
 - If Musoni pays 9 notes of 1 000Frw, how much money will he get as balance?

Unit 2: Positive and negative integers

Unit at Glance

Topic area: Numbers and Operations

Key competence: To be able to solve problems related to comparing, ordering, and finding distance between negative and positive integers.

Lesson 1: Concept of positive and negative numbers	Period 1	Period 2	
	Concept of positive and negative numbers (meaning, reading and writing)	Location of negative and positive numbers on a number line	
Lesson 2: Comparison of negative and positive numbers	Period 1	Period 2	Period 3
	Comparison of negative and positive numbers	Exercises on comparison of negative and positive numbers	Exercises on comparison of negative and positive numbers
Lesson 3: Ordering negative and positive numbers	Period 1	Period 2	
	Ordering negative and positive numbers	Exercises on ordering negative and positive numbers	
Lesson 4: Computing distance between integers	Period 1	Period 2	Period 3
	Computing distance between integers	Exercises on computing distance between integers and its application to daily life	Exercises on computing distance between integers and its application to daily life
Lesson 5: Revision of the unit			
Lesson 6: Assessment of the unit	Period 1	Period 2	
	Assessment	Feedback and mediation	

Unit 2 warm-ups and games

Negative or positive number

Write a number and pupils tell you if it is a positive number or a negative number.

Greater than... or less than....

Say a number and pupils say the number which is greater than or less than the number said (use negative numbers mostly).

Which number comes before or after?

Say an integer (negative or positive) then pupils say the number which comes before or after that number/integer.

Distance to 10

Say a number, and pupils tell you the distance between that number and 10.

e.g., Say 6 and pupils say 4 or say -2 pupils say 12.

Say the distance between numbers

Draw a number line and represent some numbers on it, eg, say -7 and 9 and pupils compute the distance between the 2 numbers mentally. Go on with some numbers, eg -5 and 10, -19 and 23, etc.

Unit Lessons

Lesson 1

Concept of positive and negative numbers

Topic area	Numbers and Operations
Unit 2	Positive and negative integers
Key Unit competence	To be able to solve problems related to comparing, ordering, and finding distance between negative and positive integers.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain that when two numbers are placed on a number line, the number to the right is greater than the number to the left. Skills: <ul style="list-style-type: none"> Locate positive and negative numbers on the number line. Attitude and values: <ul style="list-style-type: none"> Appreciate the importance of using positive and negative numbers in practical contexts.
Key words	Positive integers Negative integers Number line
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning task in group activities and presentation Peace and values education developed through discussing in group and agreeing the correct answer.

Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Cooperation developed through working in pairs or groups. - Critical thinking developed through linking the parts of a plant and a number line - Research and problem solving developed though being resourceful in finding answers to questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 **Concept of positive and negative numbers (meaning, reading and writing)**

Instructional objectives	Given different numbers, pupils will be able to identify negative and positive integers confidently, correctly and in a given time.		
Class setting/ organization	Indoor: Arrange desks so that pupils can work individually, in pairs and in small groups. Make sure each group is mixed in terms of gender and ability.		
Materials	<ul style="list-style-type: none"> – Manila paper on which a plant is drawn. – Manila paper on which a number line is drawn – Flash cards on which negative and positive integers are written 		
References	<ul style="list-style-type: none"> – Tom Roche. 1978, Figure it out, P. 15-18 – http://www.mathsisfun.com/whole-numbers.html visited on September 07,2015 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 minutes)	Assist pupils in playing the mental math game: One more than... and chanting	<ul style="list-style-type: none"> - Play the game: One more than... - Chant in hundreds from 0 up to 1 000 (forward and backward). 	Communication skills developed through playing game and chanting.
Development of lesson (25 minutes)	Activity 1: Concepts of integers Show or draw a plant on the board. Draw roots below the soil level and the stems, leaves and flowers above the soil line.	Activity 1: Pupils observe a plant or its illustration (with roots below the soil line and the stem, leaves and flowers above the soil line). Using this plant pupils discover that there is a distance covered by roots and a distance covered by the stem starting from soil level.	Communication skills developed through explaining the answers.

Facilitate pupils to discover that roots are growing up in different direction/ sense from the stem.

Activity 2: Meaning of integers

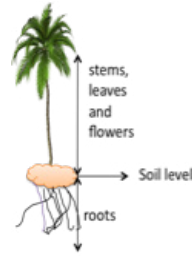
- Asking a volunteer to draw a number line on board.
- Facilitate pupils to establish a link between parts of a plant (roots, soil level and stem) and a number line.

Activity 3: Location of integers

Ask them to explain how to call numbers to the right of 0 and numbers to the left of 0.

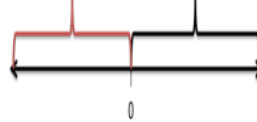
Activity 4: Writing integers

Facilitate pupils to discover how we can indicate positive integers and negative integer and discuss what about 0.



Activity 2:

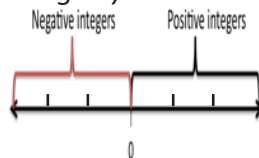
- What is the part of the number line represented by the soil level? (0)
- What is the part of the number line represented by stem? (*the number on the right side of zero*)
- What is the part of number line represented by roots? (*The number on the left side of zero*)



Activity 3

How do we call the numbers to the right of 0? (*Numbers on the right side of zero are called positive integers*)

How do we call the numbers to the left of 0? (*Numbers on the left side of zero are called negative integers*)



Activity 4

Discuss how the positive and negative integers are written and discuss about.

(Negative integers are indicated by negative sign e.g. -4, while the positive integers are indicated by the positive sign e.g. +4, Zero is neither positive nor negative)

Pupils say situations when we use negative numbers (they are used for temperature: in some seasons in Europe, America, etc).

Critical thinking developed through linking the parts of a plant and a number line

	<p>Summary</p> <ul style="list-style-type: none"> • Numbers on the right side of zero are called positive integers. All of those numbers are written with a positive sign (+), eg: + 1, +3, etc.- • Numbers on the left side of zero are called negative integers. They are written with a negative sign (-), eg: -1, - 4. • Zero is also an integer, but it is neither positive nor negative. 		
	<p>Application</p> <p>Write questions on board.</p> <p>Facilitate/ help pupils to answer by using a complete sentence.</p>	<p>In small groups pupils do the following activities:</p> <ol style="list-style-type: none"> 1) Discuss other examples in real life that can be compared to a number line. 2) Observe the following numbers and make a list of negative numbers and another one of positive numbers: -4, 0, +2, -6, +4, +3,-1, +1. 3) Give your own examples of positive and negative numbers 	<ul style="list-style-type: none"> – Communication skills developed through answering questions. – Critical thinking developed through finding examples in real life that can be compared to a number line. – Cooperation developed through working in groups.
<p>Conclusion (10 minutes)</p>	<p>Assessment</p> <p>Write assessment questions on the board and facilitate pupils to answer individually.</p>	<ol style="list-style-type: none"> 1) Respond by true or false: <ol style="list-style-type: none"> a) +10 is a negative integer. b) +7 is a negative integer. c) - 6 is a positive integer. d) -1 is a negative integer. e) +3 is a positive integer. f) -10 is a positive integer. 2) From the following integers which ones are negative integers? +2; +1; -2; -10; -100; +3; -20; +6 	
	<p>Homework</p> <p>Write homework questions on the board.</p>	<p>Pupils copy the following activities in their notebooks and do them when they reach home:</p> <ol style="list-style-type: none"> 1) Observe the following numbers and make a list of negative numbers and another one of positive numbers: -7,0,+2, -1, +10,-9,-11, +15,-19, -20 2) Pupils to tell people at home where they can use negative numbers. 	

Instructional objectives

Using number line, pupils will be able to locate negative and positive numbers confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs and in small groups. Make sure each group is mixed in terms of gender and ability.

Materials

Number line

References

- <http://www.mathisfun.com/elementary-math.html>
- <http://www.numbernut.com/basic/index.shtml>
- EDC/Akazi Kanoze, Accelerated Learning Program, Mathematics, Learner’s Book (2011). P 45

Introduction/ Review

Correction of homework.

Games: Negative or positive number.

Chant in thousands from 0 up **10 000**. Vary by starting at 500.

Development

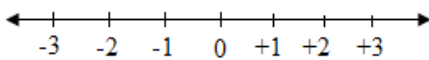
Presentation

Activity 1: Locating integers on a number line

Pupils in pairs/in groups discuss where to locate the following numbers on a number line and explain their answer: -1, +1, -2, +2, +3,-3.

One pupil presents on the board.

Answer



Activity 2: Distance between two integers on a number line.

In pairs pupils discuss and find the distance between 0 and +1; +1 and +2; 0 and -1

One pupil presents on the board.

Answer:

The distance between each given pair of integers on the number line is 1.

Math Facts!

- A number line is a graduated line with 0 at the center and positive numbers to the right of 0 and negative numbers to the left of 0.
- The distance between each given pair (consecutive numbers) of integers on the number line is 1.
- Numbers become greater as you move to the right of 0 and smaller as you move to the left of 0.
- All negative integers are under zero while all positive numbers are over 0.

Application

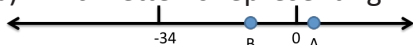
1) Pupils work in pairs small groups and locate the following integers on a number line: - 1, - 2, - 3, - 4, - 5, - 6, - 7, - 8,- 9,- 10, + 1, + 2, + 3, + 4, + 5, + 6, + 7, + 8, + 9, + 10.

2) Pupils in groups observe the following number line and answer the related questions:

a) Which letter is representing - 14?



b) Which letter is representing + 2

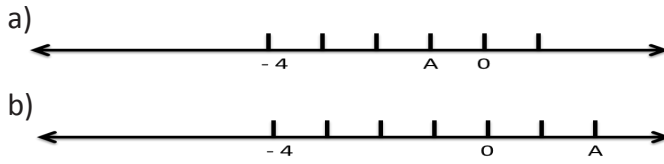


Conclusion

Assessment

Individually pupils work out the following:

- 1) Locate the following integers on a number line: - 3, - 6, - 7, - 9, 0, + 3, + 6, + 7, + 9
- 2) Find the integer represented by the letter A on the number lines below:



- 3) Think of 2 positive numbers and 2 negative numbers between - 5 and + 5 and represent them on a number line.

Homework

Pupils copy the following activities in their notebooks and do them when they reach home:

- 1) Represent the following numbers on a number line:
-2, -3, -4, -10, -11, +2, +3, +4, +10, +11
- 2) A meteorology centre has measured different temperature of the top of different mountains in Celsius degrees and found the results shown by the table below. Represent the temperatures on a number line.

Mountain	Temperature In Celsius degree
A	- 15° C
B	- 1° C
C	+ 1° C
D	- 5° C
E	+ 15° C
F	+ 16° C

Lesson 2

Comparison of negative and positive numbers

Topic area	Numbers and operations
Unit 2	Positive and negative integers
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain that when two numbers are placed on the number line, the number to the right is greater than the number to the left. Skills: <ul style="list-style-type: none"> • Apply knowledge of position on a number line to determine which of two numbers is greater. Attitude: <ul style="list-style-type: none"> • Appreciate the importance of using positive and negative numbers in practical contexts
Key words	Higher, lower, greater than (>), less than(<), equal to (=)
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning tasks in group activities and presentation. - Peace and values education developed through discussing in group and leading to consensus. - Environment and sustainability developed through discussing the effect of high temperature on the environment.

Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Cooperation developed through working in pairs or groups. - Critical thinking developed through comparing integers and making judgment.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 ▶ Comparison of negative and positive numbers

Instructional objectives

Given two integers, pupils will be able to determine which of two integers is greater than the other confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work, individually, in pairs and in small groups. Make sure each group is mixed in terms of gender and ability.

Materials

Charts on which number lines are drawn and put on the wall.

References

- <http://www.mathisfun.com/elementary-math.html> visited on September 07,2015
- <http://www.numbernut.com/basic/index.shtml> visited on September 07,2015
- EDC/ Akazikanoze, Accelerated Learning program, Mathematics, Learner's Book. 45

Introduction/ Review

Correction of homework.

Game: **Greater than....or less than...**

Development

Presentation

Pupils work in pairs/small groups to do the following activities and then they present them on board:

Activity 1: Location of positive and negative integers on a number line

a) Represent on a number line the following temperatures of the top of a tall mountain and show all positive temperatures and all negative temperatures:

- Monday: + 5^oc
- Tuesday: + 4^oc
- Wednesday: -2^oc
- Thursday: -4^oc
- Friday: + 2^oc
- Saturday: 0^oc
- Sunday: - 1^oc

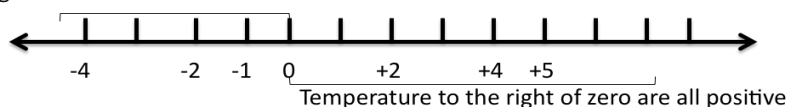
b) Respond to the following questions:

- When was it coldest? Justify/explain your answer.
- When was it hottest? Justify/explain your answer.
- Use comparison symbols (<, >, =) and compare the coldest and the hottest temperature.

Answers:

a) *Representation of the temperatures on the number line:*

Temperature to the left of zero are all negative



b)

- It was coldest on Thursday. Because -4°C is the smallest temperature.
- It was hottest on Monday. Because $+5^{\circ}\text{C}$ is the highest temperature.
- $-4 < +5$

Activity 2: Comparison of two integers

Compare the following numbers using: less than....., greater than... , equal to... Explain your answers.

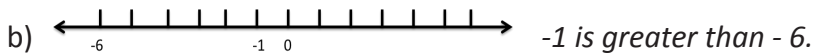
a) $-5 \dots\dots\dots + 5$

b) $-1 \dots\dots\dots - 6$

c) $-10 \dots\dots\dots - 10$

d) When both numbers are negative, how do you determine which number is greater than or less than the other?

Answers:



c) -10 is equal to -10 .

d) When both integers are negative, the higher the number, the less value you have.

Activity 3: Comparison of two integers

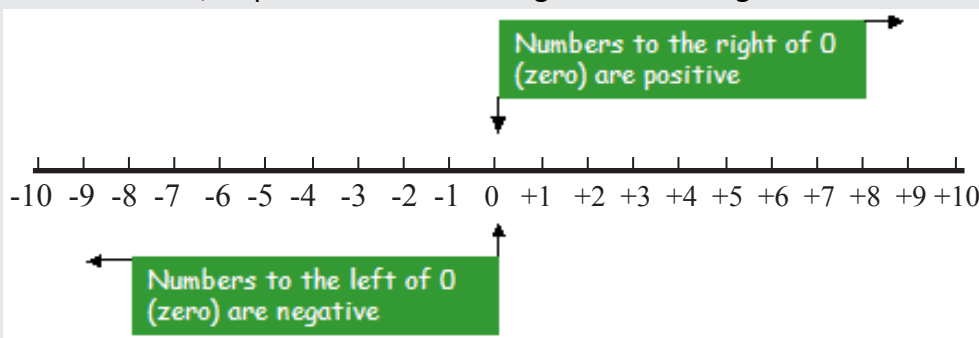
The temperature measure in Country A was $+15^{\circ}$ and in Country B it was -5° which country was hotter than the other? Explain your answer.

Answer:

Country A was hotter than Country B because $+15^{\circ}$ is greater than -5° . Any positive number is greater than any negative number.

Math Facts!

- To compare positive and negative numbers use the same terms and the same comparison signs (<, >, =) used to compare whole numbers: greater than (>), less than (<), and equal to (=): eg, $+2$ is less than $+10$ ($+2 < +10$); $+8$ is greater than $+2$ ($+8 > +2$); -2 is less than -1 ($-2 < -1$); -1 is greater than -2 ($-1 > -2$)
- Negative numbers are always less than zero, and positive numbers are always greater than zero. Therefore, all positive numbers are greater than negative numbers.



- When comparing two negative numbers, the higher number has less value than the lower number. A low negative number (like -2) is greater than a high negative number (like -100). Even 0 is greater than -100 .

Application

1) Write the following numbers on the board and pupils in small groups compare them using comparison signs $<$, $>$, $=$:

a) $+10 \square -10$

b) $+11 \square -2$

- c) - 15 □ - 13
 d) - 20 □ - 20

2) Observe the following temperatures of a city during one month at different dates:

Date	Temperature
1 st March	+ 13°C
5 th March	+ 7°C
15 th March	+ 5°C
21 st March	+ 0°C
27 th March	- 2°C
29 th March	- 7°C
31 st March	-10°C

- a) When was the city the coldest? Explain.
 b) When was the city the hottest? Explain.
 c) Using comparison signs compare the temperature of 21st March and that of 29th March.

3) Kamanzi and Mukamana are tourists. One day they visited two cities and measured the temperature for each city at sunrise, in city A where they were in winter season the temperature was - 3°C and in city B where they were in spring season the temperature was + 5°C .

- a) Using greater than or less than, compare the temperature of those two cities.
 b) What is the effect of high temperature on the environment?
 c) When it is very cold what do we do?
 d) State one factor that can lead to the increase of temperature.

Conclusion

Assessment

Pupils work out the following activities individually.

1) Compare the following numbers using <, >, or =

- a) + 3 □ - 5
 b) + 7 □ - 1
 c) - 12 □ - 10
 d) - 40 □ - 1
 e) + 11 □ - 50

2) Observe the following numbers and say which is the greatest. Which is the smallest?

0, - 10, + 9, + 10, - 11, - 20, + 19,

3) On top of Mountain A the temperature is - 12°C while on top of Mountain B the temperature is + 22°C.

- a) Which mountain is colder than the other? Why?
 b) Using comparison signs compare the temperatures of the two mountains. Read your answer to your neighbours.

Homework

Pupils copy the following activities in their notebooks and do them when they reach home:

1) Insert the correct symbol: <,> , = between the two numbers :

- a) - 5 □ +5
 b) +22 □ -12
 c) + 9 □ 0

2)

- a) Which is colder: -4°C or 1°C?
 b) Which is warmer: -15°C or -11°C?

Lesson 3

Ordering negative and positive numbers

Topic area	Numbers and operations
Unit 2	Positive and negative integers
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the process of ordering negative and positive numbers. Skills: <ul style="list-style-type: none"> • Ordering negative and positive numbers. Attitude: <ul style="list-style-type: none"> • Appreciate the importance of using positive and negative numbers in practical contexts.
Key words	Ascending order, descending order.
Cross cutting issues	- Gender enhanced through assigning tasks in group activities and presentations - Peace and values education developed through discussing in group and leading to consensus
Competences developed	- Cooperation developed through working in pairs or in groups. - Communication developed through discussing and answering activities. - Critical thinking developed through ordering integers.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Ordering negative and positive numbers

Instructional objectives

Given different integers, pupils will be able to order positive and negative integers in ascending and descending order confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Examples of negative and positive integers which are ordered on manila paper.

References

- EDC/Akazikanoze, Accelerated Learning Program, Mathematics, Learner's Book. 48
- <http://www.helpwithfractions.com/adding-fractions-same-denominator> visited on September 07, 2015
- <http://www.mathisfun.com/elementary-math.html> visited on September 07, 2015
- <http://www.numbernut.com/basic/index.shtml> visited on September 07, 2015

Introduction/ Review

Correction of homework

Game: **Which number comes after or before?**

Chant in ones from -10 to 10.

Development

Presentation

Activity 1: Ordering integers

Write on board the following temperatures measured on the top of a mountain in one week.

- a) Monday: $+5^{\circ}\text{C}$
- b) Tuesday: $+4^{\circ}\text{C}$
- c) Wednesday: -4°C
- d) Thursday: -3°C
- e) Friday: $+2^{\circ}\text{C}$
- f) Saturday: 0°C
- g) Sunday: -1°C

Pupils work in small groups and:

- a) Order the above temperatures from the coldest temperature to the hottest (ascending order).
- b) Order them from the hottest to the coldest (descending order).
- c) Identify the coldest day and the hottest day of the week.

One group shares their findings with the whole class.

Note: make sure pupils are answering using complete sentences by providing explanations, e.g. Monday is the hottest day. Wednesday is the coldest day because the temperature -4°C is the smallest temperature.

Answers:

- a) *The temperatures ordered from the coldest to the hottest (ascending order): -4°C , -3°C , -1°C , 0°C , $+2^{\circ}\text{C}$, $+4^{\circ}\text{C}$, $+5^{\circ}\text{C}$;*
- b) *The temperatures ordered from the hottest to the coldest (descending order): $+5^{\circ}\text{C}$, $+4^{\circ}\text{C}$, $+2^{\circ}\text{C}$, 0°C , -1°C , -3°C , -4°C .*
- c) *The coldest day is: Wednesday (-4°C) because -4°C is the smallest temperature, and the hottest day is: Monday ($+5^{\circ}\text{C}$) because $+5^{\circ}\text{C}$ is the highest temperature.*

Math Facts!

- Positive and negative integers can be ordered in ascending and descending order.
- When putting integers in **ascending order (from the smallest to the greatest)**, first look at the negative numbers because these are always less than positive numbers. The bigger the negative number, the lower value it has. So with the example above, the “most negative” number is -4 , then as we move closer to 0, we have -3 and -1 (-4 , -3 , -1). Next comes 0. Then move on to the positive numbers ($+2$, $+4$, $+5$). All together in ascending order, we have -4 , -3 , -1 , 0 , $+2$, $+4$, $+5$.
- To put numbers in **descending order (from the greatest to smallest)**, do the opposite. First look at the positive numbers. Identify the greatest positive number and then the next highest positive number and so on. So we have $+5$, $+4$, $+2$. Then comes 0. Then look at the negative numbers. Which is closest to zero? Then next closest to 0? So we have -1 , -3 , -4 . All together in descending order, we have: $+5$, $+4$, $+2$, 0 , -1 , -3 , -4 .

Application

In small groups, pupils work out the following:

- 1) Order the following numbers: $+20$, -50 , $+13$, 0 , -90 , -30 .
 - a) From the smallest to the greatest.
 - b) From the greatest to the smallest.
- 2) In a weather report the average of the temperature of a country was as follows:
 - January: $+24^{\circ}\text{C}$
 - March: -10°C
 - April: $+14^{\circ}\text{C}$
 - July: $+30^{\circ}\text{C}$
 - December: -24°C

- Which month was the hottest?
- Which month was the coldest?
- Put these temperatures in order from the hottest to the coldest.

Conclusion

Assessment

Individually, order the following integers from the smallest to the greatest:

- $+ 30, 0, - 190, + 119, + 44, - 89$
- $- 20, - 35, + 60, - 152, - 200, - 1$

Homework

Pupils copy the following activities in their notebooks and do them when they reach home:

- Put the following lesson in order starting from the greatest to the smallest:
 $- 120, + 80, + 110, 0, + 36, + 56, - 1$
- Order the following numbers from the smallest to the greatest and then locate them on a number line.
 $- 10, + 20, - 5, + 10, - 15, + 5$

Lesson 4 Computing distance between integers

Topic area	Numbers and operations
Unit2	Negative and positive integers
Key competence	To be able to solve problems related to comparing, ordering, and finding distance between negative and positive integers.
Learning objective	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Compute the distance between integers. Skills: <ul style="list-style-type: none"> Apply knowledge of computing distance between integers. Attitude and values: <ul style="list-style-type: none"> Appreciate the importance of using positive and negative numbers in practical contexts.
Material	Number line on manila paper
Key words	Computing, steps.
Cross cutting issues	- Gender enhanced through assigning task in group activities and presentation - Peace and values education developed through discussing in group and leading to consensus
Competences developed	- Cooperation developed through working in pairs, groups - Communication developed through discussing and answering activities. - Critical thinking developed through the game "who am I".
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Using a number line pupils will be able to compute the distance between integers confidently, accurately and in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, pairs and in small groups.

Materials

- Flash cards with different numbers (positive and negative integers) not exceeding 99 999.
- A number line on manila paper.

References

- Akazikanoze, Accelerated Learning Program, Mathematics, Learner’s Book. 50 -51
- <http://www.helpwithfractions.com/adding-fractions-same-denominator> visited on September 07,2015
- <http://www.mathisfun.com/elementary-math.html> visited on September 07,2015
- <http://www.numbernut.com/basic/index.shtml> visited on September 07,2015

Introduction/ Review

Correction of homework.

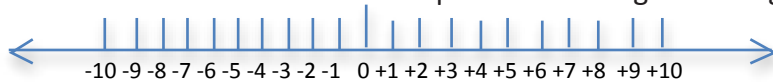
Games: **Which number comes before or after?**

Chant in tens from -50 up to +50(forward and backward).

Development

Presentation

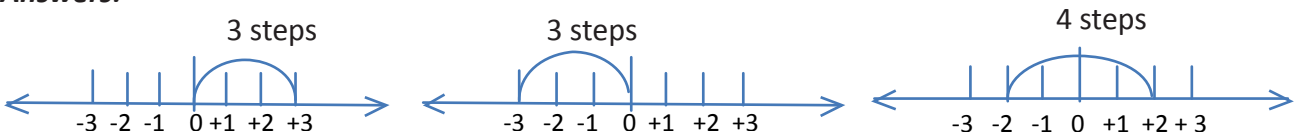
Draw a number line with different positive and negative integers: from -10 to +10 on the board.



Pick the following integers:

0 and +3; 0 and -3; -2 and +2. Pupils work in small groups and calculate/determine the distance between those integers. One pair computes the distance between 0 and +3 on a number line. A second pair computes the distance between 0 and -3. And a third one computes the distance between -2 and +2. Each pair has to explain to others how they computed the distance between integers.

Answers:



The distance between 0 and +3 is: 3. The distance between -3 and 0 is: 3. The distance between -2 and +2 is: 4.

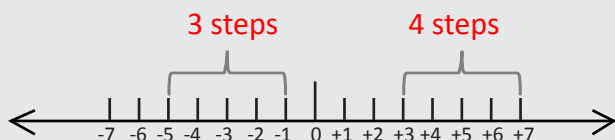
Math Facts!

- We can compute the distance between 2 integers by counting the intervals between those integers. Thus the distance from 0 to +1 is **1**. The distance from 0 to +2 is **2** and the distance from -2 to +2 is **4**.
- When computing the distance between integers we follow the rules below:

Rule 1:

If two numbers are on the same side of zero, the distance between them is the difference of their distances from zero.

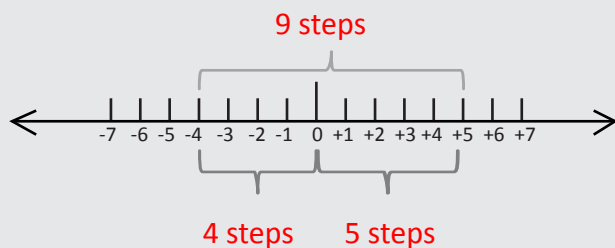
Eg1. The distance between +3 and +7 is 4; the distance between -2 and -5 is also 3 as illustrated by the following drawings:



Rule 2:

If two numbers are on opposite sides of zero, the distance between them is the sum of their distances from zero.

Eg 1. The distance between -4 and +5 is 9 as illustrated by the drawing below:



Application

1) Pupils in small groups answer the following questions using a number line:
What is the distance between the following numbers?

- 0 and +2
- + 2 and -1
- 1 and +1
- 2 and +2

2) Pupils in small groups play the game: **Who am I? / Where am I?** :

"I am exactly 4 steps away from +4. And 2 steps away from -2 Where am I?" Find the number using a number line.

Conclusion

Assessment

Pupils answer the following questions individually:

1) What is the distance between the following numbers?

- 2 and -6
- 1 and -3
- 2 and +7
- 4 and +4
- 0 and -5

f) +1 and +6

2) On a number line Kalisa places a coin on 0. He moves it 5 places to the left which integer would his coin now be on?

Homework

Pupils copy the following activities in their notebooks and do them when they reach home:

1) What is the distance between the following numbers?

- a) -1 and +2
- b) -2 and +5
- c) +4 and -3
- d) +2 and +7
- e) -1 and +9

2) The average temperature of Venus is 480 °C. The average temperature on Pluto is – 230 °C. How much warmer is Venus than Pluto?

Lesson 6

Assessment of the unit

Topic area	Numbers and operations
Unit 2	Negative and positive integers
Key competence	To be able to solve problems related to comparing, ordering, and finding distance between negative and positive integers.
Assessment criteria	Pupils are able to accurately, confidently in required time: <ul style="list-style-type: none">• To compare two integers• To find the distance between negative and positive integers on number line
Competences developed	Critical thinking.
Attention to special educational needs	When preparing the assessment, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities... e.g. Pupils with writing problems, pupils with visual impairments, pupils with hearing impairments,...

Assessment questions

20 marks

Question 1

Complete the following:

Integers can beor..... .

Question 2

Give an example of:

- a) A positive integer.
- b) A negative integer.
- c) A number which is neither positive nor negative. How many such integers can you list?

Question 3

Below is a table of the lowest recorded temperatures in history in 1983.

	Place	Date	Degrees Celsius
World (Antarctica)	Vostok	21-Jul-83	-89
Africa	Ifrane, Morocco	Feb. 11, 1935	-24
Asia	Oimekon, Russia	Feb. 6, 1933	-68
Australia	Charlotte Pass, N.S.W.	Jun. 29' 1994	-22
Europe	Ust 'Shchugor, Russia	Jan.	-55
Greenland	Northice	Jan. 9, 1954	-66
North America (excl. Greenland)	Snag, Yukon, Canada	Feb. 3, 1947	-63
Oceania	Mauna Kea, Hawaii	May.17, 1970	-11
South America	Sarmiento, Argentina	June. 1, 1907	-33
U.S. (excl. Alaska)	Rogers Pass, Mont.	Jan. 20, 1954	-56
United States	Prospect Creek, Alaska	Jan. 23, 1971	-62

Source: Adapted from National Oceanic and Atmospheric Administration (NOAA).

- a) Arrange them from the coldest to the hottest temperature (in ascending order).
- b) Arrange them from the hottest to the coldest temperature (in descending order).

Question 4

Using a number line show the distance between the following integers?

- a) 0 and +10
- b) -9 and +2

Unit 3: Classifying numbers by their properties

Unit at glance

Topic area: Numbers and Operations

Key competence: Be able to classify numbers flexibly, seeing them as belonging to various families.

Lesson 1: Odd, even and prime numbers	Period 1	Period 2
	Meaning and classifying odd, even and prime numbers	Exercises on classifying odd, even and prime numbers
Lesson 2: Multiples of numbers	Period 1	
	Finding the multiples of numbers	
Lesson 3: LCM of numbers	Period 1	Period 2
	Finding the LCM using informal method	Exercises on finding the LCM of a number using informal method
Lesson 4: Factors of a number	Period 1	
	Finding the factors of numbers	
Lesson 5: square and square root of a number	Period 1	Period 2
	Finding the exact square numbers	Finding the exact square root of numbers (<100)
Lesson 6: Assessment	Period 1	Period 2
	Assessment of the unit	Feedback and remediation

Unit warm-ups and games

Even or odd number?

Say a number between 0 and 100. Pupils say if the number is even or odd.

Prime number or not

Say a number between 0 and 100. Pupils say if the number is a prime number or not.

Find the factors of a number

Say a number (between 0 and 50) and pupils say some of its factors, e.g, say 15 and pupils say the factors of 15. In other words, what numbers can you multiply together to make 15? (The factors are: 1,3,5 and 15).

Find the square of a number

Say a number from 0 to 100, eg, 4 and pupils say its square (the answer is: 16).

Find the square root of a number

Say a number between 0 and 100 (a number which has a square root) and pupils say its square root, e.g, say 25 and pupils say its square root (answer: 5) .

Unit Lessons

Lesson 1

Odd, even and prime numbers

Topic area	Numbers and operations
Unit 3	Classifying numbers by their properties
Key Unit competence	Be able to classify numbers flexibly, seeing them as belonging to various families.
Learning objectives	By the end of the lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the meaning of odd and even numbers. • Explain the properties of odd and even numbers. • Give examples of numbers in each family. • Describe the properties of prime numbers. Skills: <ul style="list-style-type: none"> • Classify numbers as odd, even numbers or prime. Attitude: <ul style="list-style-type: none"> • Cooperate and display a teamwork spirit. • Demonstrate creativity in problem solving.
Key words	Odd number, even number, prime number
Cross cutting issues	- Standardization culture enhanced through discussing the importance of hygiene (good health). - Gender developed through assigning tasks in group work and presentations.
Competences developed	- Communication developed through answering questions. - Cooperation developed through working in pairs or in groups. - Critical thinking and problem solving developed through analyzing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives	Given a real life situation and list of numbers, pupils will be able to classify odd, even and prime numbers correctly, confidently and in a given time.		
Class setting/ organization	Arrange desks so that pupils can work individually and in small groups.		
Materials	Flashcards with numbers from 1 to 20. The number of flashcards depends on the number of pupils in class.		
References	<ul style="list-style-type: none"> – Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45. – Tom Roche.1984. Busy at Maths, P. 155-157. – Mwuengeri E. et al. 2008. Mathematics: Pupils Book, P. 103-106. 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 minutes)	Facilitate pupils to chant	Chant in 2's, 3's and 4's' from 0 to 40 (forward and backward)	
Development (25 minutes)	<p>Activity 1:</p> <p>Give each pupil a flashcard with a number from 1 to 10.</p> <p>b) Ask pupils from each group to say their numbers aloud. Ask class if everyone agrees that the number is in the right group.</p>	<p>Activity 1: Classification of odd, even, prime numbers from 1-10</p> <p>Pupils work individually to divide their numbers by 2.</p> <p>a) Pupils with numbers which are divisible by 2 put them together and make group A. Pupils with numbers which are not divisible by 2 make group B. Pupils with numbers which are divisible only by one and by themselves make group C.</p> <p>b) Pupils from each group to say their numbers out loud. And class to say if everyone agrees that the number is in the right group.</p> <p>(Answer:</p> <p>a) <i>The numbers which are divisible by 2 are: 2; 4; 6; 8; 10;</i></p>	<p>Cooperation developed through working in pairs, group.</p> <p>Communication developed through answering questions.</p> <p>Critical thinking and problem solving developed through analyzing and organizing ideas.</p>

	<p>Put pupils in groups of 4 and divide by 2 all the numbers between 10 and 20.</p>	<p>b) <i>The numbers which are not divisible by 2 are: 1; 3; 5; 7; 9</i></p> <p>c) <i>The numbers which can divided by one and by themselves are: 1,3,5,7</i></p> <p>Activity 2: Classifying and describing the properties of odd, even and prime numbers from 10-20</p> <p>Pupils work in group of four and divide by 2 all the numbers between 10-20 and classify them as follows:</p> <p>a) Put together all numbers divisible by 2</p> <p>b) Put together all numbers which are not divisible by 2</p> <p>c) Put together all numbers which are divisible by themselves</p> <p>Some group representatives present on the board</p> <p><i>Answers:</i></p> <p>a) <i>The numbers which are divisible by 2 are: 10, 12,14,16,18.</i></p> <p>b) <i>The numbers which are not divisible by 2 are:11,13,15,17,19</i></p> <p>c) <i>The number which are divisible by one and by themselves are:11,13,17,19</i></p> <p><i>Pupils conclude that:</i></p> <p><i>The numbers in group A are Even numbers; the numbers in group B are odd numbers; the numbers in group C are prime numbers.</i></p>	<p>Gender developed when assigning tasks in group work.</p>
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	<p>Summary: Facilitate pupils to give the definitions of even number, odd number and prime number in their own words and to give more examples of odd, even, prime numbers by extending to the numbers that are more than 20.</p> <p>Write the definitions and some pupils read them loudly.</p>	<ul style="list-style-type: none"> • An even number is a number that can be divided exactly by 2. The numbers 2, 4, 6, 8, and 10 are all even numbers. • An odd number is a number that cannot be divided by 2. The numbers 1, 3, 5, 7, 9, 15 and 21 are all odd numbers. • A prime number is a number which is divided by 2 numbers only: 1 and itself, eg, 3, 5, 7, 11... <p>Note: 1 is not a prime number because it is divided by only one.</p>	<p>Critical thinking and problem solving developed through analyzing and organizing ideas.</p>																								
	<p>Application</p> <p>Facilitate pupils to work in small groups</p>	<p>1) The following are registration numbers for some of P4 pupils at BUMENYI primary school:</p> <table border="1"> <thead> <tr> <th>Names</th> <th>REG/N^o</th> </tr> </thead> <tbody> <tr> <td>AHISHAKIYE</td> <td>1</td> </tr> <tr> <td>BUSORO</td> <td>5</td> </tr> <tr> <td>CYUSA</td> <td>11</td> </tr> <tr> <td>CYUZUZO</td> <td>12</td> </tr> <tr> <td>KAMANA</td> <td>18</td> </tr> <tr> <td>KALISA</td> <td>23</td> </tr> <tr> <td>KAMANZI</td> <td>25</td> </tr> <tr> <td>RUGERO</td> <td>32</td> </tr> <tr> <td>GISA</td> <td>37</td> </tr> <tr> <td>MAZIMPAKA</td> <td>39</td> </tr> <tr> <td>MBANGUKIYE</td> <td>42</td> </tr> </tbody> </table> <p>a) Write down all the odd numbers between the Registration Numbers of AHISHAKIYE and MBANGUKIYE?</p> <p>b) Write down all the even numbers between AHISHAKIYE and MBANGUKIYE?</p> <p>c) Write down all the prime numbers between AHISHAKIYE and MBANGUKIYE.</p> <p>2) Write the year when you were born and say if it is an odd or even number.</p>	Names	REG/N ^o	AHISHAKIYE	1	BUSORO	5	CYUSA	11	CYUZUZO	12	KAMANA	18	KALISA	23	KAMANZI	25	RUGERO	32	GISA	37	MAZIMPAKA	39	MBANGUKIYE	42	
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<p>Conclusion (10 min)</p>	<p>Assessment Write assessment activities on the board.</p>	<p>1) Write down all the odd numbers between: i) 10 and 24 ii) 28 and 42 2) In Rwandan Banks, people are given numbers and then their number is called to receive service. At a bank in town one day, people were given the following numbers: 5; 6; 7; 8; 9; 11; 12; 14; 15; 16; 17; 18; 19; 20. Write down odd and even numbers from the above numbers. 3) Say which days of the week correspond with odd numbers and which ones correspond with even numbers, starting from Monday, represented by 1.</p>																																				
	<p>Homework Write homework activities on board.</p>	<p>The table below shows the hygiene level of primary schools in %</p> <table border="1"> <thead> <tr> <th>Names of activity</th> <th>SCHOOL X</th> <th>SCHOOL Y</th> <th>SCHOOL Z</th> <th>SCHOOL W</th> </tr> </thead> <tbody> <tr> <td>pupils who take shower twice per day</td> <td>77</td> <td>74</td> <td>71</td> <td>76</td> </tr> <tr> <td>Pupils who wash hands each time before and after eating</td> <td>91</td> <td>89</td> <td>68</td> <td>77</td> </tr> <tr> <td>pupils who wash hands after toilet</td> <td>98</td> <td>97</td> <td>99</td> <td>93</td> </tr> <tr> <td>Pupils who wear clean uniform from Monday up to Friday</td> <td>87</td> <td>83</td> <td>86</td> <td>84</td> </tr> <tr> <td>Pupils who always have cut nails</td> <td>75</td> <td>73</td> <td>70</td> <td>72</td> </tr> <tr> <td>Pupils who brush teeth after eating and before sleeping</td> <td>94</td> <td>82</td> <td>80</td> <td>81</td> </tr> </tbody> </table>	Names of activity	SCHOOL X	SCHOOL Y	SCHOOL Z	SCHOOL W	pupils who take shower twice per day	77	74	71	76	Pupils who wash hands each time before and after eating	91	89	68	77	pupils who wash hands after toilet	98	97	99	93	Pupils who wear clean uniform from Monday up to Friday	87	83	86	84	Pupils who always have cut nails	75	73	70	72	Pupils who brush teeth after eating and before sleeping	94	82	80	81	<p>Standardization culture enhanced through discussing the importance of hygiene (good health)</p>
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		<p>pupils answer the following:</p> <p>a) Write down all the odd numbers from the above table</p> <p>b) Write down all the even numbers from the above table</p> <p>c) Write down all the prime numbers from the above table</p> <p>d) Which school had the greatest percentage of pupils who wash their hands after toilet?"</p> <p>e) What is the importance of having good hygiene practices every day?</p>	
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Lesson 2

Multiples of numbers (Finding the multiples of numbers)

Topic area	Numbers and operations
Unit 3	Classifying numbers by their properties
Key Unit competence	Be able to classify numbers flexibly, seeing them as belonging to various families.
Learning objectives of lesson 1	<p>By the end of the lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain the meaning of multiples of numbers. <p>Skills:</p> <ul style="list-style-type: none"> • Describe multiples of a given number. <p>Attitude:</p> <ul style="list-style-type: none"> • Demonstrate a cooperative and teamwork spirit. • Demonstrate creativity in problem solving.
Key words	The multiple of a number
Cross cutting issues	Gender developed through allocating tasks in group work.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Cooperation developed through working in pairs or in groups. - Critical thinking developed through the activities
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Given a number, pupils will be able to find its multiples correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually in pairs or in groups.

Materials

Manila paper on which a 100 grid is drawn.

References

- Tom Roche. 1984. Busy at Math Rang 5. P13.
- Tom Roche.1984. Busy at Maths, 155-157. P21.
- <http://www.enhanced.teaching.com>
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Games: **Even or odd number?**

Development

Presentation

Activity 1: Concept of multiples of numbers.

Here is a 100 grid with some numbers shaded. in small groups pupils observe it and answer the questions below.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- What do all the numbers in the last column have in common?
- What do you notice about all the numbers in the 5th column?
- How can we call these numbers (in the 5th column)?
- Can you give examples of numbers which have the same characteristics?

Possible answers:

- Each number is a product of ten by another number.
- Each number is a product of five by another number.
- They are called multiples of 10 and multiples of 5.
- Personal answers.

Activity 2: Finding multiples of a number

Kalisa has produced bricks and he is arranging them in rows. He is putting 16 bricks in each row.

A) What will the total number of bricks be in the following rows?

Calculations:

$1 \times 16 = 16$

$2 \times 16 = 32$

$3 \times 16 = 48$

$4 \times 16 = 64$

Answers

1 row : 16 bricks

2 rows : 32 bricks

3 rows : 48 bricks

4 rows : 64 bricks

b) What are the common characteristics of the answers you get after getting the number of bricks in each row?

(Answer: Each number of bricks on every row can be divided by 16 (if we divide each answer by the number of rows we get 16).)

Activity 3: Describing multiples of numbers

Below are the two first multiples of 2, 3, 4, and 5

$2 \times 1 = 2$

$3 \times 1 = 3$

$4 \times 1 = 4$

$5 \times 1 = 5$

$2 \times 2 = 4$

$3 \times 2 = 6$

$4 \times 2 = 8$

$5 \times 2 = 10$

Pupils answer the following questions:

What do you observe on the first multiple of each number ($2 \times 1 = 2$, $3 \times 1 = 3$, $4 \times 1 = 4$, $5 \times 1 = 5$)?

(The first multiple of every number is the number itself.)

Math Facts!

- A multiple of a number is the product you get after multiplying any counting number by that number eg, to find the multiples of 3: multiply 3×1 , 3×2 , etc. The multiples of 3 are therefore 3, 6, 9... $3n$, n is a counting number.
- The first multiple of every number is the number itself. So a multiple of a number cannot be less than that number.

Application

Pupils in small groups write the first nine multiples of:

a) 2

b) 3

c) 4

d) 5

Conclusion

Assessment

Pupils individually find multiples of 25 which are between 100 and 200.

Homework

Find 5 multiples of the following numbers:

a) 8

b) 9

c) 11

d) 14

e) 15

Lesson 3

Lowest Common Multiple (LCM) of numbers

Topic area	Numbers and operations
Unit 3	Classifying numbers by their properties
Key Unit competence	Be able to classify numbers flexibly, seeing them as belonging to various families.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none">• State the method/steps for calculating the Lowest Common Multiple (LCM) Skills: <ul style="list-style-type: none">• Calculate the Lowest Common Multiple (LCM) of two numbers. Attitude and values: <ul style="list-style-type: none">• Demonstrate a cooperative and teamwork spirit.• Demonstrate creativity in problem solving.
Key words	Lowest common multiple
Cross cutting issues	Gender enhanced through assigning tasks in group presentations.
Competences developed	<ul style="list-style-type: none">- Communication developed through answering questions.- Cooperation developed through working in pairs, groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Finding the Lowest Common Multiple (LCM) using informal method

Instructional objectives

Given a list of numbers and a situation pupils will be able to calculate the Lowest Common Multiple (LCM) of two numbers.

Materials:

Manila paper with examples of LCM of 2 numbers.

References:

- Tom Roche. 1984. Busy at Math Rang 5, P. 13.
- Tom Roche.1984. Busy at Maths, 155-157.
- www.Math.schoolspecialty.com

Class setting/organization

Indoor: Arrange desks so that pupils can work individually, in pairs or in groups.

Introduction/Review

Correction of homework.

Games: **Prime number or not.**

Development

Presentation:

Activity 1: Finding LCM of 2 and 3

- Each pupil to find multiples of 2 and 3 and circle the first number that is divisible by both 2 and 3.
- In pairs, pupils to show each other how they did the exercise and discuss their answers.
- Two pairs to discuss their answers.

- One group member to write the first 10 multiples of 2 and another one writes the first 10 multiples of 3.
- Some pupils to come and underline all the numbers that are divisible by both 2 and 3.
- Another pupil to come and underline the first number that is divisible by both 2 and 3.

Answer:

The multiples of 2 are: 2, 4, 6, 8, 10, 12, 14, 16, 18, 20

The multiples of 3 are: 3, 6, 9, 12, 15, 18, 21, 24, 27, 30

The first number that is divisible by both 2 and 3 is: 6. so the LCM of 2 and 3 is 6.

Activity 2: The process of finding LCM of 5 and 6

- Each pupil to find multiples of 5 and 6 and circle the first number that is divisible by both 5 and 6.
- In pairs, pupils to show each other how they did the exercise and discuss their answers.
- Two pairs to discuss their answers and how they come up with the answers.
- One of the group member to write the first 10 multiples of 5 and the other one writes the multiples of 6.
- Some pupils to come and underline all the numbers that are divisible by both 5 and 3.
- Another pupil to come and underline the first number that is divisible by both 5 and 6.

Answer:

The multiples of 5 are: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50.

The multiples of 6 are: 6, 12, 18, 24, 30, 36, 42, 48, 54, 60.

The first number that is divisible by both 5 and 6 is: 30. So the LCM of 5 and 6 is: 30.

Math Facts!

- The lowest common multiple (LCM) of two numbers is the smallest number (not zero) that is a multiple of both.
- To find **LCM**: we first find multiples of those numbers and then we underline/ identify the ones which are common for both given numbers, and then we look at the Lowest number. This number is divisible by both numbers.

Application activities

Work out the following activities (in small groups):

- 1) Find the lowest common multiple (LCM) of the following sets of numbers
 - a) 2 and 8
 - b) 4 and 10
 - c) 5 and 15

- 2) Solve the following problem:

You take a bus to town every 6 days to sell some of your wares. For the first time, your friend takes the same bus every 4 days. If you meet on the bus today, in how many days will you meet in the bus for the second time? (hint: use multiples of 4 and 6).

Conclusion

Assessment

Individually, pupils solve the following:

- 1) Find the lowest common multiple of the following sets of numbers:
 - a) 3 and 9
 - b) 4 and 12

- c) 6 and 14
- d) 7 and 10

2) The African football Competition called Africa Cup of Nations (CAN) takes place every 2 years while the World cup takes place every 4 years. If they both take place this year, in how many years will they take place again in the same year?

Homework

- 1) What is the lowest common multiple of the following sets of numbers:
 - a) 11 and 7
 - b) 20 and 48
 - c) 24 and 60

- 2) You order paper supplies for your shop every 10 days and household items every 4 days. If both deliveries came today, in how many days will the 2 deliveries arrive on the same day again (for you to plan the stock space)?

Lesson 4 Factors of a number

Topic area	Numbers and operations
Unit3	Classifying numbers by their properties
Key Unit competence	Be able to classify numbers flexibly, seeing them as belonging to various families.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the meaning of factors of numbers. Skills: <ul style="list-style-type: none"> • Classify factors of given numbers. Attitude: <ul style="list-style-type: none"> • Demonstrate a cooperative and teamwork spirit. • Demonstrate creativity in problem solving.
Key words	Factors
Cross cutting issues	Gender enhanced through activities and assigning tasks in group activities.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Cooperation developed through working and playing in pairs and in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Given numbers and a real life situation, pupils will be able to find factors of numbers correctly, confidently and in a given time.

Materials:

- Tom Roche.1984. *Busy at Maths*, 155-157.
- www.Math.school specialty.com

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in groups.

Introduction/Review

Correction of homework.

Game: Multiples of a number.

Development**Presentation****Activity 1: Finding factors of 12**

Step 1: Pupils individually to find all the numbers that can be multiplied by other numbers to give 12.

Step 2: Pupils to discuss in pairs, what everyone did and then two pairs to discuss what they did. One pupil to write all the numbers that can be multiplied to get 12.

Answers:

$2 \times 6 = 12$; $3 \times 4 = 12$; $12 \times 1 = 12$. So the numbers which can be multiplied by other numbers to get 12 are: 2, 3, 4, 6, 12.

Activity 2: Factors of 18

In small groups pupils, find the factors of 18.

Answer:

$$1 \times 18 = 18$$

$$2 \times 9 = 18$$

$$3 \times 6 = 18$$

So the numbers which can be multiplied by other numbers to get 18 are: 1, 2,3,18.

i) Compare the factors of 18 and say which factor is greatest (the greatest factor is 18).

Teacher facilitate pupils to conclude that 1, 2, 3, 4, 6, 12 are factors of 12 and 1, 2,3,18 are factors of 18.

Math Facts!

- Factors of a number are two or more numbers multiplied together to give that number (the product). Example: The factors of 12 are 12, 3, 4, 6 and 12 because 12 equals 1×12 ; 2×6 ; and 3×4 .
- A number can have many factors. Eg, 12
 - 3 and 4 are factors of 12 because $3 \times 4 = 12$
 - 2 and 6 are factors of 12 because $2 \times 6 = 12$
 - A number is the multiple of its factors. So 12 is a multiple of 1, 2, 3, 4, 6 and 12.
 - The greatest factor of a number is the number itself.

Application

Pupils in small groups work out the following:

- 1) Find the factors of:
 - a) 4

- b) 8
- c) 10

2) There are 24 pupils in a classroom. In how many different ways can the teacher group them?

Conclusion

Assessment

Individually, pupils work out the following:

1) Find the factors of:

- a) 9
- b) 12
- c) 14
- d) 27
- e) 35
- f) 40

2) For your birthday party you have invited 120 persons and you have planned 120 bottles of Fanta for your invitees. You want to serve an equal number of bottles of Fanta.

- a) How many bottles of Fanta will each invitee get if they all come to your party?
- b) How many bottles of Fanta will each invitee get if only 60 persons come to your party?
- c) How many bottles of Fanta will each invitee get if only 40 invitees come to your party?

Homework

1) Find the factors of:

- a) 8
- b) 25
- c) 48
- d) 50

2) You have 56 pieces of candies/sweets to distribute at a party.

- a) How many pieces of candies/sweets will each person get if 28 people come to the party?
- b) How many pieces of candies/sweets will each person get if 8 people come to the party?
- c) How many pieces of candies/sweets will each person get if 7 people come to the party?

Lesson 5

Square and square root of a number

Topic area	Numbers and operations
Unit 3	Classifying numbers by their properties
Key Unit competence	To be able to classify numbers flexibly, seeing them as belonging to various families
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the meaning of square numbers and square root. Skills: <ul style="list-style-type: none"> • Calculate the square of a number and find the square root of a square number ≤ 100 Attitude and values: <ul style="list-style-type: none"> • Appreciate the importance of using square numbers and square roots. • Demonstrate a cooperative and teamwork spirit. • Demonstrate creativity in problem solving.
Key words	Square; square root of a number
Cross cutting issues	Gender enhanced through assigning tasks in group presentations.

Competences developed	- Communication developed through answering questions. - Cooperation developed through working in pairs and in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Period 1 Finding the exact square numbers

Given different numbers pupils will be able to find the square of numbers correctly, confidently and in a given time.

Class setting / organization

Arrange desks so that pupils can work in pairs and in groups.

Materials

Flashcards with some square roots of numbers.

References

- Tom Roche.1984. Busy at Maths, Pag:155-157.
- www.Math.schoolspecialty.com
- www.Math.schoolspecialty.com

Introduction/ Review

Correction of homework.

Game: Find factors of a number.

Development

Presentation

Activity 1: Finding a square of a number

Pupils do the following exercises individually:

- $5 \times 5 =$
- $13 \times 13 =$
- $24 \times 24 =$
- $50 \times 50 =$

Some pupils present on the board.

Answers:

- $5 \times 5 = 25$
- $13 \times 13 = 169$
- $24 \times 24 = 576$
- $50 \times 50 = 2500$

Pupils answer the following questions:

What do you observe from the above exercises? Answer: *(each product is found by multiplying a number by itself; the multiplicand and the multiplier are made of the same numbers).*

What is the result we get when we multiply a number by itself? Answer: (a square number).

Activity 2: How to read and write the square of number

Help pupils find how to write and read the square numbers:

$5 \times 5 = 25 = 5^2$:five squared.

$13 \times 13 = 169 = 13^2$:thirteen squared.

$24 \times 24 = 24^2$:Twenty four squared.

$50 \times 50 = 2500 = 50^2$:fifty squared.

Math Facts!

- The number we get after multiplying a number by itself is a square number, eg, $3 \times 3 = 9$, so 9 is a square of 3.
Another way to write the square number that is the most common is: n^2 (n stands for a number e.g. $3^2 = 9$.)
- Here is a list of few square numbers:
 $4 = 2 \times 2$ or 2^2
 $9 = 3 \times 3$ or 3^2
 $16 = 4 \times 4$ or 4^2
 $25 = 5 \times 5$ or 5^2
 $36 = 6 \times 6$ or 6^2
 3^2 is read : Three squared.
 5^2 is read : Five squared.
Note: $0^2 = 0$, $1^2 = 1$

Application

In small groups, pupils work out the following:

Find the squares of the following numbers:

- 7
- 11
- 16
- 50
- 65

Conclusion

Assessment

Individually, pupils do the following:

Find the squares of the following numbers:

- 25
- 30
- 36
- 40
- 55

Homework

Find the squares of the following numbers:

- 36
- 47
- 51
- 72
- 100

Instructional objectives

Given a squared number, pupils will be able to calculate its square root accurately, confidently in a given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in group.

Materials

Manila paper with square roots of some numbers

References

- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths.
- Mwumvaneza E. 2008. Mathematics: Teacher Guide, Primary Four.
- websites: <http://www.mathisfun.com>
- www.elementary-math.html,

Introduction/ Review

Correction of homework.

Games: Find the square of a number.

Development**Presentation****Activity 1: Finding the square root of a number**

Pupils in pairs find out answers of the following:

$$81 = 9 \times 9 = 9^2$$

- What is the relationship between 81 and 9 (Answer 9 is a product of 9 by 9, 81 is a square of 9). So 9 is a square root of 81.
- What is a square root of a number (Answer: The square root of a number is a number which when multiplied by itself gives that number).

Math Facts!

- The square root of a number is a number which when multiplied by itself gives that number. eg:
 - The square root of 4 is 2 because $2 \times 2 = 4$.
 - The square root of 9 is 3 because $3 \times 3 = 9$.
 - The square root of 16 is 4 because $4 \times 4 = 16$.
 - The square root of 81 is 9 because $9 \times 9 = 81$.
- The symbol we use for the square roots is: $\sqrt{\quad}$.
eg: $\sqrt{36} = 6$ (because $6 \times 6 = 36$)

Application

Pupils in small groups work out the following:

Find the square root of the following numbers:

- a) 4
- b) 9
- c) 16
- d) 25

Conclusion**Assessment**

Individually, find the square root of the following numbers:

- a) 9
- b) 16
- c) 36
- d) 49
- e) 64

Homework

Find the square root of the following numbers:

- a) 0
- b) 25
- c) 49
- d) 81
- e) 100

Lesson 6

Assessment of the unit

Topic area	Numbers and operations
Unit3	Classifying numbers by their properties
Key competence	To be able to classify numbers flexibly, seeing them as belonging to various families
Assessment criteria	<p>Pupils are able to accurately, confidently and in a given time:</p> <ul style="list-style-type: none"> • Classify odd, even, and prime numbers • Find multiples of a number • Find factors of a number • Find LCM of two numbers • Find the square and square root of numbers.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing take into consideration different abilities and needs of : slow, gifted and talented pupils, pupils with disabilities, eg, pupils with writing problems, pupils with visual impairments, pupils with hearing impairments...

Assessment questions

20 marks

Question 1

Find out which of these numbers are even, odd or prime numbers.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 24,

Question 2

Write the first nine multiples of:

- a) 2
- b) 3
- c) 4
- d) 5

Question 3

Find the factors of the following numbers:

- a) 15
- b) 30
- c) 49
- d) 45
- e) 50

Question 4

Find the LCM of the following numbers:

- a) 4 and 9
- b) 12 and 15
- c) 7 and 25

Question 5

Calculate the following:

- a) What is 12^2 ?
- b) What is 15^2 ?
- c) What is 21^2 ?
- d) What is 33^2 ?
- e) What is 70^2 ?

Question 6

What are the square roots of the following numbers:

- a) 25
- b) 36
- c) 64
- d) 81
- e) 100

Question 7

A shopkeeper is arranging crates of Fanta in a store room. He/she has to arrange 96 crates of Fanta. How many crates will he put in each row if the rows are:

- a) 16 rows
- b) 12 rows
- c) 8 rows

Question 8

Kankindi has two part time house workers. The one who washes clothes comes once every 3 days. The gardener comes once every 5 days. If today the 2 workers met at Kankindi's house, help Kankindi know in how many days the 2 workers will meet again in her house so that she can plan their lunch accordingly?

Unit 4: Fractions of the same denominator

Unit at glance

Topic area: Numbers and Operations

Key competence: Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately..

Lesson 1: Proper fractions	Period 1	Concept and representation of a proper fraction	Period 2	Representation, reading and writing a proper fraction in figures and words
	Period 1	Concept, reading and writing improper fractions in figures and words	Period 2	Exercises on reading and writing proper and improper fractions in figures and words
Lesson 3: Concept, reading and writing mixed fractions in figures and words				
Lesson 4: Converting fractions	Period 1	Converting mixed fractions into improper fractions and improper fractions into mixed fractions	Period 2	Exercises on converting mixed fractions into improper fractions and improper fractions into mixed fractions
	Period 1	Ordering and comparing fractions of same denominator	Period 2	Exercises and problems on comparing and ordering fractions of same denominator
Lesson 5: Comparing and ordering fractions	Period 1	Addition and subtraction of fractions of same denominator	Period 2	Exercises and problems on addition and subtraction of fractions of same denominator
	Period 1	Multiplication of fraction by a whole number	Period 2	Exercises and problems on multiplication of fraction by a whole number

Lesson 8: Multiplication of a fraction by a fraction.	Period 1	Period 1	Period 2
	Multiplication of fraction by a fraction	Exercises on multiplication of a fraction by a fraction	
Lesson 9: Division of a fraction by a whole number	Period 1	Period 1	Period 3
	Division of fraction by a whole number	Exercises and problems on division of a fraction by a whole number	Exercises and problems on division of a fraction by a whole number
Lesson 10: Division of a fraction by a fraction	Period 1	Period 1	Period 3
	Division of a fraction by a fraction	Exercises on division of a fraction by a fraction	Exercises and problems on division of a fraction by a fraction
Lesson 11: Exercises on addition, subtraction, multiplication and division of fractions	Period 1	Period 1	Period 2
	Exercises on addition, subtraction, multiplication and division of fractions (by whole number and fractions)	Exercises on addition, subtraction, multiplication of a fraction (by a whole number and a fraction)	
Lesson 12: Revision of the unit			
Lesson 13: Assessment of the unit	Period 1	Period 1	Period 2
	Assessment	Feedback and Remediation	

Unit warm-ups and games

Flowers

In groups of 10 to 15, on a circle pupils count from 1 to 30. If your number is even, you give flowers avoiding saying the number. If your number is odd, you say it loudly. The rest of the class act as evaluators. Then change the groups of pupils.

Is the same as

Show fractions written on different flash cards and pupils say the fraction.

$$1\frac{1}{2}; 1\frac{1}{3}; 1\frac{1}{4}; 1\frac{1}{5}; 1\frac{1}{6}; 1\frac{1}{7}$$

In corners

Create 3 corners by putting cards with:

Proper fraction

Improper fraction

Mixed fraction

Using cards with different fractions, the teacher shows a fraction then pupils move to the corner corresponding to the fraction shown. Some learners explain why they choose to be in that corner.

This game can be done in groups of 10-15 if the game is done in the classroom.

After the first round, a second group of pupils play the same game until the whole class has participated.

Unit Lessons

Lesson 1

Proper fractions

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge <ul style="list-style-type: none"> Explain the meaning of numerator and denominator in a fraction. Skills: <ul style="list-style-type: none"> Represent proper fractions with real objects. Attitude and values: <ul style="list-style-type: none"> Develop the spirit of sharing.
Key words	A fraction A denominator A numerator A fraction bar A proper fraction An ordinal number A cardinal number
Cross cutting issues	<ul style="list-style-type: none"> Gender balance developed through distribution of roles in different activities. Peace education developed through group, discussion leading to consensus.

Competences developed	<ul style="list-style-type: none"> - Communication developed through reading and writing fractions and explaining to other pupils how they came up with their answers. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through solving problems.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching, take into consideration different abilities and needs of learners: slow pupils, gifted pupils, pupils with disabilities.

Period 1

Concept and representation of a proper fraction

Instructional Objectives	Using real objects pupils will be able to explain the meaning of a fraction and to represent a proper fraction confidently, correctly and in a given time.		
Class setting/ organization	Arrange desks so that pupils can work individually, then in pairs and after in small groups.		
Materials	Wall charts to show fractions, scissors, square papers or manila papers for pupils to cut		
References	<ul style="list-style-type: none"> - Houghton Mifflin. 2002. Mathematics, p 324-325. - Akazi kanoze ALP Math, non published, p64-77. - Tom Roche.1984. Busy at Maths, 27-31 - Byamukama J.& Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 116- 18 - https://www.mathsisfun.com 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Facilitate and play the game Give flowers! with pupils.	Play the game: "Give flowers! "	
Development (25 min)	<p>Presentation</p> <p>Distribute the materials to groups of pupils (square papers, scissors), and give instructions related to Activity 1.</p> <p>Facilitate pupils to do activities using some questions.</p>	<p>Presentation</p> <p>Activity 1: Concept of proper fractions</p> <p>In small groups, pupils fold the paper in half from left to right. Then fold it in half again from top to bottom. Unfold the paper. There should be 4 small squares. Cut along the folds to make 4 smaller squares.</p> <p>Pupils find out how many parts they got.</p>	<p>Communication developed through discussions in groups and explaining how they came up with their answers.</p> <p>Co-operation developed through group working.</p>

	<p>Draw a square on manila paper and divide it into 4 equal parts.</p> <p>Facilitate pupils to write different fractions.</p> <p>Facilitates the pupils to identify elements of a fraction.</p> <p>Helps pupils to draw conclusions about fractions and give activities and related instructions.</p>	<p>Pupils say how to call each part of the paper in relation to the whole paper? (Each part is $\frac{1}{4}$ of the whole paper)</p> <p>Activity 2: Concept of proper fraction</p> <p>Pupils to come and shade one fourth ($\frac{1}{4}$) of the square on the board and write the corresponding fraction.</p> <p>-They write the fraction representing the non shaded parts.</p> <p>- They write the fraction that represents the whole square.</p> <p>Through observations of a square divided into equal parts, pupils find out that a fraction is a number representing parts of a whole:</p> <ul style="list-style-type: none"> • One part out of 4 is shaded and represented by the fraction: $\frac{1}{4}$ • Three parts out of 4 are not shaded and they are represented by the fraction: $\frac{3}{4}$. • The square is divided into 4 equal parts and represented by the fraction: $\frac{4}{4}$. • Pupils observe again the fractions ($\frac{1}{4}, \frac{3}{4}$) and draw conclusions that: • 1 and 3 are parts of a whole and they are called numerators. • 4 represent the total number of parts in the whole. It is called denominator. • The line that separates the numerator and the denominator is called a fraction bar, 	<p>Peace education developed through discussions leading to consensus.</p>
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		<ul style="list-style-type: none"> • Pupils compare numerators and denominators of the following fractions: $\frac{1}{4}$; $\frac{2}{4}$; $\frac{3}{4}$ • The numerators of the above fractions are less than their denominators. They are called proper fractions. 	
	<p>Summary</p> <p>Ask pupils the questions which help them to discover a fraction.</p> <p>Help pupils draw conclusions about the different parts of a fraction</p>	<ul style="list-style-type: none"> • The numerator of a fraction is a part of a whole. • The denominator represents the total number of parts divided in the whole. • A fraction whose numerator is less than the denominator is called a proper fraction. 	
	<p>Application</p> <p>Facilitate pupils to work out different exercises.</p>	<p>Application</p> <p>In small groups solve the following problems:</p> <ol style="list-style-type: none"> 1) You are 45 pupils in the class. Teacher asks the first born in their families to stand up. You count them and find that they are 9. - What is the fraction of first born pupils in your class? 2) Draw a rectangle and divide it into 5 equal parts then shade $\frac{2}{5}$ of it. 	<p>- Communication developed through discussions in groups and explaining how they came up with their answers.</p> <p>Critical thinking developed through solving problems related to fractions</p>

		<p>3) Mother bought a sugar cane which had 8 equal parts. She wants to give 6 equal parts to 6 children, and keep the rest for 2 children who are absent. Represent the following:</p> <p>a) The shares that all the 6 children will get in fraction.</p> <p>b) The share that is kept for the 2 children who are absent in fraction.</p>	
<p>Conclusion (10 min)</p>	<p>Assessment Write assessment questions on the board. Guide collective correction.</p> <p>Facilitates peer correction.</p>	<p>Assessment:</p> <p>1) Father has bought a fabric of 6 metres to sew clothes for his children. The elder wears a piece of cloth made from 3m of fabric, the following child wears a piece of cloth made from 2 m of fabric and the youngest child wears a piece of cloth made from 1m of fabric.</p> <p>a) Represent the share that each child got using a rectangle.</p> <p>b) Write the fractions representing the share of each child.</p>	<p>Critical thinking developed through solving problems</p>
	<p>Homework Write exercises on the board and pupils copy them and do them at home.</p>	<p>Homework</p> <p>1) Draw a rectangle and divide it into 9 equal parts. And then shade $\frac{5}{9}$ of it.</p> <p>2) You are 35 pupils in your class. Girls are 19 and boys are 16.</p> <p>a) Represent the number of girls in your class by a fraction.</p> <p>b) Find the fraction of boys.</p>	

Instructional objectives

Given a fraction in words or in figures, pupils will be able to read and write a proper fraction in figures and words fluently, confidently, correctly in required terms.

Materials

Flashcards on which are written proper fractions.

References

- <https://www.mathsisfun.com/fractions.html>

Class setting /Organization

Arrange desks so that pupils work individually and then in small groups.

Introduction/Review

Correction of homework.

Game: 'Give flowers'

Development

Presentation

Activity 1: Writing proper fractions in figures and words.

Put pupils in groups of 9: girls and boys combined. In groups, pupils share roles and respect gender balance. They do the following and present their findings to the class:

In your group:

- a) Count the number of group members.
- b) Write the number of girls and the corresponding fraction in figures and in words.
- c) Write the number of boys and the corresponding fraction in figures and in words.

NB: The number of group members can change according to the class.

The answer will depend on the number of members (boys/girls) which are in each group but for all the fractions the denominator will be 9.

Activity 2: Reading and writing proper fractions in words

Pupils in pairs share how to read the following fractions and write them in words:

- a) $\frac{1}{2}$
- b) $\frac{1}{3}$
- c) $\frac{1}{4}$
- d) $\frac{1}{7}$
- e) $\frac{1}{11}$
- f) $\frac{1}{12}$

Some pupils from different pairs read aloud the above fractions one by one and teacher helps them focusing on how to read and write a fraction: the numerator as a cardinal number and the denominator is read as an ordinal number.

e.g.

Cardinal number		Ordinal number	
In figures	In words	In figures	In words
1	One	1 st	First
2	Two	2 nd	Second
3	three	3 rd	Third
4	Four	4 th	Fourth
5	Five	5 th	Fifth
6	six	6 th	sixth
7	seven	7 th	Seventh
8	eight	8 th	Eighth
9	nine	9 th	Ninth
10	ten	10 th	Tenth

Facilitate learners to discover rules and exceptions related to writing fractions in words and reading them, using drawings.

$\frac{1}{2}$: One-half or a half

$\frac{1}{3}$: One-third or a third

$\frac{1}{4}$: One-fourth or one-quarter

$\frac{1}{7}$: One-seventh or a seventh

$\frac{1}{11}$: One-eleventh

$\frac{2}{3}$: Two-thirds

$\frac{3}{4}$: Three-fourths

$\frac{4}{5}$: Four-fifths

$\frac{13}{18}$: Thirteen-eighteenths

Math Facts!

- The numerator is read or written as one would say the number (this is called a cardinal number and the denominator is read or written as an ordinal number. (e.g. half, third, fourth, fifth, sixth, etc.).
- When the numerator is greater than 1 the denominator ends in "s", e.g. $\frac{2}{3}$ is written: Two-thirds.)
- A fraction can also be read or written as a number (cardinal) over a number (cardinal). e.g. $\frac{13}{18}$ can be read as "thirteen over nineteen".

Exceptions:

$\frac{1}{2}$ is read: One-Half

$\frac{3}{4}$ can be read as three-fourths or three-quarters.

Application

Pupils do the following activities in small groups.

1) Read the following fractions:

a) $\frac{1}{6}$

b) $\frac{7}{9}$

c) $\frac{22}{35}$

2) Write the following fractions in words:

a) $\frac{20}{21}$

b) $\frac{42}{73}$

3) Write the following fractions in figures:

a) Three-quarters

b) Twenty-three over twenty seven.

4) At the beginning of the school year, mother bought one dozen of notebooks (12) to be shared by three children. The elder child got 6 notebooks, the second one got 4 notebooks and the younger

one got 2 notebooks. Write their shares using fractions in figures and in words.

Conclusion

Assessment

1) Read the following fractions and then write them in words:

a) $\frac{1}{5}$ b) $\frac{7}{8}$ c) $\frac{1}{3}$ d) $\frac{2}{3}$

2) Pupils write the following fractions in figures:

- a) Nineteen - Twenty sixths.
b) Two thirds.

3) Solve the following:

A farmer bought 100 kg of animal food for his/her chicken and pigs. The chickens were given 40 kg of that food while the pigs were given 60 kg of that food. Represent those shares in fractions and then write the fractions in words.

Homework

1) Pupils to draw a circle or a rectangle and represent the fractions: $\frac{1}{3}$ on it (they could show a circle of 3 equal parts and shade in one part)

2) Write the following fractions in words:

a) $\frac{35}{100}$ b) $\frac{77}{78}$

3) Write the following fractions in figures:

- a) Forty over fifty five
b) Twenty one-twenty thirds.

4) Solve the following:

Mugeni had received 5 pens to use at school in the last term. At the end of the term she had used only 2 pens. Represent with fractions the number of pens used and the number of pens remaining and write the corresponding fractions in words.

Lesson 2

Improper fractions (Concept reading and writing improper fractions in figures and words)

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the meaning of numerator and denominator in an improper fraction. Skills: <ul style="list-style-type: none"> Read and write improper fractions. Attitude: <ul style="list-style-type: none"> Develop the spirit of sharing.
Key words	An improper fraction
Cross cutting issues	<ul style="list-style-type: none"> Peace education developed through working in groups and discussion leading to general compromise. Gender balance developed through distribution of roles.

Competences developed	<ul style="list-style-type: none"> - Communication developed through reading and writing fractions, and in presenting to the class on board how they came up with their answers. - Cooperation developed through in working in a pairs and in groups. - Critical thinking developed through solving problem.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 **Concept, reading and writing improper fractions in figures and words**

Instructional objectives

Given proper fractions and improper fraction, pupils will be able to discover the difference between the two types of fractions as well as to read and write improper fractions in figures and words fluently, confidently, correctly in required time.

groups.

Materials

Drawings on manila papers, or real things that can be shared.

References

- <https://www.mathsisfun.com/fractions.html>

Class setting/organization

Arrange desks so that pupils can work individually, then in pairs and after in small

Introduction / Review

Correction of homework.

Chant: **Write fractions on flash cards**

Show fractions *from* $\frac{1}{2}$ *to* $\frac{1}{10}$ written on a flash card and pupils chant it altogether, and then ask some pupils one by one to read each fraction loudly.

(E.g. a half, a third, a quarter, a fifth, a sixth, a seventh, an eighth, a ninth, one tenth).

Development

Presentation

Activity 1: Writing fractions

Write the fractions below in a two column table on a manila paper and pupils in pairs observe them and discover the difference between the 2 types of fractions in column **A** and **B** (they first consider fractions which are in the same row.)

A	B
1) $\frac{1}{2}$	a) $\frac{3}{2}$
2) $\frac{3}{4}$	b) $\frac{4}{3}$
3) $\frac{5}{10}$	c) $\frac{5}{5}$
4) $\frac{11}{15}$	d) $\frac{9}{9}$
5) $\frac{23}{40}$	e) $\frac{7}{7}$
6) $\frac{35}{70}$	f) $\frac{25}{20}$
7) $\frac{75}{75}$	g) $\frac{75}{50}$

Answer:

- In column A the numerators are less than the denominators while in Set B the numerators are greater or equal to the denominator.

- Fractions in column A are proper fractions.

- Fractions in column B are called **improper fractions**.

Activity 2: Reading improper fractions

Pupils read the following fractions:

$\frac{3}{2}$: Three-seconds; $\frac{4}{3}$: four- thirds; $\frac{7}{5}$: seven- fifths

Pupils say how they read improper fractions in comparison of how proper fractions are read.

Math Facts!

- An improper fraction is a fraction where the numerator is greater than or equal to the denominator.

Eg, a) $\frac{3}{2}$ (three over two or Three-halves); b) $\frac{4}{4}$ (Four- fourths).

- We read and write improper fractions in figures and words in the same way as we do for proper fractions.

Application

Individually or in pairs, pupils do the following activities:

1) Write the following fractions in words:

a) $\frac{8}{7}$; b) $\frac{9}{5}$; c) $\frac{22}{21}$

2) Group the following fractions into improper fractions and proper fractions. Justify your answer.

a) $\frac{10}{10}$; b) $\frac{27}{28}$; c) $\frac{41}{40}$ d) $\frac{33}{29}$

3) Write the following fractions in figures:

a) Eighteen- fifteenths
b) Fourteen - twelfths

Conclusion

Assessment

1) Write the following fractions in words:

a) $\frac{7}{3}$; b) $\frac{28}{27}$; c) $\frac{33}{33}$; d) $\frac{22}{24}$

2) Write the following in figures:

a) Five-quarters.
b) Sixteen-twelfths.
c) Fifty three-thirty fifths

3) Say whether a given fraction is proper or improper:

a) $\frac{67}{68}$ b) $\frac{103}{35}$

Homework

1) Write the following fractions in words:

a) $\frac{33}{34}$ b) $\frac{13}{11}$

2) Write the following in figures:

a) Seven -sixths

b) Fourteen-eighths

3) In a farm, there are 47 animals: goats and sheep. The number of goats is equal to 32. Find the fraction representing the number of sheep.

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.

Lesson 3

Mixed fractions (concept, recording and writing mixed fractions in figures and words)

Learning objectives	By the end of this lesson pupils will be able to Knowledge: Explain the meaning of the numerator and the denominator in a mixed fraction. Skills: Apply fractions in daily life. Attitude: Develop the spirit of well sharing.
Key words	A mixed fraction/ a mixed number
Cross cutting issues	- Gender balance developed through distributing roles in group works. - Peace education developed in group discussions leading to consensus.
Competences developed	- Communication developed through explaining their answers. - Cooperation developed through working in pairs and in groups. - Critical thinking and problem solving developed through solving problems including fractions and related to real life situations.
Attention to special educational needs.	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Given some fractions, pupils will be able to read and write mixed fractions in figures and words accurately, confidently and in a given time

Class setting/organization

Outside the class, pupils practice on real objects that can be divided into parts.

Materials

Chalks, manila papers on which are drawn whole objects and their pieces.

References

- Tom Roche.1984. Busy at Maths, 35-36
- Houghton Mifflin. 2002. Mathematics, p 342-345

Introduction/Review

Correction of homework.

Chant

Chant with pupils improper fractions with numbers from 3 to 10 as numerators and the denominator is 3.

Development

Presentation

Call 2 pupils to come in front of the class and give them 2 pieces of papers with the same

dimensions.

Step 1: The two pupils A & B fold their papers into 4 equal parts.

Step 2: Pupil A cut his/her paper into 4 equal parts.

Step 3: Pupil A gives to pupil B one part.

Step 4: Pupil B describes the situation: I have one paper and a quarter of a paper.

Step 5: Pupil B counts the number of equal parts folded in the whole paper plus one added part received from his/her colleague.

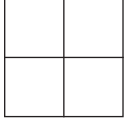
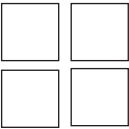
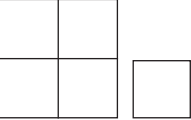
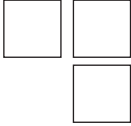
Step 6: The class translates the situation into fractions: 1 paper folded into 4 parts makes 4 equal parts.

$$1 = \frac{4}{4}$$

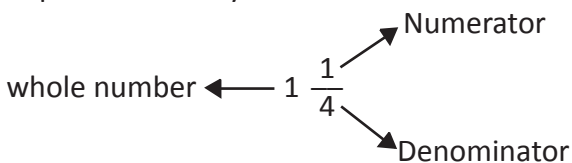
$$1 + \frac{1}{4} = \frac{4}{4} + \frac{1}{4} = \frac{5}{4}$$

Step 7: Pupil A give to pupil B two parts and the class translates that into fraction: $\frac{5}{4} + \frac{2}{4} = \frac{7}{4}$

Continue the process until pupil B has 2 whole.

<p>Pupil A (a boy) folds his paper into 4 equal parts.</p> 	<p>Pupil B (a girl) folds her paper into 4 parts and cut it into 4 equal parts</p> 
<p>Pupil B has one whole paper and one part $1 + \frac{1}{4} = 1 \frac{1}{4}$</p>  $1 + \frac{1}{4} = 1 \frac{1}{4}$	<p>Pupil B give to pupil A one part</p> 

Representation by a fraction.



We have 1 paper and one-fourth of a paper

How do we call that type of fraction? (Answer: a mixed fraction)

What are the names of the different parts of the mixed fraction?

(1: a whole number, 1 above 4: the numerator, 4: the denominator).

One pupil to come and write that fraction in words and pupils read it aloud.

Pupils give their own examples of mixed fractions and some pupils write their fractions on the board in figures and words. The whole class reads these mixed fractions.

Math Facts!

- A mixed fraction or a mixed number is a number which is together with a fraction.
- When reading a mixed fraction we read the number followed by “and” and we read the fraction which is together with that number: Eg: $2\frac{3}{4}$ is read as: two and three fourths or two and three-quarters.

Application

In small groups, pupils do the following:

1) Write the following fractions in words:

a) $2\frac{1}{2}$ b) $5\frac{3}{4}$ c) $2\frac{3}{4}$ d) $12\frac{4}{5}$ e) $25\frac{7}{8}$ f) $33\frac{1}{3}$

2) Write the following fractions in figures:

- Six and a quarter
- Four and three- eighths.
- Twelve and five- sixths.
- Twenty and twenty- twenty fourths.

Conclusion**Assessment**

1) Write the following fractions in words:

a) $4\frac{3}{13}$ b) $1\frac{1}{5}$ c) $2\frac{4}{21}$ d) $20\frac{4}{8}$

2) Write the following fractions in figures:

- Seven and a quarter
- Five and five- eighths.
- Eleven and five sixths.
- Ten and twenty- twenty fourths.

Homework

1) Write the following fractions in words:

a) $5\frac{2}{7}$ b) $7\frac{3}{4}$ c) $15\frac{7}{9}$

2) Write the following fractions in figures:

- Seven and three-quarters
- Five and five- eighths.

Lesson 4

Converting fractions

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the process of converting improper fractions into mixed fractions and vice versa. Skills: <ul style="list-style-type: none"> Convert improper fractions into mixed fractions and vice versa. Attitude an values: <ul style="list-style-type: none"> Develop the spirit of fair shares in real life.
Key words	To convert, a mixed fraction/ a mixed number, improper fraction
Cross cutting issues	<ul style="list-style-type: none"> Gender balance developed through distribution of roles in different groups. Peace education developed through group discussion leading to compromise.
Competences developed	<ul style="list-style-type: none"> Communication in official languages developed through answering questions. Co-operation developed through working in pairs and in groups. Problem solving developed through giving ideas on how different things can be shared.
Attention to special educational needs.	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Converting mixed fractions into improper fractions and improper fractions into mixed fractions.

Instructional Objectives

Given some fractions and real life situations that include fractions, pupils will be able to convert mixed fractions into improper fractions and improper fractions into mixed fractions accurately, confidently in a required time.

Class setting/organization

Indoor: Pupils sit in a way which facilitates them to work in pairs.

Materials

12 sweets, manila papers on which are drawn sweets and how they will be shared.

References

- Houghton Mifflin. 2002. Mathematics, 342-43
- <http://www.webmath.com/convfract.htm>

Introduction

Correction of homework.

Chant

Show flash cards on which are written mixed fractions which have 1 as a whole number and fractions from $\frac{1}{2}$ to $\frac{1}{9}$, and pupils read them individually, in pairs and as the whole class.

Development**Presentation**

Activity 1: At a birth party, there are 12 sweets to be shared equally by 8 children. Find how many sweets will each child eat and represent it by fractions.

In small groups, pupils solve the problem and one pupil solves it on the board.

Answer: *Converting mixed fractions we need to share 12 sweets in 8 equal parts.*

Calculations:

$$12 \div 8 = \frac{12}{8} = 1 \text{ and } 4 \text{ as a remainder}$$

$$\text{This can be written as: } 1 + \frac{4}{8} = 1\frac{4}{8} \text{ in lower terms we write } 1\frac{1}{2}$$

Solution: Each child will get one whole sweet and a half. We write: $1\frac{1}{2}$ and we read: One and a half.

Activity 2: Converting mixed fractions

Convert $3\frac{1}{2}$ into an improper fraction.

Answer:

Step 1: Multiply the whole number (3) by the denominator (2)

Step 2: Add the result with the numerator = $6 + 1 = 7$

Step 3: Write this last result above the denominator:

Conclusion: *to convert $3\frac{1}{2}$ into an improper fraction we multiply the denominator (2) with the whole number (3); we add the numerator(1) and we write the result over the denominator (2)*

$$= \frac{(3 \times 2) + 1}{2} = \frac{7}{2}$$

Math Facts!

a) To convert an improper fraction into a mixed fraction, follow the following steps:

- i) Divide the numerator by the denominator.
- ii) Write the whole number.
- iii) Write the remainder above the denominator.

b) To convert a mixed fraction to an improper fraction, follow these steps:

- i) Multiply the whole number part by the fraction's denominator.
- ii) Add that to the numerator.
- iii) Then write the result on top of the denominator.

Application

In small groups, pupils do the following:

- 1) Convert the following improper fractions into mixed fractions:

a) $\frac{10}{2}$ b) $\frac{15}{6}$

- 2) Convert the following mixed fractions into improper fractions:

a) $2\frac{3}{4}$ b) $5\frac{2}{3}$ c) $7\frac{2}{7}$

- 3) A crate of soda is made of 24 bottles. If you need to buy one crate and a half, show by a mixed fraction what you will buy.

Conclusion

Assessment

1) Convert the following mixed fractions into improper fractions:

a) $3\frac{2}{3}$ b) $5\frac{3}{5}$ c) $7\frac{5}{6}$

2) Convert the following mixed fractions into improper fractions:

a) $\frac{18}{4}$ b) $\frac{29}{3}$ c) $\frac{48}{5}$

3) A volley ball team has 16 players. For every match only 6 players can play at a time.

- Show by a fraction how many teams you can create.
- Which type of fraction do you have?
- Convert the fraction into mixed or improper fraction.

Homework

1) Convert from improper fractions to mixed fractions:

a) $\frac{44}{15}$ b) $\frac{18}{4}$ c) $\frac{13}{9}$

2) Convert from a mixed fraction to an improper fraction:

a) $4\frac{2}{3}$ b) $7\frac{3}{6}$ c) $16\frac{4}{6}$

3) 93 children registered to enter in P1 at Kamashashi Primary school. The school has only two classrooms for P1 and the number of pupils in one classroom is supposed to be 45.

- Show that case by a fraction.
- Which type of fraction do you have?
- Show how you think those children will be distributed into classrooms.
- As all the registered children must find places into the two classrooms give ideas on how the head teacher will distribute them into classes.

Lesson 5

Comparing and ordering fractions with the same denominator

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, comparing and ordering fractions with the same denominator, add and subtract same-denominator fractions, multiply and divide fractions accurately.

Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the process of comparing and ordering fractions with the same denominator. • Apply the rules of comparison of fractions in real life. Skills: <ul style="list-style-type: none"> • Compare two fractions with the same denominator Attitude and values: <ul style="list-style-type: none"> • Demonstrate capacity of distinguishing greater and smaller fractions in real life.
Key words	Greater than, smaller than, the smallest, the greatest
Cross cutting issues	- Gender balance developed through distribution of roles in different groups.
Competences developed	- Communication developed through comparing in using proper terms used in comparing things and through explaining to other pupils how they came up with their answers on the board. - Cooperation developed through group work - Peace education developed through discussion leading to consensus. - Critical thinking developed through comparing or ordering fractions and giving his/her judgment.
Attention to special educational needs.	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Comparing and ordering fractions of same denominator

Instructional objectives

Given two or more fractions with the same denominator, pupils will be able to compare and order fractions of same denominator accurately, confidently and in required time.

Class setting/organization

Organize desks so that all the pupils can see drawings on the board or on manila paper and work in pairs.

Materials

Drawings and divisions practiced on rectangles, squares or circles, on manila papers or on the board.

References

- *Houghton Mifflin. 2002. Mathematics, 338-41*
- *Tom Roche.1984. Busy at Maths, 39-40*

Introduction

Correction of homework.

Math games

Write the following fractions on flash cards. Show each fraction to pupils and they read it and say the corresponding improper fraction.

e.g.,

$$1\frac{1}{4} =$$

$$1\frac{1}{2} =$$

$$1\frac{2}{3} =$$

$$2\frac{1}{6} =$$

Development

Presentation

Activity 1: Comparing proper and improper fractions with the same denominator

In small groups, pupils read the following problem and answer the questions below.

Daniel, Charles and Mike, have three equal gardens for planting vegetables. Each garden is divided into 12 equal strips of land. Last season, Daniel planted 8 strips out of 12; Charles planted 6 strips out of 12, whereas Mike planted 4 strips out of 12.

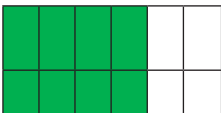
- Draw three gardens and represent the way Daniel, Charles and Mike have divided their gardens into strips.
- Shade the planted parts on each drawing.
- Write the corresponding fractions under the shaded parts.
- Who planted on the greatest part?
- Compare fractions representing the planted parts.

Some group representatives present this on the board.

Answers:

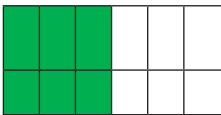
a – c:

Daniel:



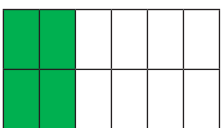
$$\frac{8}{12}$$

Charles



$$\frac{6}{12}$$

Mike



$$\frac{4}{12}$$

d) Daniel has planted on a larger area than Charles and Mike.

Charles has planted on a larger area than Mike, so:

$\frac{4}{12}$ is smaller than $\frac{6}{12}$ because the numerator 4 is smaller than the numerator 6.

$\frac{4}{12}$ is smaller than $\frac{8}{12}$ because the numerator 4 is smaller than the numerator 8.

$\frac{8}{12}$ is greater than $\frac{6}{12}$ because the numerator 8 is greater than the numerator 6.

$\frac{8}{12}$ is greater than $\frac{4}{12}$ because the numerator 8 is greater than the numerator 4.

e) The fractions representing the planted parts can be compared as follows:

$\frac{8}{12}$ is greater than $\frac{6}{12}$ and $\frac{6}{12}$ is greater than $\frac{4}{12}$.

NB: Comparing improper fractions is the same as comparing proper fractions:

eg: $\frac{7}{4}$ and $\frac{5}{4}$

Solution: $\frac{7}{4}$ is greater than $\frac{5}{4}$ because as they have the same denominator, the greater fraction is the one with the greater numerator.

Activity 2: Comparing mixed fractions.

Individually, pupils compare the given mixed fractions and explain their findings.

a) $9\frac{4}{10} \square 8\frac{9}{10}$

b) $5\frac{6}{8} \square 5\frac{7}{8}$

A few pupils present on the board and explain the process they used. (Teacher can guide them by asking: What do we do first? What do we do next?...)

Answers:

$9\frac{4}{10}$ is greater than $8\frac{9}{10}$

$5\frac{6}{8}$ is smaller than $5\frac{7}{8}$

To compare mixed fraction follow the following steps:

a) Compare the whole number parts, eg,

9 is greater than 8

So:

$9\frac{4}{10}$ is greater than $8\frac{9}{10}$

b) If the whole number parts are the same, compare the fraction parts, eg:

$5\frac{6}{8}$ and $5\frac{7}{8}$

In this example we compare $\frac{6}{8}$ and $\frac{7}{8}$

And as the denominators are the same, we compare the numerators, so:

$\frac{6}{8}$ is smaller than $\frac{7}{8}$

The final answer is:

$5\frac{6}{8}$ is smaller than $5\frac{7}{8}$ ($5\frac{6}{8} < 5\frac{7}{8}$)

Activity 3: Ordering fractions with the same denominator

Observe the 3 gardens above and:

- Order the fractions representing the planted parts from the smallest to the greatest.
- Arrange the corresponding fractions from the greatest to the smallest.

Some pupils present on the board.

Answer: a) The fractions representing the planted parts can be arranged (from the smallest to the greatest) as follows:

$\frac{4}{12}$; $\frac{6}{12}$; $\frac{8}{12}$, because as the denominator is the same, the smallest fraction is the one with the smallest numerator.

b) The fractions representing the planted parts can be arranged from the greatest to the smallest as follows: $\frac{8}{12}$; $\frac{6}{12}$; $\frac{4}{12}$.

Math Facts!

To compare proper and improper fractions with the same denominator:

If fractions have the same denominator, the fraction with the greatest numerator is the greatest fraction.

To compare mixed fractions follow the following steps:

- Compare the whole number parts,
- If the whole number parts are the same, compare the fraction parts: the fraction with the greatest numerator is the greatest fraction.

To order fractions with the same denominator

When we order fractions of the same denominator we consider the numerators, and we arrange fractions from the smallest to the greatest or from the greatest to the smallest.

Application

Individually and after in pairs, pupils do the following activities:

1) Compare the following fractions using $<$, $>$ or $=$

a) $\frac{7}{13} \square \frac{7}{13}$

b) $1\frac{3}{4} \square 3\frac{1}{4}$

c) $\frac{23}{9} \square \frac{19}{9}$

2) Compare the following fractions using **greater than**, **smaller than** or **equal to**:

a) $\frac{6}{11}$ and $\frac{8}{11}$ b) $\frac{47}{7}$ and $4\frac{4}{7}$

b) Order from the smallest to the greatest: $\frac{7}{12}$; $\frac{4}{12}$; $\frac{6}{12}$; $\frac{10}{12}$; $\frac{13}{12}$; $\frac{12}{12}$

3) Solve the following problems:

a) One morning Kalisa, Mutoni and Kamali decided to jog from their home to the Lake. Kalisa jogged

$\frac{4}{6}$ of the distance and got tired, Mutoni jogged the whole distance and Kamali jogged $\frac{5}{6}$ of

the distance. List the above children from the one who jogged the longest distance to the one who jogged the lowest distance.

b) Sugira was given $\frac{4}{10}$ of a piece of bread while Kampire was given $\frac{6}{10}$ of it. Who ate a bigger piece of bread?

Conclusion

Assessment

1) Compare using $>$; $=$ or $<$

a) $\frac{3}{4} \square \frac{7}{4}$

b) $2\frac{3}{4} \square 2\frac{1}{4}$

c) $5\frac{6}{3} \square 2\frac{1}{3}$

d) $3\frac{2}{5} \square \frac{17}{5}$

2) Order from the smallest to the greatest and vice versa:

$\frac{7}{9}; \frac{9}{9}; \frac{4}{9}; \frac{2}{9}$

3) Solve the following problem:

Mbaraga runs a distance of 5 kilometers in $2\frac{1}{4}$ hours. Bugingo runs the same distance in

$3\frac{1}{4}$ hours. Who uses a longer time?

Homework

1) Order from the smallest to the greatest:

$\frac{3}{7}; \frac{2}{7}; \frac{6}{7}; \frac{5}{7}$

$\frac{3}{4}; \frac{1}{4}; \frac{4}{4}; \frac{2}{4}$

2) Order from the greatest to the smallest:

$\frac{4}{5}; \frac{2}{5}; \frac{3}{5}$

3) Compare using **greater than**, **smaller than** or **equal to**:

a) $\frac{7}{10}$ and $\frac{70}{70}$ b) $\frac{2}{3}$ and $\frac{3}{3}$ c) $\frac{6}{6}$ and $\frac{6}{6}$

Lesson 6 Addition and subtraction of fractions the same denominator

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the process of adding and subtracting fractions with the same denominator. Skills: <ul style="list-style-type: none"> Add and subtract fractions that have the same denominator. Apply the knowledge of fractions to solve mathematical problems that involving operations of fractions. Attitude: <ul style="list-style-type: none"> Developing personal confidence in carrying out operations on fractions
Key words	See lesson 1, 2 and 3.
Cross cutting issues	<ul style="list-style-type: none"> Peace education developed through discussions leading to consensus in groups of work. Gender balance developed through distribution of roles in different groups.
Competences developed	<ul style="list-style-type: none"> Communication developed through discussions in group as well as explaining to other pupils how they came up with their answers. Co-operation developed through working in pairs and in groups. Critical thinking developed through carrying out operations of addition and subtraction on fractions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Addition and subtraction of fractions of same denominator

Instructional objectives

Given fractions with the same denominators, pupils will be able to carry out operations of addition and subtraction on fractions of same denominator accurately, confidently and in a given time.

Class setting and organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Drawings on manila papers.

References:

- Byamukama J. & Mulisa L. 2010. *New Upper Primary Maths: Pupils Book for Grade 4*, 126
- Houghton Mifflin. 2002. *Mathematics*, 350-361
- https://www.mathsisfun.com/fractions_addition.html
- <http://www.helpwithfractions.com/adding-fractions-same-denominator>

Introduction/Review

Correction of homework.

Development

Presentation

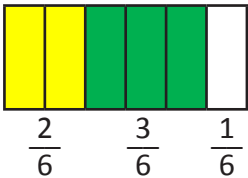
Activity 1: Addition and subtraction of proper fractions

In a drawing lesson, Gasaro drew a rectangle and colored it as follows: $\frac{2}{6}$ in yellow, $\frac{3}{6}$ in green and left $\frac{1}{6}$ non colored.

- Find the colored part of Gasaro's rectangle in fraction.
- What is the fraction of the non-colored part?

In pairs pupils solve the problem and some pupils solve it on the board explaining how they came up with their answer.

Answer



a) i) Calculation

$$\frac{2}{6} + \frac{3}{6} + \frac{1}{6} = \frac{5}{6}$$

ii) Solution

The fraction of the colored part is $\frac{5}{6}$

b) i) Calculation

$$\frac{6}{6} - \frac{5}{6} = \frac{1}{6}$$

ii) Solution

The fraction of the colored part is $\frac{1}{6}$

To add or subtract the above fractions we add or subtract numerators and we write the result above the denominator.

Activity 2: Addition and subtraction of improper fractions

Pupils in small groups work out the following:

$$\begin{array}{ll} \text{a) } \frac{8}{7} + \frac{12}{7} = & \text{b) } \frac{14}{9} - \frac{10}{9} = \\ \frac{8}{7} + \frac{12}{7} = \frac{20}{7} & \text{b) } \frac{14}{9} - \frac{10}{9} = \frac{4}{9} \end{array}$$

Some pupils present on the board.

Pupils conclude that: to add or subtract improper fractions we add or subtract numerators and we write the result above the denominator.

Activity 3: Addition and subtraction of mixed fractions

Pupils work in pairs and solve the following and some pupils present on the board:

a) Addition of mixed fractions

$$1\frac{3}{4} + 1\frac{1}{4} =$$

b) Subtraction of mixed fractions

$$2\frac{5}{7} + 1\frac{4}{7} =$$

Answers:

First method:

$$1) 1\frac{3}{4} + \frac{1}{4} = \frac{7}{4} + \frac{5}{4} = \frac{12}{4}$$

$$2) 2\frac{5}{7} - 1\frac{4}{7} = \frac{19}{7} - \frac{11}{7} = \frac{8}{7}$$

Pupils conclude that: for adding or subtracting the above mixed fractions, we have first changed them into improper fractions.

Second method:

$$1) 1\frac{3}{4} + 1\frac{1}{4} =$$
$$1 + 1 = 2$$
$$\frac{3}{4} + \frac{1}{4} = \frac{4}{4}$$

So

$$1\frac{3}{4} + 1\frac{1}{4} = 2\frac{4}{4}$$

$$2) 2\frac{5}{7} - 1\frac{4}{7} =$$

$$2 - 1 = 1$$

$$\frac{5}{7} - \frac{4}{7} = \frac{1}{7}$$

$$\text{So } 2\frac{5}{7} - 1\frac{4}{7} = 1\frac{1}{7}$$

Pupils conclude that: We can also use the second method for adding or subtracting mixed fractions: we add or subtract whole numbers first and then we add or subtract fractions numbers.

Math Facts!

- Whenever you add or subtract fractions of same denominator, you add or subtract the **numerators** and you keep the same **denominator**.
- For adding or subtracting mixed fractions with the same denominator, there are two ways of doing this: **Method (a)**: Convert the two fractions in an improper fraction first and then do the operations; **Method (b)**: Add or subtract the whole numbers first and then the fractions.

Application

In small groups, pupils do the following:

1) Calculate

$$a) \frac{4}{8} - \frac{2}{8} =$$

$$b) \frac{7}{9} + \frac{1}{9} =$$

$$c) 5\frac{4}{6} + 3\frac{5}{6} =$$

$$d) 4\frac{5}{8} - \frac{3}{8} =$$

2) Solve the following problems:

- If at your school $\frac{3}{5}$ of pupils are girls, find the fraction of boys.
- In the school tests, you got $\frac{60}{100}$ of results. What is the fraction of marks for your answers which were not correct?
- In a relay race, Kalisa run $1\frac{3}{4}$ km and his team mate Kageni run $1\frac{1}{4}$ km. How long was the distance to run (in fraction).
- Bwiza received money to buy school materials. She spent $\frac{2}{7}$ on notebooks and the rest of the amount was spent on other materials. Find the fraction representing the amount spent on other materials.

Conclusion

Assessment

1) Calculate:

a) $\frac{37}{49} + \frac{31}{49} =$

b) $7\frac{1}{8} + 6\frac{3}{8} =$

c) $3\frac{4}{5} + 2\frac{3}{5} =$

2) Solve the following problems:

- In a farm there are 56 cattle (goats, sheep and cows) represented as follows: Goats are $\frac{27}{56}$
Sheep are $\frac{19}{56}$. Find the fraction representing the number of cows.
- A farmer has harvested 1 000kg of beans. He needs to use $\frac{15}{100}$ of the harvest for re-investment, $\frac{20}{100}$ for eating at home, $\frac{40}{100}$ for selling, and the rest will be his reserve. Find out the fraction representing his reserve.

Homework

1) Calculate:

a) $\frac{16}{28} + 4\frac{5}{28} =$

b) $2\frac{7}{30} + 3\frac{3}{30} =$

c) $4\frac{8}{9} - 3\frac{6}{9} =$

2) Solve the following problem:

The population census of some sectors has shown the proportion of women and men in fractions as follows:

Sector	Proportion of women	Proportion of men
1	$\frac{52}{100}$?
2	?	$\frac{47}{100}$
3	$\frac{54}{100}$?
4	$\frac{51}{100}$?
5	?	$\frac{46}{100}$
6	$\frac{50}{100}$?

- a) Fill the table with the right fraction representing either the proportion of men or women in each Sector.
- b) Compare the number of women and men in each sector.

Lesson 7 Multiplication of a fraction by a whole number

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain how to multiply fractions by whole numbers and by fractions Skills: <ul style="list-style-type: none"> Apply the knowledge on fractions to solve mathematical problems that involve operations on fractions. Attitude and values: <ul style="list-style-type: none"> Appreciate the importance of accuracy in carrying out operations on fractions. Develop personal confidence in carrying out operations on fractions
Key words	See lesson 1, 2 and 3.
Cross cutting issues	<ul style="list-style-type: none"> Gender balance developed through distributing roles in group works. Peace education developed in discussions leading to consensus into groups. Financial education developed through activities about budgeting and saving money.
Competences developed	<ul style="list-style-type: none"> Communication developed through discussions as well as explaining on the board how they came up with their answers. Cooperation developed through working in pairs and in groups. Critical thinking and problem solving developed through solving problems including fractions related to real life situations.
Attention to special educational need.	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Multiplication of a fraction by a whole number

Instructional objectives

Given fractions and some real life situations, pupils will be able to multiply proper fractions, improper fractions and mixed fractions by a whole number correctly, confidently and in given time.

Class setting/class organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Flash cards on which are demonstrated operations of multiplication of a fraction by a whole number.

References:

- NCDC. 2008. Mathematics for primary five, 73-75
- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 130

Introduction/Review

Correction of homework.

Mental Math activities

Show exercises involving fractions written on flash cards and pupils give a quick answer mentally:

a) $\frac{2}{4} - \frac{1}{4} =$

b) $\frac{1}{3} + \frac{2}{3} =$

c) $\frac{3}{5} + \frac{2}{5} =$

d) $\frac{3}{7} + \frac{3}{7} =$

e) $\frac{3}{6} - \frac{3}{6} =$

Development**Presentation**

In small groups, pupils solve the following:

Activity 1: Multiplication of a proper fraction and improper fraction by a whole number

A school uses $\frac{1}{12}$ of its annual budget in one month.

- a) Using repeated addition show the fraction representing the budget used by the school in 6 months.
- b) Translate the operation of addition in a) using multiplication.

Answer:

a) $\frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} + \frac{1}{12} = \frac{6}{12}$

In 6 months the school uses $\frac{6}{12}$ of its annual budget.

b) Translating the operation using multiplication = $\frac{1}{12} \times 6 = \frac{1}{12} \times \frac{6}{1} = \frac{1 \times 6}{12} = \frac{6}{12}$

Note: Remember that 6 is the same as $\frac{6}{1}$, so when you multiply $\frac{1}{12} \times \frac{6}{1}$, multiply the numerators and then the denominators.

In 6 months, the school uses $\frac{6}{12}$ of its annual budget.
The annual budget in 12 months

$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$						
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The budget used in 6 months

1 column is equal to the budget used in 1 month.

Activity 2: Multiplication of a mixed fraction by a whole number

In small groups, pupils work out the following exercises:

$$3\frac{1}{4} \times 3 =$$

Some groups representatives present their findings on the board and other groups follow, discuss and confirm the answer.

$$a) 3\frac{1}{4} \times 3 = \frac{13}{4} \times 3 = \frac{13 \times 3}{4} = \frac{39}{4} = 9\frac{3}{4}$$

$$b) 4\frac{2}{3} \times 3 = \frac{14 \times 3}{4} = \frac{42}{4} = 14$$

Teacher facilitates pupils to formulate the rules for Math facts.

Math Facts!

- To multiply a fraction by a whole number, multiply the numerator by the whole number and keep the same denominator.
- To multiply a mixed fraction by a whole number, first convert the mixed fraction into an improper fraction and then follow the steps above.

Application

In groups pupils do the following:

1) Calculate:

$$a) \frac{1}{8} \times 16 =$$

$$b) 2\frac{1}{5} \times 2 =$$

$$c) 3\frac{1}{6} \times 4 =$$

2) Solve the following problem:

a) You spend $1\frac{1}{2}$ hour per day walking to and from school. How many hours do you spend walking to and from school in 5 days?

b) Each of your 4 friends ate $\frac{3}{4}$ of a small packet of groundnuts. How many packets of groundnuts did your friends eat in total?

Conclusion**Assessment**

1) Calculate:

a) $\frac{3}{4} \times 12 =$

b) $\frac{7}{10} \times 10 =$

c) $\frac{17}{14} \times 4 =$

d) $\frac{1}{7} \times 21 =$

e) $3\frac{2}{7} \times 3 =$

f) $2\frac{2}{5} \times 6 =$

2) Solve the following problem:

A cyclist rides $10\frac{1}{2}$ km an hour. How many kilometers can he/ she ride in 8 hours?

Homework

1) Calculate:

a) $\frac{4}{8} \times 6 =$

b) $\frac{15}{7} \times 8 =$

c) $\frac{21}{17} \times 7 =$

d) $\frac{24}{7} \times 21 =$

e) $4\frac{2}{5} \times 7 =$

f) $3\frac{2}{6} \times 4 =$

2) Solve the following problems:

a) In one day a worker can complete $\frac{2}{12}$ of his/her work. Find out the work that he/she can complete in 5 days.

b) An employee who gets a monthly salary of 30 000Frw spends his/her money as follows: $\frac{3}{10}$ for his/her children school fees; $\frac{5}{10}$ for family needs; $\frac{2}{10}$ for saving. Find out the amount that he/she spends on each of the above needs.

Lesson 8

Multiplication of a fraction by a fraction

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain how to multiply fractions by fractions. • Explain the process of solving problems involving multiplication of fractions Skills: <ul style="list-style-type: none"> • Apply the knowledge of multiplication of fractions by fractions to solve mathematical problems that involving operations of fractions. Attitude and values: <ul style="list-style-type: none"> • Demonstrate accuracy and confidence in matter of shares.
Cross cutting issues	<ul style="list-style-type: none"> - Gender balance developed through distributing roles in group works. - Peace education developed through discussions leading to consensus into groups.
Competences developed	<ul style="list-style-type: none"> - Communication developed through explaining on board how they came up with their answers. - Cooperation in working in pairs and in groups. - Critical thinking and problem solving in solving problems including fractions related to real life situations.
Attention to special educational needs.	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Multiplication of a fraction by a fraction

Instructional objectives

Given fractions, pupils will be able to multiply a fraction by a fraction correctly and in required time.

Class setting/class organisation

Arrange desks so that pupils can work in pairs and be able to follow on board.

Materials

Manila papers on which are carried out operations of multiplication of fractions by fractions with arrows showing different steps.

References:

- NCDC Rwanda. 2008. Mathematics. Pupils books Primary Five, 51-53
- Byamukama J.& Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 132-133.

Introduction/Review

Mental math game:

Show a fraction written on a flash card and pupils multiply it by 3 mentally. You can use the following fractions:

$$\frac{1}{2}; \frac{2}{5}; \frac{1}{4}; \frac{3}{5}; \frac{4}{8}; \frac{5}{12}$$

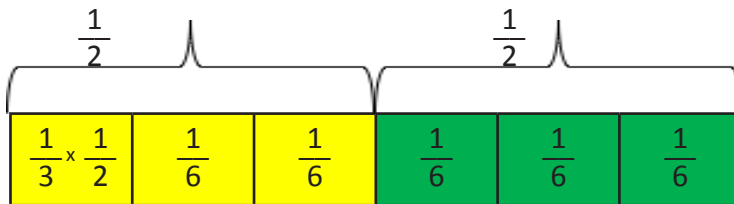
Development**Presentation****Activity 1: Multiplying a proper fraction by a fraction**

a) In pairs pupils solve the following:

Some pupils present the answer on the board explaining how they did it (teacher helps where necessary).

1) a) $\frac{1}{3} \times \frac{1}{2} =$

Demonstration:



Answer: $\frac{1}{3} \times \frac{1}{2} = \frac{1 \times 1}{2 \times 3} = \frac{1}{6}$

Activity 2: Multiplying an improper fraction by a fraction.

In small groups, pupils solve the following:

$$2\frac{4}{5} \times \frac{3}{6} =$$

One pupil present on the board.

Answers:

$$2\frac{4}{5} \times \frac{3}{6} = \frac{(2 \times 5) + 4}{5} \times \frac{3}{6} = \frac{14 \times 3}{5 \times 6} = \frac{42}{30} = \frac{21}{15} = 1\frac{6}{15} = 1\frac{2}{5}$$

Activity 3: Multiplying a fraction by a fraction.

In small groups, pupils solve the following:

- a) A worker has agreed to cultivate $\frac{14}{18}$ of a field. After cultivating $\frac{3}{4}$ of the agreed fraction, he fell sick and stopped his work. Find the fraction of the cultivated area in comparison with the whole field that he had to cultivate.

Answer

a) Calculation:

$$\frac{3}{4} \times \frac{14}{18} = \frac{42}{72} = \frac{14}{24}$$

Answer: The fraction of the dug area is $\frac{14}{24}$

Some groups representatives present on the board.

Activity 4: Multiplying a fraction by a fraction.

Pupils produce their own exercises and solve them. Some pupils present on the board.

Facilitate the pupils to draw conclusions about how to multiply a fraction by a fraction.

Math Facts!

The multiplication of a proper and an improper fractions by a fraction:

There are two simple steps to multiply proper and improper fractions by a fraction:

- i) Multiply numerators.
- ii) Multiply denominators.

The multiplication of a mixed fraction by a fraction

There are three steps to multiply mixed fractions by a fraction.

- i) Convert the mixed fraction into improper fractions.
- ii) Multiply numerators.
- iii) Multiply denominators.

Application

In small groups, pupils do the following:

1) Calculate:

a) $\frac{8}{18} \times \frac{18}{8} =$

b) $4\frac{3}{5} \times \frac{7}{8} =$

c) $\frac{6}{35} \times \frac{20}{21} =$

- 4) Mukarukundo had walked $\frac{1}{2}$ of the way from home to school when she remembered that she had forgotten her notebook and returned home to take it. The distance from her home to school is $\frac{8}{10}$ a kilometre. What fraction of a kilometre had she walked when she turned back home?

Conclusion

Assessment

Calculate:

1) $6\frac{3}{4} \times 1\frac{2}{5} =$

2) $\frac{9}{10} \times \frac{25}{33} =$

3) $\frac{3}{4} \times 2\frac{1}{14} =$

Homework

Calculate:

1) $\frac{7}{12} \times \frac{8}{21} =$

2) $4\frac{2}{6} \times \frac{3}{7} =$

3) $2\frac{3}{4} \times 3\frac{3}{4} =$

- 4) You have $\frac{2}{4}$ of a sugar cane. You want to give $\frac{1}{3}$ of it to your friend. How much of the whole sugar cane will you give to your friend?
- 5) In my class there are 36 pupils. $\frac{3}{4}$ of the whole class went for sports activities. $\frac{2}{3}$ of the pupils who went out for sports played basket ball.
- Find the fraction of the class who played basket ball.
 - What is the number of pupils who went for sports?
 - What is the number of pupils who played basket ball?

Lesson 9 Division of a fraction by a whole number

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Learning objectives	<p>By the end of the lesson, pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain how to divide fractions by whole numbers. • Explain the process of solving problems involving division of a fraction by a whole number. <p>Skills:</p> <ul style="list-style-type: none"> • Apply the knowledge of division of fractions by whole numbers to solve mathematical problems that involving operations on fractions. <p>Attitude and values:</p> <ul style="list-style-type: none"> • Demonstrate accuracy and confidence in matters of sharing.
Key words	See lesson 1, 2 and 3
Cross cutting issues	<ul style="list-style-type: none"> - Gender balance developed through distributing roles in group work. - Peace education developed in discussions leading to consensus into groups.
Competences developed	<ul style="list-style-type: none"> - Communication developed through discussions in group work as well as explaining on the board how they came up with their answers. - Cooperation developed through working in pairs and in groups. - Critical thinking and problem solving developed through solving problems including fractions related to real life situations.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Given activities on division of fractions by a whole number, pupils will be able to divide a fraction by a whole number correctly, confidently and in required time.

Class setting/class organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Drawings of rectangles, squares, divided into parts.

References

- Mwuengeri E et al. 2008. *Mathematics. Pupils books Primary Five*, 53.
- <https://www.mathsisfun.com/numbers/fractions-division-whole>.

Introduction/Review

Correction of homework.

Mental Math activities:

Show a fraction written on a flash card, and pupils, one by one, read it and multiply it by 4 mentally.

You can use the following fractions: $\frac{2}{3}$; $\frac{3}{4}$; $\frac{1}{4}$; $\frac{4}{5}$; $\frac{6}{9}$; $\frac{3}{12}$;

Development

Presentation

Activity 1: Division of a fraction by a whole number

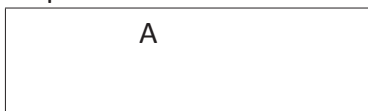
In small groups pupils solve the following:

1) $\frac{1}{2} \div 2 =$

Some pupils solve it on the board:

Demonstration: $\frac{1}{2} \div 2 =$

Step1: Take a whole



Step2: Divide it into two equal parts



Pupils express each of the parts using a fraction:

$\frac{1}{2}$ $\frac{1}{2}$

Step 3: Divide each small part into 2 small parts: each part is $\frac{1}{4}$ of the whole.



Answers:

$\frac{1}{2} \div 2 = \frac{1}{2 \times 2} = \frac{1}{4}$

How to demonstrate this:

Take a whole; divide it into 2 equal parts: each part is equal to $\frac{1}{2}$.

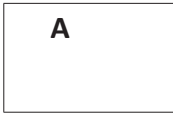
To divide $\frac{1}{2}$ by 2; we divide each of the 2 equal parts into two small equal parts.

If we count the number of small parts divided in the whole, we find that they are 4; which is the denominator of the new fraction.

So each small part is equal to $\frac{1}{4}$.

Activity 2: Using drawings on the board, demonstrate how to work out the following: $\frac{2}{3} \div 4$

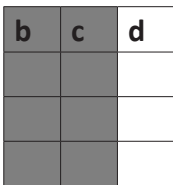
Step 1: take a whole paper



Step 2: The whole paper is divided into 3 parts and the shaded part represent $\frac{2}{3}$



Step 3: The parts b and c are divided into 4 equal parts.



The whole paper is divided now into 12 equal parts.

$$\text{Then, } \frac{2}{3} \div 4 = \frac{2}{3 \times 4} = \frac{2}{12}$$

Activity 3: Division of a fraction by a whole number

$$4 \frac{4}{5} \div 4 = \frac{(4 \times 5) + 4}{5} \div 4 = \frac{24}{5} \div 4 = \frac{24}{5 \times 4} = \frac{24}{20}$$

Pupils to draw conclusions that on how to divide a fraction by a whole number.

Math Facts!

To divide proper and improper fraction by a whole number:

- Multiply the denominator by the whole number and keep the numerator.
- If you have a mixed fraction, convert the mixed fraction into an improper fraction and then apply the rule.

Application

In small groups, pupils do the following:

1) Calculate:

a) $1 \frac{2}{4} \div 3$

b) $\frac{7}{8} \div 7$

c) $\frac{14}{17} \div 2$

2) Solve the following problems:

- a) Mugeni finishes $\frac{1}{5}$ of her weekly plan in 9 hours. Show by a fraction the activities of the weekly plan that she can accomplish in 1 hour.
- b) In a relay race that covers $1\frac{1}{2}$ km, each of three runners runs the same distance.
- i) Determine the fraction representing the distance covered by each athlete.
- ii) Express in km the distance covered by each of the 3 runners.

Conclusion

Assessment

1) Calculate:

- a) $\frac{8}{10} \div 4 =$ b) $\frac{24}{7} \div 9 =$ c) $\frac{8}{12} \div 6 =$ d) $\frac{9}{15} \div 3 =$ e) $2\frac{4}{14} \div 6 =$

2) Solve the following problem:

Four workers have to cultivate $\frac{7}{8}$ of a field. Find the fraction representing the field that each worker has to cultivate.

Homework

Solve the following:

- 1) $\frac{22}{6} \div 10 =$ 2) $\frac{13}{19} \div 3 =$ 3) $\frac{19}{10} \div 2 =$ 4) $3\frac{5}{8} \div 5 =$

b) Three carpenters are going to repair $\frac{5}{8}$ of pupils desks. Those carpenters have to repair the same number of desks. Find the fraction representing the number of desks that will be repaired by each carpenter.

Lesson 10

Division of a fraction by a fraction

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key Unit competence	Be able to explain the meaning of fractions, add and subtract same denominator fractions, multiply and divide fractions accurately.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain how to divide fractions by a fraction. • Explain the process of solving problems involving division of a fraction by a fraction. Skills: <ul style="list-style-type: none"> • Apply the knowledge of division of a fraction by a fraction to solve mathematical problems that involving operations on fractions. Attitude and values: <ul style="list-style-type: none"> • Demonstrate accuracy and confidence in matters of sharing.
Key words	See lesson 1, 2 and 3.
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussions leading to consensus. - Gender balance developed through distribution of roles into groups.

Competences developed	<ul style="list-style-type: none"> - Communication developed through group discussions as well as explaining to other pupils how they came up with their answers on the board. - Cooperation developed through working in pairs and in groups. - Critical thinking developed through solving different problems involving fractions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1**Division of fractions by fractions****Instructional objectives**

Given fractions, pupils will be able to divide a fraction by a fraction correctly, confidently and in given time.

Materials

Drawings on manila papers demonstrating how to divide a fraction by a fraction.

Class setting/organization

Arrange desks so that pupils can work individually, then in pairs and after in small groups.

References:

- Mwumvaneza E. et al.. 2008. Mathematics: Teacher Guide, Primary Four, 55-56.
- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 133-134

Introduction/Review

Correction of homework.

Mental Math activities:

Show a fraction written on a flash card, and pupils, one by one, read it and divide it by 3 mentally,

e.g, say $\frac{3}{4} \div 3$ and pupils answer: $\frac{3}{12}$

Development**Presentation****Activity 1: Division of a fraction by a fraction**

Pupils in pairs solve the following in their notebooks and some pupils solve the exercises on the board:

a) $\frac{1}{2} \div \frac{1}{3} =$

b) $5\frac{3}{4} \div \frac{5}{6} =$

Answer:

a) $\frac{1}{2} \div \frac{1}{3} = \frac{1 \times 3}{2 \times 1} = \frac{3}{2}$

b) $5\frac{3}{4} \div \frac{5}{6} = \frac{23}{4} \div \frac{5}{6} = \frac{23}{4} \times \frac{6}{5} = \frac{23 \times 6}{4 \times 5} = \frac{138}{20} = 6\frac{18}{20}$

Pupils conclude that: for multiplying the first fraction by another fraction, we have multiplied the first fraction by the inverse of the second fraction. To have the inverse of a fraction, we change its numerator into denominator and its denominator into the numerator.

Math Facts!

To divide a fraction by another fraction:

Multiply the first fraction with the inverse of the second fraction (the divisor).

In the case of mixed fractions: Convert the mixed fraction into an improper fraction and then follow the process above.

Application

Individually then in pairs and after into small groups, pupils work out the following:

a) $\frac{7}{12} \div \frac{2}{3} =$ b) $\frac{10}{4} \div \frac{5}{9} =$ c) $4 \frac{5}{6} \div 3 \frac{3}{8} =$

Conclusion

Assessment

Individually, pupils work out the following:

a) $\frac{8}{13} \div \frac{3}{4} =$ b) $4 \frac{2}{8} \div \frac{7}{8} =$ c) $3 \frac{7}{12} \div 4 \frac{6}{10} =$

Homework

Calculate:

a) $\frac{9}{14} \div \frac{8}{7} =$ b) $\frac{6}{10} \div \frac{6}{16} =$ c) $3 \frac{6}{28} \div 5 \frac{8}{10} =$

Lesson 13 Assessment of the unit

Topic area	Numbers and operations
Unit 4	Fractions of the same denominator
Key unit competence	Be able to explain the meaning of fractions, add and subtract same-denominator fractions, multiply and divide fractions accurately.
Assessment criteria	Given fractions with the same denominator, pupils are able to: <ul style="list-style-type: none">• Compare, add and subtract fractions with the same denominator correctly and in a given time.• To multiply and divide same-denominator fractions accurately and in given time.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Assessment questions

20 marks

Question 1)

Write the following fractions in words:

a) $\frac{22}{7}$

b) $8 \frac{7}{9}$

Question 2)

Write the following in figures:

- a) Eleven fifteenths
- b) Twenty two and twenty thirds.

Question 3)

Compare using **smaller than, greater than** or **equal to**:

a) $\frac{17}{19}$ and $\frac{17}{19}$

b) $\frac{22}{22}$ and $\frac{21}{22}$

c) Order the following from the greatest to the smallest:

$$\frac{13}{16}, \frac{17}{16}, \frac{10}{16}, \frac{24}{16}, \frac{16}{16}$$

Question 4)

Calculate:

a) $4\frac{3}{8} - 2\frac{7}{8} =$

b) $\frac{450}{90} \div 5 =$

c) $\frac{27}{28} \div \frac{7}{16} =$

Question 5)

Solve the following problems:

- a) Seven teachers contributed money to start a farming cooperative. The first one gave $\frac{2}{10}$ of the needed amount, the second contributed with $\frac{3}{10}$, the third contributed with $\frac{1}{10}$. The remaining contribution was given by 4 other teachers.
 - i) Find the fraction representing the contribution of 3 first teachers
 - ii) Find the fraction representing the contribution of one of the 4 remaining teachers if they all contributed equally.
- b) A worker has built $\frac{3}{5}$ of a wall in 3 days. If he does the same amount of work every day, find the fraction representing the work that he does in one day.
- c) Nkubito will spend $\frac{2}{5}$ of his time on Saturday playing in 2 volley ball matches. Find the fraction of time he/she will spend playing in each match?

Unit 5: Decimal numbers

Unit at glance

Topic area: Fraction, decimals and proportional reasoning.

Key competence: Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places.

Lesson 1: Concept and place value of decimal numbers	Period 1 Concept of decimal numbers	Period 2 Converting decimal fractions into decimal numbers and place value of decimal numbers (up to 2 decimals place)	Period 3 Exercises on decimal fractions and place value of decimal numbers up to 2 decimal places)
Lesson 2: Reading and writing decimal numbers	Period 1 Reading and writing decimal numbers (up to 2 decimal places) in figures using place value	Period 2 Exercises on reading and writing decimal numbers (up to 2 decimal places) in figures and in words using place value	
Lesson 3: Comparing and ordering decimal numbers	Period 1 Compare and ordering decimal numbers (up to 2 decimal places)	Period 2 Exercises on comparing and ordering decimal numbers (up to 2 decimal places) and its application to daily life	
Lesson 4: Addition of decimal numbers	Period 1 Addition of decimal numbers (up to 2 decimal places) with and without carrying and its application to daily life	Period 2 Exercises and problems on addition of decimal numbers (up to 2 decimal places) with and without carrying	
Lesson 5: Subtraction of decimal numbers	Period 1 Subtraction of decimal numbers (up to 2 decimal places) with and without borrowing and its application to daily life	Period 2 Problems on subtraction of decimal numbers (up to 2 decimal places) with and without borrowing	
Lesson 6: Problems involving addition and subtraction of decimal numbers (up to 2 decimal places) with and without borrowing and its application to daily life			
Lesson 7: Revision of the unit			
Lesson 8: Assessment of the unit	Period 1 Assessment	Period 2 Feedback and remediation	

Unit warm - ups and games

Which decimal comes before or after?

Show a flash card on which a decimal number is written for a short time. And pupils say, one by one, the decimal number which comes before or after that decimal number.

N.B: Continue the game with different flash cards and involve many pupils to make the game competitive and interesting.

You may use pupils after demonstration. (Instead of teacher, one pupil may come and show others those decimal numbers).

Unit Lessons

Lesson 1

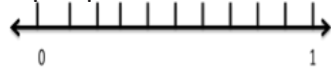
Concept and place value of decimal numbers

Topic area	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key Unit competence	Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the concept of decimal numbers using place values up to 2 decimal places. Identify the place values in written decimals. Skills: <ul style="list-style-type: none"> Correctly translate between written decimals and spoken English Convert fractions into decimals. Attitude: <ul style="list-style-type: none"> Develop personal confidence in the use of decimal numbers.
Key words	Decimal, decimal point, tenths place, hundredths place.
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning tasks in group activities and presentations. Peace and values education developed through discussions in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> -Communication developed through discussing and answering activities -Cooperation developed through working in pairs and in groups. - Critical thinking developed through representing decimals on a number line. -Research and problem solving developed though being resourceful in finding answers to questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives	Using a number line pupils will be able to place a decimal number (up to two place value) on a number line confidently, correctly and in required time.		
Class setting / organization	Indoor: Arrange desks so that pupils can work individually, in pairs and in small groups.		
Materials	Manila paper on which number line graduated from 0 to 10 is written.		
References	<ul style="list-style-type: none"> – Tom Roche.1984. Busy at Maths, P 48. – www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015 		
Steps / Timing	Teachers' activities	Pupils' activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	<p>1) Write the review exercises on the board.</p> <p>2) Facilitate playing games</p> <p>Which fraction comes before or after?</p> <p>Say a fraction, eg, $\frac{5}{10}$</p>	<p>1) Pupils work out the following exercises: Order the following fractions in ascending and descending order: $\frac{1}{10}, \frac{5}{10}, \frac{7}{10}, \frac{9}{10}, \frac{8}{10}$.</p> <p>2) Pupils play the game: Which fraction comes before or after?</p> <p>Say the fraction of the same denominator which comes before or after the fraction said by the teacher.</p>	Communication developed through playing the games.
Development (25 min)	<p>Presentation</p> <p>Activity 1: Concept of decimals through zoom in activity.</p> <p>Show to pupils a number line written on manila paper on the board and ask them related questions.</p>	<p>Activity 1:</p> <p>In pairs pupils discuss:</p> <p>a) What is exactly halfway between 0 and 10? (<i>Half way between 0 and 10 there is 5</i>)</p> <p>b) What is exactly halfway between 0 and 1? (<i>half way between 0 and 1 there is $\frac{1}{2}$ or 0.5</i>)</p> <p>One pupils presents on the board.</p>	<ul style="list-style-type: none"> - Communication developed through discussing and answering activities - Cooperation developed through working in pairs.

Activity 2: Concept of decimals

Draw a number line and divide the distance between 0 and 1 into 10 equal parts.



Facilitate pupils to discover that between 0 and 1 there are other numbers

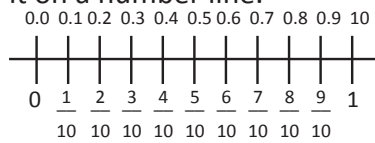
Activity 2:

Pupils observe the number line and count the small parts between 0 and 1. Write individually what fraction each small part is representing and say it.

(between 0 and 1 there are 10 equal parts, each part is $\frac{1}{10}$;

The first part is $\frac{1}{10}$, the second part is $\frac{2}{10}$ the third part is $\frac{3}{10}$... the ninth part is $\frac{9}{10}$)

Pupils in pairs discuss other ways that each fraction can be written as and represent it on a number line.



$$0.1 = \frac{1}{10}$$

$$0.2 = \frac{2}{10}$$

$$0.3 = \frac{3}{10}$$

$$0.4 = \frac{4}{10}$$

$$0.5 = \frac{5}{10}$$

$$0.6 = \frac{6}{10}$$

$$0.7 = \frac{7}{10}$$

$$0.8 = \frac{8}{10}$$

$$0.9 = \frac{9}{10}$$

Pupils find out that:

- a) The number between 0 and 1 are: 0.1; 0.2; 0.3; 0.4; 0.5; 0.6; 0.7; 0.8; 0.9.

- Critical thinking developed through representing decimals on number line.

Activity 3: Concept of decimals

Draw a number line and divide the distance between 0 and 1 into 10 equal parts.



Draw a second number line and divide the distance between 0 and 0.1 into 10 equal parts.



Facilitate pupils to establish a relationship between

$$\frac{1}{100} = 0.01$$

- b) All of these numbers are less than 1 and greater than 0.
- c) All of these numbers are written using 2 digits and between the two digits there is a point.
- d) A number written with a point between its digits is called a decimal number.

Activity 3:

- a) Pupils observe the 2 numbers lines and compare them
- b) Pupils count the number of equal parts between 0 and 0.1, and say the number of the same size parts that are between 0 and 1.
- c) Which fraction represents each small part?

Pupils find out that:

- The number of the same size parts that are between 0 and 1 are equal to 100

-One part represents $\frac{1}{100}$ which can be written as 0.01

$$0.01 = \frac{1}{100}$$

$$0.02 = \frac{2}{100}$$

$$0.03 = \frac{3}{100}$$

$$0.04 = \frac{4}{100}$$

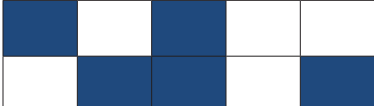
$$0.05 = \frac{5}{100}$$

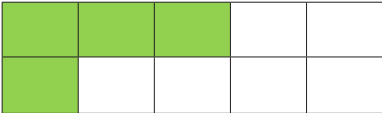
$$0.06 = \frac{6}{100}$$

$$0.07 = \frac{7}{100}$$

$$0.08 = \frac{8}{100}$$

$$0.09 = \frac{9}{100}$$

	<p>Application Facilitate pupils to do activities and guide them on how to do them if necessary.</p>	<p>1) a) In pairs pupils represent on number line decimal numbers which are equivalent to:</p> $\frac{11}{10}; \frac{12}{10}; \frac{13}{10}; \frac{14}{10}; \frac{15}{10}; \frac{16}{10};$ $\frac{17}{10}; \frac{18}{10}; \frac{19}{10}.$ <p>On the same number line locate the following numbers.</p> <p>1.21; 1.31; 1.75; 1.98</p> <p>2) Write the fraction represented by the following shaded part and then write the corresponding decimal number</p>  <p>Pupils present their answers on the board.</p>	<p>-Communication developed through discussing and answering activities.</p> <p>-Cooperation developed through working in pairs.</p> <p>- Critical thinking developed through representing decimals on a number line.</p>
<p>Conclusion (10 min)</p>	<p>Assessment</p> <p>Write activities on the board.</p>	<p>Assessment</p> <p>Individually pupils do the following:</p> <ol style="list-style-type: none"> 1) Represent the decimal numbers between 3 and 4 on a number line. 2) Write 2 decimal numbers on your choice between 11.1 and 11.2 (one digit after a point) then represent them on a number line 3) Fill in the blank spaces. 0.11, 0.12, 0.13, ..., ..., 0.16 	<p>- Critical thinking developed through representing decimals on number line</p>

		<p>Homework</p> <p>1) Write the fraction represented by the following shaded part and then write the corresponding decimal number:</p>  <p>2) Represent the decimal numbers between 5.1 and 5.9 (one number after a point) on a number line.</p>	
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Period 2 **Converting decimal fractions into decimal numbers and place value of decimal numbers (up to 2 decimals places)**

Instructional objectives:

- Using division pupil will be able to convert fractions into decimal number (up to 2 place values) correctly, confidently and accurately in a required time.
- Using place value table pupils will be able to identify the place value of each digit in a given decimal (up to 2 place value) correctly, confidently and accurately and in a required time.

Materials

Manila paper on which a place value table is written.

Class setting/organization: indoor

Arrange desks so that pupils can work individually, in pairs and in small groups.

References

- Tom Roche.1984. Busy at Maths, P 49
- Byamukama J.al. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.63-64
- www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015

Introduction/Review

Correction of homework.

Games:

Which decimal comes before or after?

Chant decimals from 0.1 to 0.9 forward and backward.

Development

Presentation

Activity 1: Converting decimals numbers

Pupils, individually, work out the following:

During the first Mathematics test marked on 10, Mukamwiza gets $\frac{9}{10}$; while in the second marked on 100 she gets $\frac{85}{100}$. Express each mark into decimals.

Answers:

- Using division $9 \div 10 = 0.9$ and $85 \div 100 = 0.85$

- Using counting zeros in the denominator and move the decimal point in the numerator (from the right to the left) considering the number of zeros in the denominator. eg. $\frac{9}{10} = 0.9$, $\frac{85}{100} = 0.85$

Activity 2: Converting fractions into decimals

Convert the following fraction into a decimal.

$$4\frac{32}{100} =$$

Answer:

First convert the mixed fraction into improper fraction: $4\frac{32}{100} = 4\frac{(4 \times 100) + 32}{100} = \frac{400 + 32}{100} = \frac{432}{100}$

Convert $\frac{432}{100}$ into a decimal by dividing the numerator by the denominator $432 \div 100 = 4.32$

Activity 3: Representing decimals in a place value table

In 2013 - 2014 performance contract evaluations (Imihigo), district A was the first and had 76.15 and district B was the last with 70.7.

- Represent their marks in a place value table.
- Observe the decimal numbers and write the number of digits after the point.

Answer:

a)

Tens	Ones		Tenths	Hundredths
7	6	.	1	5
7	0	.	7	

- The number of digits after the point are two in 76.15 while in 70.7 there is one digit after the point

Math Facts!

- When converting a fraction into a decimal, you count the 0's in the denominator (only when the denominator is 10, 100, 1 000,...) and then counting from the right to left, then move the decimal point in the numerator considering the number of zeros in the denominator. So for example, $\frac{1}{10}$ has one zero. Move the point counting from the right of one to the left, making it 0.1.
- When converting a mixed decimal fraction (a fraction with a denominator which is a power of 10) into a decimal number you first convert the mixed fraction into an improper fraction and then you apply the rule above (or you divide).
- The place value of the whole part in decimal numbers is the same as the place value of whole numbers (ones, tens, hundreds...). One place value after a point is called tenths; two place values after a point are called hundredths, etc.
- A decimal number which has 1 digit after the point is called one place value decimal while a decimal number which has 2 digits after the point is called two place value decimal.

Note:

- The tens and hundreds which come after a point are expressed as ordinal numbers.
- 0's on the extreme right of a decimal number do not change its value. e.g, $1.0 = 1$; $1.50 = 1.5$

Application:

In small groups, pupils do the following:

- Write the following fractions in decimal form:

a) $\frac{2}{100} =$
 b) $\frac{11}{100} =$

- 2) Represent the following numbers in a table of place value:
 a) 0.45
 b) 4.03
- 3) Write the place value of the underlined digits in the following numbers as in the example given:
1.07: 1 is in the place value of ones 7 in the place value of hundredths.
 a) 2.09
 b) 5.25
- 4) In a store, 50 out of 100 kg are beans.
 a) Write the fraction that represents the kg of beans.
 b) Convert that fraction into a decimal number.
 Some groups present on the board.

Conclusion

Assessment

Individually pupils do the following:

- 1) Write in decimal form:

a) $\frac{8}{100} =$
 b) $\frac{24}{100} =$

- 2) Represent the following numbers in a place value table:
 a) 2.76
 b) 8.03
- 3) During the election of local leaders in district D, among 100 leaders who were elected, 59 are women.
 a) Which fraction represents women?
 b) Convert the fraction into decimals.

Homework

- 1) Represent the following numbers in a table of place value:
 a) 0.54
 b) 8.02
- 2) Write the place value of the underlined digits:
 a) 45.27
 b) 13.4
- 3) In 10kg of flour bought by Mutima, 4kg are sorghum.
 a) Write the fraction representing sorghum flour.
 b) Convert the fraction into decimals.

Lesson 2 Reading and writing decimal numbers

Topic area	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key Unit competence	Add, subtract and compare decimal numbers using place value of decimals up to 2 decimal places

Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Correctly read and write decimal numbers in figures and in words. Skills: <ul style="list-style-type: none"> • Correctly translate between written decimals and spoken English. Attitude: <ul style="list-style-type: none"> • Develop personal confidence in the use of decimal numbers.
Key words	Decimal point (and)
Cross cutting issues	<ul style="list-style-type: none"> – Gender enhanced through assigning tasks in group activities and presentations. – Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> – Communication developed through presentations, reading, writing decimals. – Cooperation developed through working in group. – Critical thinking developed through writing decimals. – Research and problem solving developed through being resourceful in finding answers to questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1**Reading and writing decimals numbers****Instructional objectives:**

Using place value table, pupils will be able to read and write decimal numbers correctly, confidently and in required time.

Class setting/organization

Indoor: Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Place value table on manila paper

References:

- Tom Roche 1978 Figure it out, P. 36-37
- Tom Roche.1984. Busy at Maths, P 78-79
- Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.65-66
- www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015

Introduction/Review**Review**

Correction of homework

Games: Which decimal comes before or after?

Chant decimals from 0.1 to 0.9 forward and backward.

Development**Presentation**

Pupils in pairs/small groups work out the following activities:

Activity 1: Reading and writing decimal numbers

In a Math test, students are given marks in percentage as follows:

- Murekatete: 82.4
- Nkurunziza: 71.05
- Manzi: 71.5
- Mwiza: 59.15

One pupil present on the board.

- a) Represent their marks in a place value table.
 b) Read and write their marks in words.

Answers:

a)

Tens	Ones	and	Tenths	Hundredths
8	2	.	4	
7	1	.	0	5
7	1	.	5	
5	9	.	1	5

- b) In words: Murekatete: 82.4 which is written as eighty two and four tenths.
 Nkurunziza: 71.05 which is written as seventy one and five hundredths.
 Manzi: 71.5 which is written as seventy one and five tenths.
 Mwiza: 59.15 which is written as fifty nine and fifteen hundredths.

Activity 2: Reading and writing decimals

The table below is showing heights in cm of some students in a P4 class.

Students	Heights in cm
Karake	1.35
Gasana	1.31
Mujawamariya	1.40
Mukamwiza	1.45

Observe the heights of these students and using place value table write and read them in words. Some pupils present on the board.

Answer:

Ones	and	Tenths	Hundredths
1	.	3	5
1	.	3	1
1	.	4	0
1	.	4	5

Karake's height is one and thirty five hundredths
 Gasana's height is one and thirty one hundredths
 Mujawamariya's height is one and forty hundredths
 Mukamwiza's height is one and forty five hundredths

Activity 3: Writing decimals in words

Write in word: 0.6

One pupil present on the board.

Answer

0.6 is read and written as six tenths.

Activity 4: Writing decimals in figures

Write the following decimals in figures:

- a) Eight tenths
 b) Seventeen and four hundredths

One pupil present on the board.

Answer:

- a) Eight tenths is written as $\frac{8}{10}$
 b) Seventeen and four hundredths is written $\frac{17}{400}$

Math Facts!

When you read numbers with decimals, you:

- First, read the digits to the left of the decimal point as a whole number.
- Say / read “and” for the decimal point.
- Read the digits to the right of the decimal point as a whole number and say the place value name of the last digit.

When writing a decimal number in words, write the decimal part as if it were a whole number, followed by “and ” then name the place value of the last digit.

Note: when a decimal number has zero in the whole number place value we do not read or write it, we only read and write the decimal digits as a fraction:

eg, 0.34 is read and written as thirty four hundredths.

Application

- 1) Pupils read the following decimal numbers individually and then, one or two pupils read them aloud, finally the whole class read them aloud.
 - a) 1.01 =
 - b) 0.12 =
 - c) 3.50 =
- 2) In small groups, pupils represent the following numbers in a place value table and write them in words.
 - a) 1.01
 - b) 0.12 =
 - c) 3.50 =
- 3) Write the following decimal numbers in figures:
 - a) Ten and nine tenths.
 - b) Sixty nine and three tenths.
 - c) Fifty and six hundredths.Some pupils present on the board.

Conclusion

Assessment

Individually pupils do the following:

- 1) Using a place value table, pupils individually write the following numbers in words and then they read them:
 - a) 3.9 =
 - b) 24.08 =
 - c) 20.17 =
- 2) Write the following decimal numbers in figures:
 - a) Eight tenths
 - b) Ninety six and thirteen hundredths
 - c) Thirty five and seven tenths

Homework

- 1) Kalisa runs track every day after school. The coach always reminds his/her runners to drink plenty of water when they finish running. Yesterday after track practice, Kalisa drank 1.04 liters of water. How is this number written in words?
- 2) Donata and Manzi were studying about the lifecycle of butterflies in a science class. They checked out some books from the library to find out more about the butterflies. One of the

butterflies they read about had a wingspan of 3.5 cm. How is this decimal number read? How is this decimal number written in words?

- 3) Domina wrote the following number on a sentence strip. It read, thirty thousand, four hundred twenty two and four hundredths. She asked Mihigo to write this number in standard form. He wrote it correctly. How did Mihigo write this number?

Lesson 3

Comparing and ordering decimal numbers (up 2 decimal places)

Topic area	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key Unit competence	Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Identify the place values in written decimals numbers. Skills: <ul style="list-style-type: none"> Compare 2 decimal numbers using greater than (>), less than (<) and equal to (=), and order decimals in ascending and descending order Attitude: <ul style="list-style-type: none"> Develop personal confidence in the use of decimal numbers. Appreciate the importance of decimal fractions in comparing and sharing.
Key words	Greater than, less than, equal to
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning task in group activities and presentations. Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> Communication developed through answering questions. Cooperation developed through working in pairs and in groups. Critical thinking developed through comparing decimals. Research and problem solving developed though being resourceful in finding answers to questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives:

Using place value table, pupils will be able to compare and to order decimal numbers correctly, confidently and in a required time.

Class setting/organization

Indoor: Arrange desks so that pupils can work, individually, in pairs and in small groups

Materials

Comparison terms written on manila paper, place value chart, and solved exercise on manila paper.

References:

- Tom Roche 1978 Figure it out, P. 37-38
- www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015

Introduction / Review

Correction of homework.

Games: Which decimal comes before or after?

Chant decimals from 0.1 to 0.9 forward and backward.

Development**Presentation**

Pupils solve the following in pairs:

Activity 1: Comparing decimals

Gatesi ate $\frac{3}{10}$ of a sugar cane Mugisha ate $\frac{4}{10}$ of it.

- a) Convert $\frac{3}{10}$ and $\frac{4}{10}$ into decimal numbers.
- b) Discuss and find out who ate a bigger piece of sugar cane and write it using “bigger than” or “smaller than”
- c) Compare the decimal numbers using symbols < ; > ; =
Some pupils present on the board.

Answer:

- a) $\frac{3}{10} = 0.3$ and $\frac{4}{10} = 0.4$
- b) *Mugisha ate a bigger sugar cane than Gatesi because 0.4 is greater than 0.3.*
- c) $0.4 > 0.3$

Activity 2: Comparing decimals

Represent the following decimal numbers in a place value table and compare them using “greater than”, “less than”, “equal to”.

- a) 3.05 and 4.05
- b) 4.25 and 4.5

Pupils present on the board.

Answers:

a)

Ones	and	Tenths	Hundredths
3	.	0	5
4	.	0	5

In the place value table 3 is less than 4 therefore 4.05 is greater than 3.05.

b)

Ones	and	Tenths	Hundredths
4	.	2	5
4	.	5	

In the place value table, 4 is equal to 4 we compare 2 and 5, therefore 5 is greater than 2. So 4.5 is greater than 4.25.

Activity 3: Ordering decimals

The following are the results of 5 pupils in P4: 79.5; 55.8; 79.55; 75.5; 75.49

- Which is the result of the best performer pupil? And the result of the last performer pupil?
- Arrange these results from the 1st to the last.

Some of the pupils present on the board.

Answer: Using place value table we represent and compare the digits of numbers.

Tens	Ones	and	Tenths	Hundredths
7	9	.	5	
5	5	.	8	
7	9	.	5	5
7	5	.	5	
7	5	.	4	9

From the table, we observe that:

- The result of the best performer is 79.55 because it is greatest marks, while the result of last performer is 55.8 because it is the smallest marks.
- Arrangement of result from the best performer: 79.55; 79.5; 75.5; 75.49; 55.8

Math Facts!

When comparing decimal numbers:

- Look at the whole number to the left of the decimals. The number with the greatest whole number, is the greatest number.
- If the whole numbers are the same, move to the right of the decimal point. Compare the digits in tenths. The number with the greatest tenth digit is the greatest number.
- If the digits in the tenths place value are equal, compare the digits in the hundredths place value, and so forth...

To order decimal numbers:

- First compare the decimal numbers following the above rules for comparison.
- Then order the decimal numbers from the smallest to the greatest or from the greatest to the smallest.

Application

In small groups, pupils do the following:

- Compare the following numbers using : < ; > ; =
 - $0.21 \square 0.3$
 - $3.5 \square 3.35$
 - $2.4 \square 2.4$
- A farmer sold seventy five hundredths of her harvest, and she stored for family needs twenty five hundredths of the harvest. Compare the two parts of the harvest and say which is greater than the other.
- Five swimmers entered into a competition, they used different time as shown in the table below:

Swimmer	Time in seconds
A	9.8
B	9.97
C	9.99
D	9.81
E	9.02

- Order these decimal numbers from the greatest to the smallest.
- Which is the time used by the best swimmer?
- Order the score from the best one/first one to the last one.

Conclusion

Assessment

Individually, using place value tables, pupils solve the following:

- In the weather report, the average of temperatures of a country was as follows:
January: 24.5°C; March: 10.04°C; April: 14.7°C; July: 30.47°C; December: 24.09°C
 - Which month was the hottest?
 - Which month was the coldest?
 - Put these average temperatures in order from the hottest to the coldest.
- A shopkeeper sold 50.5kg of rice in the morning. Then he /she sold 45.5kg of rice in the evening. In which round did he/she sell more rice?

Homework

- The following are the weight of 4 different people. Order them from the smallest to the biggest:

Name	Weight
Mukiza	75.5 kg
Agasaro	57.50 kg
Rukundo	57.5 kg
Gasigwa	65.5 kg

Lesson 4

Addition of decimal numbers

Topic area	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key Unit competence	Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the process of adding decimal numbers. Skills: <ul style="list-style-type: none"> Carry out addition of decimal numbers Attitude: <ul style="list-style-type: none"> Develop personal confidence in the use of decimal numbers.
Key words	Add, place value, addition, carrying, tenth place, hundredth place

Cross cutting issues	<ul style="list-style-type: none"> – Gender enhanced through assigning tasks in group activities and presentations. – Peace and values education developed through discussing in group and leading to consensus
Competences developed	<ul style="list-style-type: none"> – Communication developed through answering questions. – Cooperation developed through working in pairs and in groups. – Critical thinking developed through solving problems. – Research and problem solving developed though being resourceful in finding answers to questions
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Addition of decimal numbers (up to 2 decimal places) With and without carrying

Instructional objectives:

Using place value table or a vertical arrangement pupil will be able to add 2 decimal numbers (up to 2 place value) correctly, confidently and in a required time.

Class setting/organization

Indoor: Arrange desks so that pupils can work, individually, in pairs and in small groups

Materials

Manila paper on which a solved exercise is written

Reference:

- Tom Roche 1978 Figure it out, P. 36-37
- www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015

Introduction/Review

Correction of homework.

Games: Which decimal comes before or after?

Development

Presentation

In pairs pupils solve the following using a place value table.

Activity 1: Addition of decimal numbers without carrying

A swimmer is in a 100 meter race. She swims the first half of the race in 32.13 seconds and the last half of the race in 34.84 seconds. How long did it take her to swim the whole race?

Answers:

a) Calculations:

Tens	Ones		Tenths	Hundredths
		<i>and</i>		
3	2	.	1	3
+ 3	4	.	8	4
6	6	.	9	7

b) Solution: It took her 66.97 seconds to swim the whole race.

Activity 2: Addition of decimal numbers with carrying

Umutesi went to visit her aunt. She travelled 12.5km by bus and 4.5km by a motorbike. How many km did she travel altogether?

Some pupils correct on board.

Answer:

a) Calculations:

Tens	Ones	and	Tenths	Hundredths
	1			
1	2	.	5	
+	4	.	5	
1	7	.	0	

b) Solution:

She have travel 17 km altogether.

Activity 3: Addition of whole number and a decimal number

In a competition, Manzi got 70 marks in Math and 67.25 marks in English. Find the total marks Manzi got.

Some pupils correct on the board.

Answer:

a) Calculations:

Hundreds	Tens	Ones	and	Tenths	Hundredths
	7	0	.	0	0
	+ 6	7	.	2	5
1	3	7	.	2	5

b) Solution:

The total marks that Manzi got are 137.25

Math Facts!

- We add decimal numbers using a table as in the example above.
- We add decimal numbers in the same way we add whole numbers.
- We arrange them vertically according to their place value.
- Remember to put the points at the right place in the table.
- When adding a decimal number to a whole number, you first convert the whole number to a decimal number by putting a point after it and adding zeroes corresponding to the decimal digits of the decimal number, then arrange vertically and add.

Application

In pairs/small groups pupils do the following:

- 1) Sumwiza was measuring how much taller she got over two years. In the first year she grew 1.72 cm. In the second year she grew 7.6 cm. How much taller did she get altogether?
- 2) A weatherman was measuring the amount of rain that two cities received over a week. City A received 3.74 ml while City B received 9.8 ml. How much rain did they get in total?
- 3) Two pieces of string of 7m and 6.7 m were joined together. What is the length of the two pieces joined together?

Conclusion

Assessment

- Using a place value table, add the following decimals:
 - $51.25 + 0.75 =$
 - $10.18 + 4.22 + 0.07 =$
 - $17 + 9.48 =$
- A parent bought 3.5 litres of milk for his children and 2.5l of milk for his visitors. How many litres of milk did he buy altogether?

Homework

- Using place value table, add the following decimals:
 - $0.01 + 2.2 + 0.4 =$
 - $2.09 + 6.19 =$
 - $26 + 0.14 =$
- Gicari worked 22.5 volunteering hours in a library last month and 19.5 hours this month. How many hours did she work altogether?

Lesson 5

Subtraction of decimal numbers

Topic area	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key Unit competence	Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none">Explain the process of subtracting decimal numbers. Skills: <ul style="list-style-type: none">Carry out subtraction of decimal numbers. Attitude: <ul style="list-style-type: none">Develop personal confidence in the use of decimal numbers.
Key words	Decimal, decimal point, tenths place, hundredths place, subtract, borrowing.
Cross cutting issues	<ul style="list-style-type: none">Gender enhanced through assigning tasks in group activities and presentations.Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none">Communication developed through answering questions.Cooperation developed through working in pairs and in groups.Critical thinking developed through solving problems.Research and problem solving developed through being resourceful in finding answers to questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives:

Using a place value table, pupils will be able to subtract decimal numbers up to 2 decimal places with and without borrowing correctly, confidently and in a required time.

Class setting/organization

Indoor: Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Manila paper on which a solved exercise is written

Reference:

- Tom Roche 1978 Figure it out, P. 36-37
- Byamukama J.&Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.70
- www.teachervision.com/decimals/activity/3153.html visited on September 8, 2015

Introduction/Review

Correction of homework

Games: Which decimal comes before or after it?

Development

Presentation

Pupils work in pairs and solve the following:

Activity 1: Subtraction of decimal numbers without borrowing

Kundwa needs 2.50 meters of fabric for her school uniform. She has only 1.5meter. How many meters of fabric does she have to buy?

One pupil presents on the board.

Answer:

a) Calculation:

Ones	and	Tenths	Hundredths
2	.	5	0
-1	.	5	
1	.	0	0

b) Solution:

From the table above, for having all fabric, Kundwa has to buy 1 meter.

Activity 2: Subtraction of decimal numbers with borrowing

In a refugees camp two families have to share 15.5 kg of maize depending on the number of person per family, the share of the first family was 9.72 kg. What was the share of the second family?

One pupil presents on the board.

Answer:

a) Calculations:

Tens	Ones	and	Tenths	Hundredths
10	5	.	5	0
-	9	.	7	2
	5	.	7	8

b) Solution:

The share of the second family is 5.78 kg

Activity 3: Subtraction of a whole number and a decimal number

During the race of 100 m, Kagabo run 65.7 m for the first 5 seconds, what was the remaining distance that he needed to run?

Some pupils correct on the board.

Answer:

a) Calculation:

$$100 - 65.7 = 34.3 \text{ m}$$

b) Solution:

The remaining distance that he needed to run is 34.3 m.

Math Facts!

Subtraction of decimal numbers is done in the same way as subtraction of whole numbers:

- We arrange numbers vertically according to their place value.
- Put the points at the right place in the table.
- When subtracting a decimal number from a whole number, first convert the whole number to a decimal number by putting a point after it and adding zeroes corresponding to the decimal digits of the decimal number, then arrange vertically and subtract.

Application

In pairs/small groups pupils solve the following using a place value table:

- 1) Kaneza had 28.5 kg of cassava in a basket and she sold 12.5 kg. How many kg did she remain with?
- 2) What must be added to 1.5 l to have 2 l?
- 3) A wire of 80 m of length was broken into two parts. During installation of electricity in a house an electrician have measured one part of the wire and found 42.4 m, how long is the second part?

Conclusion

Assessment

- 1) A school generator was filled with 55.5 l of fuel. How many l remained in the generator if 12.5 l of fuel was used?
- 2) In a medicine bottle there was 250 ml of syrup, a mother gave her child 2.5 ml of syrup in morning. How many ml were left?
- 3) Mutesi is practising for the 200 meter dash. The time she could use so far was 31.25 seconds. If Mutesi wants to run the dash in 27 seconds, then about how much time must she cut in order to reach her goal?

Homework

- 1) Umurisa is 27.5 years old. Mupenzi is 35 years old. How much older is Mupenzi to Umurisa?
- 2) A carpenter bought a piece of wood that was 7.11 meters long. Then she sawed 2.3 meters off the end. How long is the piece of wood now?

Lesson 8

Assessment of the unit

Topic area:	Fraction, decimals and proportional reasoning
Unit 5	Decimal fractions/ numbers
Key unit competence	Add, subtract and compare decimal numbers using place values of decimals up to 2 decimal places
Assessment criteria	Pupils are able to accurately, confidently and in required time: Add, subtract and compare decimal numbers, and represent a decimal to 2 decimal places on a number line.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Assessment questions

20 marks

Question 1:

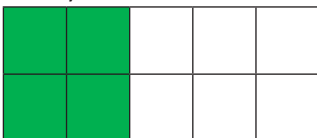
Complete the following table writing in words or in figures:

Figures	Words
0.01	
6.6	
71.62	
123.05	
	Eight tenths
	Seventy and six tenths
	Thirteen and four hundredths
	Two hundred and eighty one hundredths

Question 2.

Look at the drawing below and answer the following questions:

- Which fraction represents the shaded boxes?
- Convert that fraction into a decimal number:



Question 3:

Solve the following:

- Which option shows the numbers ordered greatest to smallest?
 - 1.32, 2, 1.7, 1.37
 - 7.99, 8, 7.64, 7.6
 - 8.55, 8.78, 9, 8.97

- iv) 2.99, 2.54, 2.52, 2.4
- b) Mugunga and Kabera were both sick. Mugunga had a temperature of 39.5 degrees. Kabera had a temperature that was 1.5 degrees less than Mugunga. What was Kabera's temperature in degrees?
- c) Mukamuvara went on a diet. In week one she lost 2.5kg, in week two she lost 1.75kg, in week three she lost 2.75kg and in week four she got fed up, ate lots of chocolate and gained 0.66kg. How many kg did she lose altogether?
- d) The weight of a baby elephant was 120.99 kg. After two years, his weight increased by 109.85 kg. Find the weight of the elephant baby after two years.

Unit 6: Length measurement Unit at Glance

Topic area: Metric Measurement .

Key competence: Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.

	Period 1	Period 2	Period 3
Lesson 1: Concept of length measurement	Concept of length measurement (Estimation and measuring from m up to mm)	Concept of length measurement: Estimation and measuring (m, dam, hm, km)	Relationship reading writing length measurements units
Lesson2: Converting length measurement units	Period 1 Converting units of length measurements (from km up to mm)	Period 2 Exercises on conversion of length measurements (from km up to mm and vice versa)	
Lesson 3: Perimeter of different shapes	Period 1 Measuring the perimeter of different shapes (using m and cm)		
Lesson 4: Addition of length measurements	Period 1 Addition of different length measurements of whole and decimal numbers (up to 2 decimal places) and its application to daily life	Period 2 Problems on addition of different length measurements of whole and decimal numbers (up to 2 decimal places)	
Lesson 5: Subtraction of length measurements	Period 1 Subtraction of different length measurements of whole and decimal numbers (up to 2 decimal places) and its application to daily life	Period 2 Exercises and problems on subtraction of length measurements of whole and decimal numbers (up to 2 decimal places)	
Lesson 6: Multiplication of length measurements	Period 1 Multiplication of length measurements by a whole number and its application to daily life	Period 2 Exercises and problems on multiplication of length measurements by a whole number	
Lesson 7: Revision	Period 1		
	Revision		
Lesson 8: Assessment	Period 1	Period 2	Feedback and remediation
	Assessment		

Unit warm-ups and games

How many decimetres?

Tell pupils a number of metres and pupils tell you the number of decimetres they get.
e.g. Say 6m and they tell you the number of dm they get (60 dm). Continue with other numbers.

How many centimetres?

Tell pupils a number of metres and pupils tell you the number of centimetres they get.
eg. Say 3m and they tell you 300 centimetres.

How many metres?

Tell pupils a number of decametres , eg. Say 5decametres and they tell you 50 metres.

How many decametres?

Tell pupils a number of hectometers, eg. Say 2hectometres and they tell you 20 decametres.

How many hectometres?

Tell pupils a number of kilometers, eg. Say 1kilometre and they tell you the 10 hectometres.

Unit Lessons

Lesson 1

Concept of length measurement

Topic area	Metric Measurements
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.
Lesson 1	Concept of length measurements
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Build on knowledge and understanding of measurement of length. • State different units of length measurements. Skills: <ul style="list-style-type: none"> • Select and use appropriate instruments / tools / materials to measure lengths, using and interpreting scales correctly. Attitude and values: <ul style="list-style-type: none"> • Appreciate the importance of metric measures in daily life. • Recognize the importance of using measuring tools correctly.
Key words	Metre, decimetre, centimetre, millimetre.
Cross cutting issues	Gender developed through practical activities in which both girls and boys have equal participation.
Competences developed	- Communication developed through presentations, reading, writing and speaking activities. - Cooperation developed through working in groups or in pairs.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives	Given small distances and different objects, pupils will be able to make appropriate estimations of length with justification as well as measuring them.		
Class setting/ organization	Outdoor: outside of class pupils will measure the length of different objects.		
Materials	Metre, decametre, ruler, rope , sticks		
References	– Tom Roche.1984. Busy at Maths, P 131 – Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.37 http://wwwmathisfun.com		
Steps / Timing	Teachers’ activities	Pupils’ activities	Generic competences and cross cutting issues to be addressed
Introduction (5min)	Ask pupils to remind you about the previous lesson. Math games: Facilitate pupils to play a game	Pupils to discuss what they remember in the previous lesson. Pupils in small group play the game: Which decimal comes before or after? One pupil in a group say a decimal number, eg, 0.5 and the other members, one by one, say the next.	-Communication developed through playing and chanting.
Development (25 min)	Presentation Allocate tasks to different groups	Activity 1: Estimation of length In small groups pupils estimate the length of different small distances and objects through observations and using their prior knowledge on length measurements from lower primary. Group representatives present their findings with justifications. They conclude that some distance or object estimations done by groups are different and they discuss the reason behind.	-Communication developed through presentations, reading, writing and speaking activities -Cooperation developed through working in group. -Communication developed through presentations, reading, writing and speaking activities -Cooperation developed through working in group.

Facilitate pupils to measure objects using different tools.

Activity 2: Measuring using different tools

In groups pupils measure the following using different tools:

- a) Measure the distance between 2 walls of the classroom using strides. One group measures the same distance using a metre ruler and write their findings. Another group measures a stick using a span hand and a ruler.
- b) Pupils compare their findings:
 - When using span hand and strides you come up with different measurements of the same distance/object.
 - The metre ruler gives the same measurements.
- c) Find that metre is the standard unit to measure the length.

Activity 3: Selection of measurement tools:

Pupils are invited to select tools for measuring different objects/distances: small objects(finger, pen)

- *To measure small distances and objects you can use metre ruler or small rulers (30cm).*

Activity 4: Measuring an object in different length units

- a) In small groups pupils do the following:
 - 1 group to measure the length of a stick in metre (m).
 - A second group to measure the length of a stick in dm.
 - A third group to measure the length of a stick in cm.

		<p>a) They discover that:</p> <ul style="list-style-type: none"> to measure the length of small objects you can consider different unit measurements: m (standard unit), dm, cm and mm. $1\text{m} = 10\text{ dm} = 100\text{ cm} = 1\,000\text{ mm}$ <table border="1"> <thead> <tr> <th>m</th> <th>dm</th> <th>cm</th> <th>mm</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>0</td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td></td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> </tbody> </table> <p>$1\text{m} = 10\text{ dm}$; $1\text{ m} = 100\text{ cm}$; $1\text{m} = 1\,000\text{ mm}$</p>	m	dm	cm	mm	1	0			1	0	0		1	0	0	0	
m	dm	cm	mm																
1	0																		
1	0	0																	
1	0	0	0																
	<p>Summary Facilitate pupils to draw conclusions on length measurements.</p>	<ol style="list-style-type: none"> It is very important in our life to make appropriate estimations of length. The standard unit of measurements of length is metre (m). The length of small distances and objects is measured in metre (m), decimetre (dm); centimetre (cm) and millimeter(mm). To have exact length measurements we use standard tools such as metre ruler, a ruler. <p>NB: When measuring, it is very important to make sure that the zero mark on the metre ruler is exactly on one end of the object or distance you are measuring.</p>																	
	<p>Application 1) Put pupils in different groups and give them different objects to use (1m string, 1m ruler). Tell them the objects they are going to measure (a wall, a teacher’s table, their desks, etc.)</p>	<ol style="list-style-type: none"> Pupils to avail their rulers. In their groups they first estimate the length of the objects they are going to measure and write their estimations in their notebooks. They then measure the object they have estimated and write their findings in their notebooks. 																	

		<p>A pupil from each group to write their estimations and findings on the board. Pupils to look at the estimations and actual measurement of each group and say which group had well estimated.</p> <p>3) Answer the following questions(individually):</p> <p>a) How long is your middle finger? Nail?</p> <p>b) How long is your ruler?(Give answer in cm, in dm)</p>																			
<p>Conclusion (10 min)</p>	<p>Assessment Facilitate pupils to measure different objects. Show pupils the side of the class to be estimated.</p>	<p>Pupils measure the length of the following (individually) using a ruler :</p> <p>a) Their foot b) Their Math book c) Their finger nail</p> <p>Through observation pupils estimate the length of their classroom door.</p>																			
	<p>Homework</p>	<p>Homework</p> <p>1) Estimate the length of the door at your home.</p> <p>2) Complete the following table(first guess the length of the following objects and then measure them):</p> <table border="1"> <thead> <tr> <th>Item</th> <th>Estimated length</th> <th>Actual length</th> </tr> </thead> <tbody> <tr> <td>Tea-spoon</td> <td></td> <td></td> </tr> <tr> <td>Fork</td> <td></td> <td></td> </tr> <tr> <td>Chair seat</td> <td></td> <td></td> </tr> <tr> <td>Chair back</td> <td></td> <td></td> </tr> <tr> <td>Door</td> <td></td> <td></td> </tr> </tbody> </table>	Item	Estimated length	Actual length	Tea-spoon			Fork			Chair seat			Chair back			Door			
Item	Estimated length	Actual length																			
Tea-spoon																					
Fork																					
Chair seat																					
Chair back																					
Door																					

Instructional objectives

Using strings of 1 dam pupils will be able to measure the length of different objects and estimate the big distances.

Class setting/organization

Outdoor: outside of class pupils will measure the length of different objects.

Materials

A metre ruler or a string of 1 m, a string of 1 dam

References

- Tom Roche.1984. Busy at Maths, P 131
- Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.37
- wwwmathisfun.com

Introduction/ Review

Correct of homework.

Game: **How many decimetres?**

Development

Presentation

Activity 1: Measuring 1 dam

- In the school compound pupils in a group of 4 measure 1 dam using 1 metre string.
- A whole string of 10 m is displayed so that pupils have time to observe the whole length.
- Facilitate pupils to discover the length measurement units corresponding to 10 metres. They conclude that 10 m=1 dam.

Activity 2: Measuring a distance of 1 hm

- In the playground pupils in 4 groups take 1dam string they have from activity 1 and put together 10 dam strings. They display the whole string of 10 dam.
- They find that: 1hectometre is equal to 10dam.
1hectometre is equal to 100m.

Activity 3: Estimating a distance of 1 km

- In small groups, outdoor, pupils consider a string of 1 hm and they discuss on how long will be a distance of 10 hectometres. They estimate the distance from their school to the nearest health center, neighbouring school, bank, market.....
- Group representatives give their estimations. Each distance is discussed and confirmed by other groups and the teacher (the teacher should have examples of the distance of 1km to be used as reference).

Activity 4: (Indoor) Summary on relationship between length measurements units (km, hm, dam, m) using a conversion table

Facilitate pupils to find out the relationship between metre, decametre, hectometre and kilometre using a conversion table:

km	hm	dam	m
		1	0
	1	0	0
1	0	0	0

- 1 dam = 10 m
- 1 hm = 10 dam
- 1 hm = 100 m
- 1 km = 10 hm
- 1 km = 100 dam
- 1 km = 1000 m

Math Facts!

- Long distances are measured in decametre (dam), hectometre and kilometre(km).
- Each length measurement unit is 10 times bigger than the successive one.

Application

Pupils in groups do the following:

- a) Outside pupils estimate the length of given sides of the school compound.
- b) Pupils measure some school compound using 1 dam string and write their findings.
- c) Pupils to compare their estimations and the actual measurements and discuss the appropriateness of their estimations.

Conclusion

Assessment

Pupils answer the following questions:

- 1) Estimate the length of a given side of the school compound.
 - a) How many dam are in 1hm?
 - b) How many m are in 1 dam?

Homework

Estimate the length of one side of your/ neighbours' compound at home.

Period 3

Period 3: Relationship, reading and writing length measurements units

Instructional objectives

- Given units of length measurement, pupils will be able to read and write them fluently in a given time.
- Given length measurement units, pupils will be able to find the relationship between them confidently, correctly and in a given time.

Materials

Conversion table of length measurement units.

References

- Tom Roche.1984. Busy at Maths, P 133
- Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.38
- <http://www.mathisfun.com>

Introduction/Review

Game: **How many m?**

Development

Presentation

Activity 1: Relationship between length measurement units from km up to mm

-Pupils in pairs draw a conversion table and fill in all the unit of length measurements.

-In pairs using the conversion table pupils discover the relationship between length measurement units from the greatest to the smallest.

Answers:

<i>km</i>	<i>hm</i>	<i>dam</i>	<i>m</i>	<i>dm</i>	<i>cm</i>	<i>mm</i>	
1	0						1km = 10hm
	1	0					1hm = 10dam
		1	0				1dam = 10m
			1	0			1m = 10dm
				1	0		1dm = 10cm
					1	0	1cm = 10mm

Pupils find that each length unit is 10 times greater/bigger than the successive unit.

Activity 2: Relationship between length measurements units from mm to km

-Pupils in pairs draw a conversion table and fill in all the units of length measurements.

-In pairs using the conversion table pupils discover the relationship between length measurement units from the smallest to greatest.

Answers

1)

<i>km</i>	<i>hm</i>	<i>dam</i>	<i>m</i>	<i>dm</i>	<i>cm</i>	<i>mm</i>	
					0.	1	1mm = 0.1cm
				0.	1		1cm = 0.1dm
			0.	1			1dm = 0.1m
		0.	1				1m = 0.1dam
	0.	1					1dam = 0.1hm
0.	1						1hm = 0.1km

Pupils discover that each length measurement unit is 10 times smaller than the preceding one.

Activity 3: Reading and writing length measurement units

Pupils read, one by one, and write in their notebooks the following length units measurements in full:

1 km:

2 hm:

5 dam:

30 m:

12 dm:

1 cm:

3 mm:

Answer:

1 km: One kilometre

2 hm: Two hectometres

5 dam: Five decametres

30 m: Thirty metres

12 dm: Twelve decimetres

1 cm: One centimetre

3 mm: Three millimetres

Activity 4: Reading and writing length measurement units (involving decimals)

Pupils read, one by one, and write in their notebooks the following length measurement units in full:

- 0.1mm:
- 0.2 cm:
- 0.5 dm:
- 5.4 m:
- 14.5 dam:
- 12.7 hm:
- 9. 1 km:

Answers:

- 0.1mm: zero point one millimetres*
- 0.2cm: zero point two centimetres*
- 0.5dm: zero point five decimetres*
- 5.4m: five point four metres*
- 14.5dam: fourteen point five decametres*
- 12.7hm: twelve point seven hectometres*
- 9. 1 km: nine point one kilometres*

Math Facts!

- Each length measurement unit is 10 times bigger than the successive one.
- Length measurement units are always written in small letters but they are always read in full. eg: dm is read / written in full as decimetre.
- When length measurement units are preceded by a number, you read / write the number and proceed with length measurement units, eg. 10 cm: is read/written in full as ten centimetres.

Application

- 1) In pairs / small groups write the following measurement units in short form:
 - a) One centimetre
 - b) Three metres
 - c) Ten decametres
 - d) Fifty hectometres
 - e) Thirty kilometres
- 2) Pupils in pairs /small groups solve the following:
 - a) $1\text{m}=\dots\text{dm}$
 - b) $1\text{dm}=\dots\text{cm}$
 - c) $1\text{km}=\dots\text{hm}$
 - d) $1\text{dam}=\dots\text{m}$

Conclusion

Assessment

Individually pupils do the following:

- 1) Teacher to say the following and pupils write them in short then they write them in full:
 - a) 24km
 - b) 3m
 - c) 12 dam
 - d) 51hm
- 2) Write the following in full:

- a) 3hm:
 - b) 1dam:
 - c) 40m:
 - d) 12mm:
- 3) Complete

- a) 21mm= ... cm
- b) 30dm= ... cm

Homework

Pupils to write in full the following:

- a) 2mm
- b) 13dam
- c) 10dm
- d) 11m

Lesson 2 ▶ Converting length measurement units

Topic area	Metric Measurements
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the process of converting length measurements units. Skills: <ul style="list-style-type: none"> • Convert accurately length measurements between different units Attitude and values: <ul style="list-style-type: none"> • Appreciate the importance of metric measures in daily life.
Key words	Conversion
Cross cutting issues	Gender developed through assigning tasks to both girls and boys.
Competences developed	<ul style="list-style-type: none"> - Communication developed through discussions in groups. - Cooperation developed through working in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 ▶ Converting units of length measurements (from km up to mm)

Instructional objectives

Given length measurement units pupils will be able to convert them (from km up to mm) correctly, confidently and in given time.

Materials

Conversion table of length measurements.

References

- Tom Roche.1984. Busy at Maths, P 132
- Byamukama J.2010. New Upper Primary Maths: Pupils Book for Grade4 P.38
- <https://www.mathsisfun.com/measure/metric-length.html>

Introduction/Review

Game: **How many dam?**

Development

Presentation

Activity 1: Conversion of length measurement unit from greater to smaller

Pupils individually draw a conversion table in their notebooks and then use it to solve the following problem:

- 1) From Kankindi's home to school there is a distance of 2.5 km. Express that distance in:
 - a) dam
 - b) m

Two pupils to share what they did by discussing on their answers and then two pairs to discuss.

- 2)
 - a) $15\text{hm} = \dots \text{dm}$
 - b) $15\text{hm} = \dots \text{km}$

Answer:

<i>km</i>	<i>hm</i>	<i>dam</i>	<i>m</i>	<i>dm</i>	<i>cm</i>	<i>mm</i>
2	5	0	0			
	1	5	0	0		
1.	5					

- 1)
 - a) $2.5 \text{ km} = 250 \text{ dam}$
 - b) $2.5 \text{ km} = 2\,500 \text{ m}$
- 2)
 - a) $15 \text{ hm} = 15\,00 \text{ dm}$
 - b) $15 \text{ hm} = 1.5 \text{ km}$

Facilitate pupils to find that:

- The last digit of a number has to be placed under the given unit before converting (when it is a whole number).
- The last digit of the whole number has to be placed under the given unit and the decimal numbers are placed under the successive units respectively (according to their place value) **Note:** The point is placed under the given unit.
- Converting from a greater unit to a smaller unit we multiply by 10.

Activity 2: Conversion of length measurement units from a smaller unit to a greater unit

- 1) Pupils individually draw a conversion table in their notebooks then use it to solve the following problem:
 - a) An athlete ran 5 000 m. How many km did he run?
 - Two pupils to share what they did by discussing on their answers and then two pairs to discuss.
 - One pupil to present on the board how they came up with the answer.

Answers:

<i>km</i>	<i>hm</i>	<i>dam</i>	<i>m</i>	<i>dm</i>	<i>cm</i>	<i>mm</i>
5	0	0	0			

b)

$5\ 000\text{m} = 5\ \text{km}$

The athlete runs 5 km.

Whole class to read aloud the answer on the board.

Facilitate pupils to find that: converting measurement units from smaller units to greater units we divide by 10.

Math Facts!

- To place whole numbers in a table the last digit of a given number should be placed under the given unit(eg 15m: the number 5 is placed under **m** then the number 1 is placed under **dam**)
- To place decimal number in table the last digit of the whole number has to be placed under the given unit and the decimal numbers are placed under the successive units respectively (according to their place value) **Note:** The point is placed under the given unit after the whole number.
- To convert from a greater unit to a small unit, multiply by 10 (from each unit to the next one in order).
- To convert from a smaller unit to a greater unit, divide by 10 (from each unit to the next one in order).

Application

In pairs pupils/in small groups do the following:

1) Convert the following:

- a) $10\text{m} = \dots\dots\text{dm} = \dots\dots\text{cm}$
- b) $100\text{dm} = \dots\dots\text{mm} = \dots\ \text{dam}$
- c) $5.5\ \text{km} = \dots\ \text{dam}$

2) Solve the following problem:

The distance from Buzimabwiza hospital to Rugwiro's home is 3 000m. Express that distance in km.

Conclusion

Assessment

Individually pupils do the following:

1) Convert the following:

- a) $71\ \text{m} = \dots\dots = \text{cm} = \dots\dots\text{mm}$
- b) $54\ \text{dam} = \dots\dots\text{dm}$
- c) $4\ 000\ \text{m} = \dots\dots\text{dam} = \dots\dots\text{hm}$

2) Solve the following problem:

Gatesi's shop is 2 000m away from her home. What distance in km does Gatesi walk to get to her shop?

Homework

1) Convert the following:

- a) $1\ 500\ \text{m} = \dots\dots = \text{dam} = \dots\dots \dots\text{hm}$
- b) $240\ \text{dm} = \dots\dots\text{m} = \dots\dots\text{mm}$
- c) $11\ 000\ \text{cm} = \dots\dots\text{dm} = \dots\dots\text{m}$

2) Solve the following problem:

There is 1 000 m from our home to school. What distance in km will I cover if I travel from home to school and go back home?

3) Kamana travelled a distance of 1 500m.What distance did he travel in kilometres?

Topic area	Metric Measurement
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> Measuring the perimeter of a shape as the distance around it Skills: <ul style="list-style-type: none"> Calculate the perimeter of different shapes in an informal way. Attitude and values: <ul style="list-style-type: none"> Appreciate the importance of metric measures in daily life
Key words	Perimeter
Cross cutting issues	- Gender enhanced through assigning tasks in group work.
Competences developed	- Communication developed through group discussions and answering questions. - Cooperation developed through working in group.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objective

Given different objects like desks pupils will be able to measure informally the perimeter of different shapes in (cm and m) correctly, confidently and in a given time.

Materials

Rulers, small objects with different shapes to measure.

References

- Tom Roche.1984. Busy at Maths, P 132
- Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.38
- <http://www.mathisfun.com>

Introduction/Review

Correct of home work.

Games: **How many mm?**

Development

Presentation

Activity 1: Measuring the perimeter of a shape

In 4 groups, pupils measure the 4 walls of a classroom.

Each group measures on wall and write the findings in their notebooks.

4 group representatives write their findings on the board according the following format:

Wall A: Wall B:.....

Wall C:..... Wall D:.....

Then they discuss (in front of the class) the measurements found while other pupils are following and participating where necessary.

They conclude that 2 opposite walls have the same measurements.
 Pupils discuss about different ways to find the length of the 4 walls of theirs classroom altogether.
 Some pupils present on the board.

Answer:

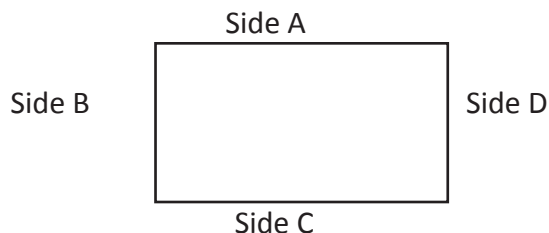
To add measurements of the 4 sides (walls).

Side A+ side B+ side C+ side D

Pupils give the answer.

Activity 2: Measuring the perimeter of a shape

Using a long string a small group of pupils go around the 4 walls of the classroom, making sure that the string is well fixed in each angle of the classroom:



-Using a meter ruler the pupils measure the length of the whole string. Findings: the string equals to the length of the 4 sides (walls) of the classroom. This length is called the perimeter of the classroom.

Pupils are facilitated to find the definition of the perimeter of any shape.

Math Facts!

- The perimeter is the distance around a shape.
- The basic formula for finding the perimeter is just adding all the side lengths together.

Application

Pupils in pairs / small groups to make choice and measure the perimeter of different objects available in the classroom using a ruler or a string. eg. the perimeter of the math book iscm.

Conclusion

Assessment

Individually pupils to measure the perimeter of their desks.

Homework

Measure the perimeter of your/ neighbour's table at home using a ruler.

Lesson 4 Addition of length measurements

Topic area	Metric Measurements
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain the process of addition of length measurement units. <p>Skills:</p> <ul style="list-style-type: none"> • Apply the knowledge of addition in solving mathematical problems involving length measurements. <p>Attitude and values:</p> <ul style="list-style-type: none"> • Appreciate the importance of metric measures in daily life.

Key words	<i>Addition, length measurement</i>
Cross cutting issues	Gender developed through assigning tasks in group work.
Competences developed	<ul style="list-style-type: none"> - Communication developed through group discussions and answering questions. - Cooperation developed through working in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Addition of different length measurements of whole and decimal numbers

Instructional objectives

Given two different units and real life situations, pupils will be able to add length measurement of whole and decimal numbers, correctly, confidently and in a given time.

Materials

Manila paper on which some solved exercises are written.

References

- Tom Roche.1984. Busy at Maths, P 133
- Byamukama J. 2010. New Upper Primary Maths: Pupils Book for Grade4 P.38
- <https://www.mathsisfun.com/measure/metric-length.html>

Introduction/Review

Correction of homework.

Game: **How many m?**

Development

Presentation

Activity 1: Addition of length measurements which do not require conversion

Pupils work individually after they discuss in pairs, then in two pairs to solve the following problems:

A motorcyclist rode 35km on Wednesday. On Thursday he rode 43km. on Friday he rode 38km. How many km did he ride in the three days?

One pupil presents on the board while explaining to others how they solved it in his/her group.

Answer:

- a) *Calculations: $35\text{ km} + 43\text{ km} + 38\text{ km} = 116\text{ km}$*
- b) *Solution: In the three days he rode 116 km.*

Activity 2: Addition of length measurements requiring conversion

Pupils work individually after they discuss in pairs, then in two pairs to solve the following problem:

Mahoro walked 4 km from home to church. Then from church to the market she walked 2 500m. How many km did she walk from home to the market?

One pupil presents on the board while explaining how they came up with their answers.

Answer:

Pupils explain that they convert first before adding two different units so $2\ 500\text{ m} = 2.5\text{ km}$ and then we add.

From home to church there is 4km then from church to the market there is 2.5 km

- a) *Calculations: $4\text{ km} + 2.5\text{ km} = 6.5\text{ km}$*
- b) *Solution: From home to the market Mahoro walked 6.5 km.*

Math Facts!

- When adding the same length measurement units add the numbers in normal way and write the answer in front of the unit given.
- When adding length measurement units which are different, convert them first into the required unit and add them. In case there are decimals, line them up when adding.

Application

Pupils in small groups solve the following:

- 1) $19 \text{ cm} + 400 \text{ mm} = \dots \text{dm}$
- 2) $1.5 \text{ dm} + 256 \text{ mm} = \dots \text{cm}$
- 3) Kalisa's home is at 20 hm from the shop and his school is at 100 dam further. If on Monday Kalisa left home and passed by the shop to buy a pen, find the total distance he covered from home to school in km.

Conclusion

Assessment

Work out:

- 1) $0.5 \text{ m} + 120 \text{ dam} = \dots \text{dm}$
- 2) $17 \text{ cm} + 301 \text{ mm} = \dots \text{dm}$
- 3) A tailor has two pieces of cloth: one measures 5 m and other measures 40 m.
 - a) How many m of cloth did he / she have?
 - b) Convert that length into cm.

Homework

Solve the following:

- 1) $19 \text{ cm} + 400 \text{ mm} = \dots \text{dm}$
- 2) $49 \text{ m} + 0.8 \text{ km} = \dots \text{m} = \dots \text{hm}$
- 3) The distance from school to Mahirwe's home is 2km and from his home to head teacher's is 450m, how many kilometres will head teacher cover from school to her home if he will pass by Mahirwe's home?

Lesson 5

Subtraction of length measurements

Topic area	Metric Measurements
Unit6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the process of subtraction of length measurement units. Skills: <ul style="list-style-type: none"> • Apply the knowledge of subtraction in solving mathematical problems involving length measurements. Attitude and values: <ul style="list-style-type: none"> • <i>Appreciate the importance of metric measures in daily life.</i>
Key words	<i>Subtraction, length measurements</i>
Cross cutting issues	Gender enhanced through assigning tasks in group work.

Competences developed	<ul style="list-style-type: none"> - Communication developed through group discussions and answering questions. - Cooperation developed through working in groups or in pairs.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 Subtraction of different length measurements of whole and decimal numbers (up to 2 decimal places)

Instructional objectives

Given different units and real life situations, pupils will be able to subtract length measurements of whole and decimal numbers correctly, confidently and in given time.

Materials

Manila paper on which some solved exercises are written.

References

- Tom Roche.1984. Busy at Maths
- <https://www.mathsisfun.com/measure/metric-length.html>

Introduction/Review

Correct of homework.

Games: **How many cm?**

Development

Presentation

In pairs pupils solve the following:

Activity 1: Subtracting length measurements which do not require converting

A mother bought 6 m of fabric to make clothes for her children. A tailor used 3m for the elder child and 2 m for the younger one. How many m are remaining?

One pupil presents on the board.

Answers:

- a) *Calculations: $6\text{ m} - 3\text{ m} - 2\text{ m} = 1\text{ m}$*
- b) *Solution: she is remaining with 1 m*

Activity 2: Subtracting length measurements which require converting

Karenzi bought a 100 cm long belt. If 2dm are cut off that belt so that it fits him, how many cm are remaining?

One pupils, presents on the board while explaining how they came up with the answer.

As we have done for addition we have to convert first all the units into cm, so $2\text{dm} = 20\text{cm}$.

- a) *Calculation: $100\text{ cm} - 20\text{ cm} = 80\text{ cm}$*
- b) *Solution: Karenzi is remaining with 80 cm.*

Math Facts!

- When we subtract the same length measurement units we subtract the numbers normally and we write the answer in front of the unit given.
- When we have to subtract different length measurement units we convert them first into the required unit and then we subtract them.

Application

In pairs/small groups pupils solve the following:

- 1) $33\text{hm} - 17\text{m} = \dots\text{m}$

- 2) $14\text{m} - 22\text{dm} = \dots\text{cm}$
- 3) $0.15\text{m} - 1.22\text{dm} = \dots\text{cm}$
- 4) $55\text{dam} - 0.24\text{m} = \dots\text{m}$
- 5) Semana is supposed to walk 2 500 m to get to his uncle's house. He has already covered 1km. How many m does he still have to cover?

Conclusion

Assessment

Individually pupils solve the following:

- 1) $51\text{ m} - 43\text{ dam} = \dots\text{dam}$
- 2) $90\text{ cm} - 0.8\text{ dm} = \dots\text{mm}$
- 3) A technician had 403 m of power cable. He used 36 dam to distribute electricity to different houses. How many m does he remain with?

Homework

Work out the following:

- 1) $53\text{ km} - 4\,080\text{ m} = \dots\text{m}$
- 2) $7\,773\text{ m} - 3\,000\text{ dm} = \dots\text{dam}$
- 3) $10.11\text{ dm} - 100.1\text{cm} = \dots\text{cm}$
- 4) Gikundiro bought a 14cm long pencil. He used 9mm for one month. How long is his pencil now?

Lesson 6

Multiplication of length measurements units

Topic area	Metric Measurements
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the process of multiplication of length measurement units. Skills: <ul style="list-style-type: none"> • Apply the knowledge of multiplication in solving mathematical problems involving length measurements. Attitude and values: <ul style="list-style-type: none"> • <i>Appreciate the importance of metric measures in daily life.</i>
Cross cutting issues	Gender developed through equal participation for both boys and girls in group presentations.
Competences developed	<ul style="list-style-type: none"> - Communication developed through group discussions and answering questions. - Cooperation developed through working in groups or in pairs. - Critical thinking developed through solving word problem activities.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives

Using rules, pupils will be able to multiply length measurement units by a whole number correctly, confidently and in required time.

References

– Tom Roche.1984. Busy at Maths
– <https://www.mathsisfun.com/measure/metric-length.html>

Introduction/Review

Correction of homework.

Game: **How many m?**

Development**Presentation**

Pupils do the following problem individually, and then discuss in pairs how they came up with the answer:

From Mutesi's home to school there is 2 km. If Mutesi goes to school in the morning and comes back home in the evening.

- a) How many km does she walk per day?
- b) How many m does she walk per day?

One pupil presents on the board while explaining how they came up with the answer.

Answer:

- a) i) Calculation: $2 \text{ km} \times 2 = 4 \text{ km}$
ii) Solution: She walked 4 km per day.
- b) i) Calculation: $2\,000 \text{ m} \times 2 = 4\,000 \text{ m}$
ii) Solution: She walked 4 000 m per day.

Math Facts!

When we multiply length measurement units by a whole number:

- We multiply the numbers and we write the answer before the given units.
- If the exercise requires converting, we do it before or after multiplying.

Application

In groups, pupils solve the following:

- 1) $24 \text{ km} \times 10 = \dots \text{ hm}$
- 2) $41 \text{ dm} \times 12 = \dots \text{ dm}$
- 3) $35 \text{ km} \times 10 = \dots \text{ dam}$
- 4) $52 \text{ cm} \times 7 = \dots \text{ mm}$
- 5) The distance from Rugwiro's home to his office is 3 km. If he walks in the morning to work, and goes home for lunch and comes back to work and returns home in the evening, how many km does he walk per day?

Conclusion**Assessment**

Work out:

- 1) $389 \text{ mm} \times 10 = \dots \text{ cm}$
- 2) $698 \text{ dm} \times 46 = \dots \text{ dm}$
- 3) $9\,00 \text{ m} \times 35 = \dots \text{ km}$
- 4) Mugeni walks 4 kilometres a day from home to the market. If she goes and comes back in the evening, how many metres does he walk in two days?

Homework

Work out the following:

- 1) $21 \text{ km} \times 100 = \dots \text{ km}$
- 2) $171 \text{ dam} \times 5 = \dots \text{ dm}$
- 3) $85 \text{ m} \times 79 = \dots \text{ hm}$
- 4) A bus travels from the city to the village and from the village to the city four times per day. Each time it travels 180 km. How many km does it travel per day?

Lesson 8

Assessment of the unit

Topic area	Metric Measurements
Unit 6	Length measurements
Key Unit competence	Convert between units of length and apply them in solving mathematical problems related to daily life situations including perimeter.
Assessment criteria	Pupils are able to accurately, confidently and in given time select, convert, add, subtract and compare length measurements through solving problems related to daily life situations.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Assessment questions

20 marks

Question 1

Answer by True or False

- a) The distance from our class to our toilet is about 200 m.
- b) My new pencil is about 14cm.
- c) Your nail is about 5 mm.

Question 2

Convert to the given units:

- a) $0.42 \text{ hm} = \dots \text{ dam} = \dots \text{ m}$
- b) $1.7 \text{ km} = \dots \text{ hm} = \dots \text{ dam}$
- c) Gororoka primary school used to have a jumping competition every year. This year Mugisha jumped 2.5 metres, Kamaro jumped 1.9metres, Nyirarugwiro jumped 2.7metres.
 - i) Convert into centimetres the length jumped by the 3 pupils.
 - ii) What do you think if Kamaro was given a prize as a winner?

Question 3

Work out:

- a) $13.3 \text{ m} + 67 \text{ dm} = \dots \text{ mm}$
- b) $5 \text{ 100 dam} - 4 \text{ 630 m} = \dots \text{ km}$
- c) $77\text{m} \times 7 = \dots \text{ dm}$
- d) A cyclist has to cover a distance of 180 km. He has already covered 85 km. What is the remaining distance in metres?
- e) From her home to the public tap there is a distance of 500m.If on Saturday Wihogora went to fetch water from the tap 4 times,
 - i) How many m did she walk?
 - ii) Convert that distance in kilometer?

Unit 7: Capacity measurements

Unit at glance

Topic area: Metric Measurement .

Key competence: To be able to convert between units of capacity and apply those in solving mathematical problems related to daily life situations.

	Period 1	Period 2
Lesson 1: Concept of capacity measurements	Concept and relationship of capacity measurement units (estimating and measuring l, cl, ml and dl)	Concept of capacity measurement units (estimating and measuring l and dal, and estimating hl) and the relationship of capacity measurement units.
Lesson 2: Reading, writing and converting capacity measurements (from hl to ml) that involve decimal numbers (up to 2 decimal places) and its application to daily life		
Lesson 3: Addition of capacity measurements by whole and decimal numbers (up to 2 decimal places) and its application to daily life		
Lesson 4: Subtraction of capacity measurements by whole and decimal numbers (up to 2 decimal places) and its application to daily life		
Lesson 5: Multiplication of capacity measurements whole numbers and its application to daily life		
Lesson 6: Assessment of the unit	Period 1 Assessment	Period 2 Feedback and remediation

Unit warm-ups and games

Types of containers

Pupils name as many types of containers that can hold liquids (e.g. 1.5 litre and 0.5 l water bottles, medicine bottles, jerry cans, barrels, water tanks, bottles for drinks such as Coke or Fanta, etc.)

Note: *In the following activities, if pupils are not familiar with the different measurements of capacity, give the pupils some examples first so they understand the conversion. For example, in "How many decilitres?", start by saying "If 23 l is equal to 230 dl, how many dl is 45 l?..."*

How many decilitres (dl)?

Say a number of litres (l), eg, 56l and pupils say the number of decilitres (dl) they get, eg, 560dl. Continue the game with other numbers of litres.

How many litres (l)?

Say a number of decalitres (dal), e.g., 32dal and pupils say the number of l they get, e.g., 320l. Continue the game with other numbers of decalitres.

How many centilitres (cl)?

Say a number of decilitres, eg, 8 dl and pupils say the number of cl they get, eg, 80cl. Continue the game with other numbers of decilitres.

How many millilitres (ml)?

Say a number of centilitres, eg, 11 cl and pupils say the number of ml they get, eg, 110ml. Continue the game with other numbers of millilitres.

Multiple conversions with one number

Say a number of litres (or ml, cl, dl...) and pupils say the number in ml, cl, dl, dal...). e.g. 5 litres is how many ml? (5 000 ml), How many cl ? (500 cl).

Unit Lessons

Lesson 1 Concept of capacity measurements

Topic area	Metric measurements
Unit 7	Capacity measurements
Key Unit competency	To be able to convert units of capacity and apply them in solving mathematical problems related to daily life situations.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Distinguish capacity of different liquid containers through observation. • State different units of capacity measurements. • Explain the relationship between the units of capacity measurements. Skills: <ul style="list-style-type: none"> • Estimate capacity of liquid containers through observation. • Select and use the appropriate tool/material to measure capacities of different liquid containers. Attitude and values: <ul style="list-style-type: none"> • Value the need for accuracy when carrying out capacity measurements.
Key words	- hectolitre (hl), decalitre (dal), litre (l), decilitre (dl), centilitre (cl), millilitre (ml). - Capacity, liquids, containers (a jerry can, a bucket, a tank), a syringe, syrup, medicine.
Cross cutting issues	- Peace education developed through discussion leading to compromise solution in group work. - Environmental education developed through discussion on ways of conserving water and reduce personal water use.
Competences developed	<ul style="list-style-type: none"> • Communication developed through group discussions and presentations on the board. • Co-operation developed through working in pairs and in groups. • Analytical skills developed through applying what was learned in length measurement to capacity measurements.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Concept and relationship of capacity measurement units (estimating and measuring l, dl, cl, ml)

Instructional objectives	Using different containers, pupils will be able to estimate and use accurately, confidently and in given time the capacity measurement units: l, dl, cl, ml and dal as well as estimate well the hl.
Class setting/ organization	Arrange desks so that pupils can work individually and then in pairs or groups.
Materials	Plastic bottles of a litre, a 5 litre jerry can, some small empty bottles of medicine of 100 ml, a bucket full of water and an empty bucket, a bottle of fanta full of water, a plastic cup, two markers of different colours, a cup, a glass, a syringe.
References	- Mwuengeri E. et al. 2008. Mathematics: Pupils Book, P.103-106 - website: http://www.wisegeek.org/what-are-the-different-syringe-sizes.htm# , September 20, 2015

Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Facilitate and play the game with pupils: Types of containers.	Play the game: Types of containers	
Development (25 min)	<p>Presentation</p> <p>Activity 1:</p> <p>Display materials on the table:</p> <p>A syringe, an empty bottle of medicine of 100 ml, plastic bottles of 1 litre, a 5 litre jerrycan, a bucket of water.</p> <p>Facilitate pupils to measure water using materials provided by asking questions.</p>	<p>Activity 1: Measuring capacity of some containers</p> <p>Using some containers whose capacity is known or which are graduated like a syringe, an empty bottle of medicine of 100 ml, plastic bottles of 1 litre, and a 5 litre jerrycan, pupils estimate and measure different capacity containers in different units, one by one, from the most common which are litre(l) to the milliliter(ml).</p> <p>Pupils, first individually and then in small groups, observe the size of the different containers and then answer the following questions:</p> <ol style="list-style-type: none"> 1) <ol style="list-style-type: none"> b) Which container would you use to measure 2 litres of water? Why? c) Measure 2 litres of water using the available containers. Explain how you do it. <p>Answer</p> <p><i>Use the litre container to measure 2 l. Fill it up twice to get 2 l. The reason why we have chosen to use 1 l is that the 5 l jerry can is too big (although you could estimate just under half of it) and the medicine container is too small.</i></p> <ol style="list-style-type: none"> 2) Would you use the same container to measure 200 millilitres of water? If not, which container would you use? Why? Demonstrate how to do it with water and the appropriate container. <p>Answer</p> <p><i>The litre container would be too big so we would use the medicine container that holds 100 ml. Two of these containers will give you 200 ml.</i></p>	<ul style="list-style-type: none"> • Communication developed through answering questions. • Critical thinking developed through estimating capacity of given containers. • Cooperation developed through discussions in groups. • Critical thinking developed through deciding which container to use in order to measure another container.

3) Facilitate pupils to establish the relationship between capacity measurements: litres, decilitres, centilitres and millilitres.

Answer:

l : Milk, oil, fuel, juice...
cl : soda, beer, serum, baby milk (nursing bottle)...
ml: syrups, medicine droppers

3) If the order from greatest to smallest is litre, decilitre, centilitre and milliliter

- a)
- How many decilitres are in a litre? (10 dl)
 - How many centilitres are in a litre? (100 cl)
 - How many millilitres are in a litre? (1 000 ml).

Show this in a table.

Answer:

l	dl	cl	ml	
1				1l
1	0			1l = 10dl
1	0	0		1l = 100cl
1	0	0	0	1l = 1000 ml

b) How many dl, cl, ml are in 22 l?

Answer:

22 l = 220 dl =
 2 200 cl = 22 000 ml.

Summary
 Facilitate pupils to draw conclusions on capacity measurements units.

- The capacity units measurements learned are: (l, dl, cl, ml.)
- The standard unit is "l".

The table of learned capacity measurement units:

l	dl	cl	ml	
1				1l
1	0			1l = 10dl
1	0	0		1l = 100cl
1	0	0	0	1l = 1000 ml

Each unit is 10 times bigger than the following one.

Critical thinking developed through finding the relationship between capacity measurements.

Application

- 1) Show to pupils different containers: one jerry can of 3 litres, another one of 5 litres.
- 2) Facilitate pupils to estimate the capacity of those containers.
- 3) Give them 3 litres, 5 litres, 1 litre and half a litre containers to use for measuring capacity in their groups.
- 4) Put on the table different containers: a nursing bottle, a cup, a glass, a syringe that can hold more than 2 ml. Examples of different sized syringes:



Source: <http://www.wisegeek.org/what-are-the-different-syringe-sizes.htm#>

- 3) Facilitate pupils to do exercises.

Application

Pupils in small groups do the following:

- 1)
 - a) Pupils estimate the quantity of liquids that can be contained in those containers.
 - b) Using a litre or a half litre container, different groups measure the capacity of the jerry cans and compare their findings with their estimations.
- 2)
 - a) Pupils in 4 groups (each group in each corner of the class) estimate the capacity of the containers: a nursing bottle, a cup, a glass, a syringe and write estimations in their notebooks.
 - b) Given a 100 ml container, a 1 – 2 ml syringe, and a 500 ml container such as a small water bottle, each group come in front and measure the capacity of each container.
 - c) Pupils compare the findings and their estimations.

- 3) Convert 45 l to dl, cl and ml.

Answer:

$$45 \text{ l} = 450 \text{ dl} = 4\ 500 \text{ cl} = 45\ 000 \text{ ml}$$

Cooperation developed through group work activity.

Peace and value developed through respecting each other in group activity.

Conclusion (5 min)	Assessment Ask assessment questions. Homework Write homework questions on the board.	Answer the following questions: 1) Give examples of liquids that are measured in ml and l. 2) Estimate the quantity of liquid that a sauce spoon can hold. 3) How many: a) dl in 2l? b) cl in 2 l? c) ml in 2l? Homework Estimate the quantity of water(in either l, dl, cl or ml) that can be contained by the following containers: a) By a jerry can that you use to fetch water at home. b) By a cup of tea.	
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Period 2

Concept of capacity measurements (estimating and measuring l, dal and extend to hl) and the relationship between those capacity measurement units

Instructional objectives

Using containers (1 litre bottle, 5 litre jerrycan) pupils will be able:

- To estimate the above containers approximately.
- To measure litres and decalitres accurately, confidently and in given time.
- To extend it to hl and explain the relationship between those capacity measurement units correctly, confidently and in a given time.

Class setting/organization:

Indoors: Arrange desks so that pupils can see when some pupils are measuring in front of the class.

Materials

Water containers such as: a litre bottle, a 5 litter's jerry can, a bucket full of water, an empty bucket, a jerry can of 10 litres.

References:

Tom Roche. 1984. Busy at Maths, P.155-157.

Introduction/Review

Correction of homework.

Game: **How many dl?**

Development

Presentation

Activity 1: Concept of capacity measurements (l, dal, hl)

Provide different sized containers such as a litre bottle and a 5 litre jerry can, a bucket full of water, an empty bucket, a jerry can of 10 litres.

One pupil measures five litres of water using a one litre bottle and pouring it into the 5 litre jerry can while others observe and help to count the number of litres poured.

Ask: How many litres have we counted? (5litres).

Another pupil comes and fills the (10litre) jerry can using the five litre jerry can, while others observe and count.

Pupils conclude: we have poured twice the 5 litre jerry can into the new jerry can. So, the big jerry cans contain 10 litres.

Pupils respond to the following questions:

- What is the unit which corresponds to 10 litres? **Hint:** Think back to the units of length. (Answer: 1 decalitre or 1dal).
- Give examples of containers that can be measured in decalitres (Answer: a 20 litre jerry can contains 2 dal; a 10 litre jerry can contains 1 dal; a small tank of 200litres contains 20dal.)
- If we take a 1 dal jerry can containing water and pour the content into a bigger container ten times, how many dal would we get?(10dal).
- What is the unit that corresponds to ten dal? **Hint:** Think back to the units of length. (1 hectolitre or 1 hl).
- Give examples of containers that can contain 1 hl? (The school water plastic tank can contain 2 000 litres. So it contains 20 hl.)
- How many times greater is a decalitre than a litre? (A dal is 10 times greater than a litre). How many times greater is a hectolitre than to a decalitre? (A hl is 10 times greater than a dal). How many times greater is a hl than a litre? (A hl is 100 times greater than a litre).
- How would you include decalitres and hectolitres in the table we used in the last lesson?

Answer:

hl	dal	l	dl	cl	ml	
1	0					1hl = 10 dl
1	0	0				1 hl = 100 l
	1	0				1dal = 10l

- What is the relationship between capacity measurement units? (Each unit is 10 times greater than the unit to the right of it or 10 times smaller than the unit to the left of it) as shown in the table above and the one below:

hl	dal	l	dl	cl	ml	
0.	0	1				1l =0 .01hl or 1 hl = 100l
	0.	1				1l = 0.1 dal or 1 dal = 10l
		1				1l
		1	0			1l = 10dl
		1	0	0		1l = 100cl
		1	0	0	0	1l = 1000 ml

Math Facts!

- Each capacity measurement unit is 10 times bigger than the unit next to it or smaller than the unit preceding it.
- The greatest unit is on the left (hl) and gets 10 times smaller each time you move to the right (to dal, l, dl, cl and ml).
- Millilitre is the smallest unit of measurement in the table. The numbers look bigger in ml because it takes
- 1 000 ml to make a litre! eg:

hl	dal	l	dl	cl	ml
0.45	4.5	45	450	4 500	45 000
1	10	100	1 000	10 000	100 000
0.01	0.1	1	0.01	0.1	1

It will take 450 dl to make 45 litres because 1 litre is 10 times bigger than 1 decilitre.

It will take 45 litres to make 4.5 decalitres because 1 decalitre is 10 times bigger than a litre.

- When converting between units, multiply by 10 from a unit to the next (moving from a larger unit to a smaller unit) and divide by 10 when moving from a smaller unit to a bigger unit.

e.g. $45 \text{ l} = \underline{\quad} \text{ dl}$. Answer: litres (l) are bigger than decilitres (dl). We move one place to the right from l to dl so multiply $45 \times 10 = 450 \text{ dl}$.

E.g. $84 \text{ l} = \underline{\quad} \text{ cl}$. Answer: we need to multiply by 100 because cl's are smaller than l's and are 2 unit places to the right. So multiply $84 \times 100 = 8\,400 \text{ cl}$.

E.g. $1 \text{ l} = \underline{\quad} \text{ dal}$. This time move to the left and divide by 10: so divide $45 \div 10 = 4.5 \text{ dal}$.

Application

- 1) Estimate the quantity of water that you need in order to wash your body. Explain.
- 2) Estimate the quantity of water you use at home in one day. Explain.
- 3) Estimate the capacity of the school water tank. Explain.
- 4) Name some ways in which to conserve water and reduce your own personal water use.
- 5) How many litres are in: a) 1dal, b) 1 hl?
- 6) How many ml are in: a) 1l, b) 1dl, c) 1cl?
- 7) How many dl are in 1 hl?

Conclusion**Assessment**

- 1) Estimate the quantity of water you use for cleaning the classroom. Explain your answer.
- 2) How many litres are in: 1dal, in 1 hl?
- 3) How many dl are in: 1l, 1dal, 1hl?
- 4) How many cl are in: 1dal, 1l, 1dl.

Homework

- 1) Estimate the quantity of oil that you use for cooking at home in one day and in one week.
- 2) Estimate the quantity of water you drink per day. Do you drink any water? What do you do in order to have safe water to drink?
- 3) How many ml are in: 1dal, 1l, 1dl, 1cl?

Lesson 2

Reading, writing and converting capacity measurement units (from hl to ml) that include decimal numbers up to 2 decimal places.

Topic area	Metric measurements
Unit 7	Capacity measurements
Key Unit competence	Convert between units of capacity and apply them in solving mathematical problems related to daily life situations.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> State different units of capacity measurements. Explain the relationship between capacity measurement units. Skills: <ul style="list-style-type: none"> Read and write correctly units of capacity measurements. Convert accurately capacity measurements between themselves. Attitude: <ul style="list-style-type: none"> Value the need for accuracy when carrying out capacity measurements. Show respect to one another when working in groups.
Key words	Hectolitre (hl), decalitre (dal), litre (l), decilitre (dl), centilitre (cl), millilitre (ml).
Cross cutting issues	Standardisation culture developed through answering questions about drinking water and keeping water clean so that it is safe to drink.
Competences developed	<ul style="list-style-type: none"> Communication in official languages developed through group discussions and explaining how they came up with their answers. Analytical skills developed through applying what was learned in length measurement lessons to capacity measurements.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Using conversion tables, pupils will be able to convert capacity measurements (from hl to ml) that involve decimal numbers (up to 2 decimal places) as well as to read and write them correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

References

Byamukama J. & Mulisa L. 2010. New Upper Primary Maths Pupils Book for Grade 4, P.42-45.

Introduction/Review

Correction of homework.

Game: **How many l?**

Development

Presentation

Activity 1: Reading and writing capacity measurement units

Pupils in groups write the following capacity measurements in full and share how to read them: hl, dal, l, dl, cl, and ml. One pupil writes them on board and some pupils read them aloud. Pupils also present them in a conversion chart, from the highest to the lowest unit.

Pupils present how they came up with their answers.

Answer:

1) The capacity measurement units are written as follows:

- a) hl: hectolitre
- b) dal: decalitre
- c) l: litre
- d) dl: decilitre
- e) cl: centilitre
- f) ml: millilitre

hl	dal	l	dl	cl	ml

Activity 2: Relationship between capacity measurements units

Pupils remind the teacher of the relationship between each unit and the following one (Each capacity measurement unit is 10 times bigger than the next one). Then they solve the following exercises using a conversion table:

- a) $1l = \dots cl = \dots ml$
- b) $1\ 000ml = \dots dl = \dots l$
- c) $55l = \dots dal = \dots hl$

Ask pupils how they used the conversion chart to arrive at their answers. Is there an easy method to arrive at the answer quickly?

Answer

hl	dal	l	dl	cl	ml	Explanation: a) $1l = 100\ cl = 1\ 000\ ml$ (Write 1 under l and add 0's until you get to cl) $1l = 100cl = 1\ 000ml$ (Write 1 under l and add 0's until you get to ml) b) $1\ 000\ ml = 10\ dl$ (Write 1 000 with the 1 under litre place and 0 in the other places. This time you divide by 10 from one unit to the preceding one so cross off zeroes from right to left until you reach dl.) $1\ 000ml = 10dl = 1l$ (Repeat the process above, crossing off an additional 0 to get to l) c) $55\ l = 5.5\ dal$ (Write 55 so that the 5 is placed under the ones place value, so the 5 in the ones place value falls under l. This time we need to move left so we divide by 10 (or move the decimal point one place to the left). $55l = 5.5dal = 0.55\ hl$ (Use the same process as above but this time move the decimal points 2 places to the left because you are dividing by 10 and then by 10 again, or by 100).
		1	0	0		
		1	0	0	0	
		1	0	0	0	
		1	0	0	0	
	5.	5				
0.	5	5				

- a) $1l = 100\ cl = 1\ 000\ ml$
- b) $1\ 000\ ml = 10\ dl = 1l$
- c) $55\ l = 5.5\ dal = 0.55\ hl$

Math Facts!

- In a conversion table the capacity measurements units are always written in conventional short form with small letters but read in full. (e.g. l = litre, cl = centilitre)
- In some contexts we write the capacity measurements in full eg: in word problems.
- When we convert from a big unit to the next smaller unit we multiply by 10 eg: 1hl = 10 dal.
- When we convert from a small unit to the next bigger unit we divide by 10, eg, 55l = 5.5dal = 0.55hl.

Application

Pupils in groups solve the following:

- 1) 5l =cl =.....dal
- 2) 10 dal =hl =.....l
- 3) 500 ml =dl =....l
- 4) 0.75hl =....dal =.....l
- 5) 4.5dal =....l =.....dl
- 6) A school tank contains 600 litres of water for caring for trees during drought. How many hectolitres (hl) are in the tank? Convert the answer into decalitres (dal).

Conclusion

Assessment

Using a conversion table, work out:

- 1) 85l = hl =.... dal =.... dl
- 2) 0.65l = dl =.... ml
- 3) 300cl =.... l =..... dal

Homework

Work out:

- 1) 1 000ml =l =dal
- 2) 2 hl=dal =.....dl
- 3) 50l =.... hl =..... dal = dl
- 4) A person drank 2 litres of drinking water per day. How many ml did he/she drink? How many cl?
Explain the importance of drinking clean water. Explain how we can keep our water clean so that it is safe for drinking.

Lesson 3

Addition of capacity measurements of whole and decimal numbers (up to 2 decimal places)

Topic area	Metric measurements
Unit 7	Capacity measurements
Key Unit competency	Convert between units of capacity and apply them in solving mathematical problems related to daily life situations.
Learning objectives	<p>By the end of this lesson, pupils will be able to :</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain the relationship between the units of capacity measurements. • Show the process of solving mathematical problems involving addition of capacity measurement units. <p>Skills:</p> <ul style="list-style-type: none"> • Convert capacity measurements accurately. • Apply the knowledge of addition in solving mathematical problems involving capacity measurements. <p>Attitude:</p> <ul style="list-style-type: none"> • Value the need for accuracy when carrying out capacity measurements. • Show respect to one another when working in groups.
Key words	Add, addition, plus, equal to...
Cross cutting issues	Environment and sustainability developed through discussing the importance of water.
Competences developed	<ul style="list-style-type: none"> - Communication in official languages developed through group discussions as well as explaining their answers. - Critical thinking developed through solving problems and applying what was learned in length measurement lessons to capacity measurements.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities....

Instructional objective

Using a conversion table, pupils will be able to add capacity measurement units of whole and decimal numbers (up to 2 decimal places) correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Capacity measurement units table drawn on Manila paper.

References

- Byamukama J.& Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45.
- Tom Roche.1984. Busy at Maths, P.155-157.
- Mwungeri E. et al. 2008. Mathematics: Pupils Book, P. 103-106.

Introduction/Review

Correction of homework.

Game: **How many cl?**

Development

Presentation

In pairs pupils solve the following problems using a conversion table of capacity measurement units:

Activity 1: Addition of capacity measurements

A car used 35 litres of fuel on Monday. On Tuesday it used 25.5 litres. How many litres did it consume altogether?

Answers:

hl	dal	l	dl	cl	ml
	3	5			
+	2	5.	5		
	6	0.	5		

$35l + 25.5l = 60.5l$

b) *Solution: The car used 60.5 l altogether.*

Activity 2: Addition of capacity measurements

A person drank a bottle of water of one litre from morning to noon and in the afternoon he/she drank a bottle of water of 50cl. How many litres of water did the person drink that day?

In pairs, pupils solve the problem and one pupil present on the board.

Answer:

a) *Calculation:*

- $50cl = 0.5 l$
- $1l + 0.5 l = 1.5 l$

hl	dal	l	dl	cl	ml
		1			
	+	0.	5		
		1.	5		

b) *Solution: On that day the person drank 1.5 l of water.*

Volunteers to:

- 1) Explain the difference between the first problem and the second problem. *(Answer: the first problem involved the same capacity measurement units (l) while the second one involves more than one unit (l and cl)).*
- 2) Explain the steps one needs to follow to solve both types of problems. *(Answer: When the units are the same, add the numbers as usual. When the units are different, convert first measurements units to the required unit by applying the rule of dividing or multiplying by 10 from a unit to the preceding one or from a unit to the next one, and then add as usual.)*

Math Facts!

- When we add the same capacity measurement units we add the numbers normally and we write the answer in front of the given unit.
- When we have to add capacity measurement units which are different we have to convert them first into the required unit and then we add them.

Application

Pupils in groups use a conversion table as necessary to work out:

- 1) $5\text{ l} + 500\text{ ml} = \dots\text{ l} = \dots\text{ dl}$
- 2) $15\text{ hl} + 10\text{ l} = \dots\text{ l} = \dots\text{ dl}$
- 3) $2.9\text{ dl} + 9.2\text{ ml} = \dots\text{ cl} = \dots\text{ ml}$
- 4) A diary sold 1 785 l in one week. In the following week it sold 1 432 l. How many decalitres did it sell in the two weeks?

Conclusion**Assessment**

Work out, using a conversion table as necessary:

- a) $5.5\text{ dal} + 28\text{ l} = \dots\text{ dal} = \dots\text{ l}$
- b) $500\text{ ml} + 10\text{ cl} = \dots\text{ l}$
- c) $3.5\text{ dal} + 10.5\text{ l} + 57\text{ dl} = \dots\text{ l}$
- d) A household consumed 3 244 litres of water in January. In February it used 4 002 litres. How many litres of water did it consume in the two months?

Homework

Work out, using a conversion table as necessary:

- a) $2\text{ hl} + 25\text{ dal} + 80\text{ dl} = \dots\text{ l}$
- b) $45\text{ l} + 5\text{ dal} = \dots\text{ dal} = \dots\text{ cl}$
- c) A doctor has prescribed to a child to take 5ml of syrup for cough in the morning, 5ml at noon and 5 ml in the evening.
 - i) How many ml does the child take every day?
 - ii) Why do you think the child has to take measured medicaments? Explain why the doctor's prescriptions must be respected.

Lesson 4**Subtraction of capacity measurements of whole and decimal numbers (up to 2 decimal places)**

Topic area	Metric measurements
Unit 7	Capacity measurements
Key Unit competency	Convert between units of capacity and apply them in solving mathematical problems related to daily life situations.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the relationship between the units of capacity measurements. • Show the process of solving mathematical problems involving subtraction of capacity measurement units. Skills: <ul style="list-style-type: none"> • Convert capacity measurements accurately. • Apply the knowledge of subtraction in solving mathematical problems involving capacity measurements. Attitude: <ul style="list-style-type: none"> • Value the need for accuracy when carrying out capacity measurements. • Show respect to one another when working in groups.
Key words	Subtract, subtraction, equal to, remain/remaining....
Cross cutting issues	Standardisation culture developed through respecting medical prescription.
Competences developed	Communication in official languages developed through group discussions as well as answering questions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities....

Instructional objectives

Using a conversion table, pupils will be able to subtract capacity measurement units of whole and decimal numbers (up to 2 decimal places) accurately, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Flash cards on which some solved exercises are written.

References

- Byamukama J.&Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45.
- Tom Roche.1984. Busy at Maths, 155-157.
- Mwungeri E. et al. 2008. Mathematics: Pupils Book, 103-106.

Introduction/Review

Correction of homework.

Development

Presentation

In groups pupils solve the following problems using a conversion table of capacity measurement units.

Activity 1: Subtraction of capacity measurement units

- 1) On Sunday a farmer produced 125 litres of milk. If she sold 115.5l, how many litres of milk did she keep for her family?
- 2) A tank contained 10 hectolitres of water. Children fetched 75 litres from it. Find the quantity of water that remained in the tank in litres. Express that quantity in decalitres (dal).
Some pupils present on the board how they came up with their answer.

Answers:

1) a) Calculations: $125\text{ l} - 115.5\text{ l} = 9.5\text{ l}$

hl	dal	l	dl	cl	ml
1	21	5 1/4	10		
-1	1	5.	5		
0	0	9.	5		

b) Solution: The farmer kept 9.5 l for his family.

2.

a) Calculations:

- $10\text{hl} = 1\ 000\text{l}$
- $1000\text{l} - 75\text{l} = 925\text{l}$

	hl	dal	l	dl	cl	ml
10	09	09	10			
-		7	5			
0	9	2	5			

b) Solution:

- The quantity of water that remained in the tank is 925 l.
- $925\text{l} = 92.5\text{ dal}$

Explanation: First convert hl to l. In the chart, l are 2 places to the right of hl. So add 2 zeroes to 10 to convert hl to l (or multiply by 100). So $10 \text{ hl} = 1\,000 \text{ l}$. Then subtract: $1\,000 \text{ l} - 75 \text{ l} = 925 \text{ l}$.

To convert l to dal, you need to move left one place in the conversion table. Move the decimal one place to left (divide by 10). So $925 \text{ l} = 92.5 \text{ dal}$.

Math Facts!

- When we subtract the same capacity measurement units we subtract the numbers normally and we write the answer in front of the given unit.
- When we have to subtract capacity measurement units which are different, we have to convert them first into the required unit and then we subtract them.

Application

Work out:

- 1) $10 \text{ hl} - 56 \text{ dal} = \dots \text{hl} = \dots \text{ dal}$
- 2) $50.5 \text{ l} - 45 \text{ dl} = \dots \text{l}$
- 3) $5 \text{ l} - 75 \text{ cl} = \dots \text{dl}$
- 4) A driver went on a journey having a full tank of 35 litres of fuel. Towards the end of the journey, he refilled the tank. It required 25.5 litres to refill it again.
 - a) How much fuel had he consumed?
 - b) Find the quantity of fuel that was left in the tank before he refilled it.
- 5) A large water bottle contains 1.5l of water. Your sister drinks 25cl and you drink 20cl of the water. How much water in litres, remains in the bottle? How many cl is this?

Conclusion

Assessment

Work out:

- a) $75 \text{ cl} - 150 \text{ ml} = \dots \text{cl}$
 - b) $5.75 \text{ l} - 17 \text{ dl} = \dots \text{l} = \dots \text{dl}$
 - c) $1\,000 \text{ ml} - 75 \text{ cl} = \dots \text{ml} = \dots \text{cl}$
- d) A bottle contains 500 ml of cough medicine. A child is given 1.5 cl. How many ml of medicine remain in the bottle? Additional question to discuss as a class: How do you know how much medicine to give to a child or to take when you are sick? *(It is important to follow the instructions of a doctor or a nurse and to read the instructions included when you buy medicine at the pharmacy. Taking too much medicine at once could make the person more sick. Taking too little medicine or not taking medicine according to the prescribed number of days will lessen the impact of the medicine on the sickness).*

Homework

Work out:

- a) $67 \text{ cl} - 50 \text{ ml} = \dots \text{ ml}$
 - b) $2.8 \text{ hl} - 150 \text{ l} = \dots \text{ dal}$
 - c) $67 \text{ dal} - 6.5 \text{ hl} = \dots \text{ dal} = \dots \text{ l}$
- d) A jerry can contains 20 litres of water. A person takes from it a glass of 500ml. The next person takes 1 500 ml of water from it. Find out the quantity of water left in the jerry can.

Lesson 5

Multiplication of capacity measurements units by whole numbers.

Topic area	Metric measurements
Unit 7	Capacity measurements
Key Unit competency	Convert between units of capacity and apply them in solving mathematical problems related to daily life situations.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Explain the relationship between the units of capacity measurements. Show the process of solving mathematical problems involving multiplying capacity measurement units. Skills: <ul style="list-style-type: none"> Convert capacity measurements accurately. Apply the knowledge of multiplication by a whole number in solving mathematical problems involving capacity measurement units. Attitude and values: <ul style="list-style-type: none"> Value the need for accuracy when carrying out capacity measurements. Show respect to one another when working in groups.
Key words	Multiply, multiplication, product, equal to.....
Cross cutting issues	Environmental and sustainability awareness is raised through having pupils discuss the importance of water.
Competences developed	<ul style="list-style-type: none"> Communication developed through answering questions. Critical thinking developed through solving problems involving multiplication of capacity measurements by a whole number. Cooperation developed through working in pairs and in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities....

Instructional objectives

Given capacity measurement units, pupils will be able to multiply capacity measurements by a whole number accurately, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

1 bottle of 1 litre and a small jerrycan of 5 litres, a bucket full of water.

References

- Byamukama J.& Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45.
- Tom Roche.1984. Busy at Maths, P. 155-157.
- Mwuengeri E. et al. 2008. Mathematics: Pupils Book, P. 103-106.

Introduction/Review

Correction of homework

Development

Presentation

In pairs pupils solve the following problem:

Activity 1: Multiplication of capacity measurement units

Select two pupils to fill a 5 l jerrycan with water by using a 500 ml bottle.

Other pupils count how many times they pour the 500ml bottle into the jerrycan of 5l to get it full. Write "5l =..." on the board and tell pupils, as individuals and then in pairs to complete the equation

(sentence).

Note: They should express 5l as an addition problem and then as a multiplication problem.

Some pupils to present on the board.

Answer:

a) Calculations:

- Using addition: $500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} + 500\text{ml} = 5\,000\text{ ml} = 5\text{ l}$.
- $500\text{ ml} \times 10 = 5\,000\text{ ml} = 5\text{ l}$

b) Solution: We have poured 10 times the 500 ml into the jerrycan of 5l to fill it.

Activity 2: Multiplication of capacity measurement units

The doctor has prescribed 5ml of syrup medicine 3 times a day to a child. Find out:

- How many ml does the child take every day?
- How many ml will he/she take in one week?
- How many cl will he /she take in one week?

One child presents on the board how they came up with their answers.

Answer:

a)

i) Calculations:

- Using addition: $5\text{ ml} + 5\text{ ml} + 5\text{ ml} = 15\text{ ml}$
- Using multiplication: $5\text{ ml} \times 3 = 15\text{ml}$

ii) Solution: The child takes 15 ml of syrup medicine per day.

b)

i) Calculations:

- Using addition: $15\text{ml} + 15\text{ml} + 15\text{ml} + 15\text{ml} + 15\text{ml} + 15\text{ml} + 15\text{ml} = 105\text{ ml}$
- Using multiplication: $15\text{ml} \times 7 = 105\text{ml}$.

ii) Solution: The child takes 105 ml of syrup medicine in one week.

c)

i) Calculation: $105\text{ ml} = 10.5\text{ cl}$

ii) Solution: The child takes 10.5 cl of syrup medicine per day.

Math Facts!

- When we multiply a capacity measurement unit by a whole number, we multiply the numbers and we write the answer before the unit.
- If it is required to convert the measurement units, we do it before or after multiplying.

Application

Pupils in groups work out the following:

- $15\text{ml} \times 7 = \dots\text{ml}$
- $40\text{hl} \times 3 = \dots\text{l}$
- $55\text{l} \times 4 = \dots\text{dal}$
- In a Hotel there are 10 tanks of 10 hl each full of water. How many litres of water does the Hotel have?

Conclusion

Assessment

Work out:

- $18\text{ l} \times 10 = \dots\text{dal}$
- $120\text{ dl} \times 20 = \dots\text{l}$
- $100\text{ dal} \times 6 = \dots\text{hl}$
- A car consumes 50 litres of fuel in one day. How much fuel does it consume in 30 days?

Homework

Work out

- $56\text{ l} \times 12 = \dots\text{ dal}$
- $100\text{ dal} \times 24 = \dots\text{ hl}$
- $8\text{ ml} \times 30 = \dots\text{ ml}$
- Four children fetched water from a tank to water trees. Each child used a jerrycan of 20 litres. Two of the four children fetched 2 jerrycans each and the other two children fetched one jerrycan each.
 - Find out the quantity of water they fetched.
 - What is the importance of water?

Lesson 6 Assessment of the unit

Topic area	Metric measurements
Unit 7	Capacity measurements
Key unit competence	Convert between units of capacity and apply them in solving mathematical problems related to daily life situations
Assessment criteria	Pupils are able to accurately, confidently and in given time, convert, add, subtract and compare capacity measurements through solving problems related to daily life situations.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities....

Assessment questions

20 marks

Question 1

Pupils solve the following:

- $20.5\text{ l} - 25\text{ dl} = \dots\text{ dl}$
- $0.5\text{ hl} + 5\text{ dal} = \dots\text{ dal}$
- $45\text{ l} \times 15 = \dots\text{ hl}$
- $(10\text{ hl} \times 10) + (800\text{ l} \times 3) = \dots\text{ hl} = \dots\text{ l}$
- $(567\text{ ml} - 42\text{ cl}) \times 7 = \dots\text{ ml}$

Question 2

Pupils solve the following problem:

A boarding school is expanding and will enroll 100 new students in the next school year. They estimate that every day they will use 15 000l of water. Currently they have 2 tanks of water that each holds 50hl of water.

- Are the two tanks enough to hold the water they will need each day? If not, how many tanks will they need? Explain your answer.
- During the dry season water gets delivered every 2 days instead of every day. How many tanks would you recommend that the school use all together to make sure there is enough water every day?
- Calculate how much water will be used in 3 days in litres and in hectolitres.

Unit 8: Mass measurements

Unit at glance

Topic area: Metric Measurement .

Key competence: Convert between units of mass and apply them in solving mathematical problems related to daily life situations

Lesson 1: Concept of mass measurements (estimating and measuring kg and g and extend to t)		Period 1	Period 2
Lesson 2: Reading, writing and converting mass measurements	Reading, writing and converting mass measurements (from t to mg) involving decimal numbers (up to 2 decimal places) and its application to daily life	Reading, writing and converting mass measurements (from t to mg) involving decimal numbers (up to 2 decimal places) and its application to daily life	Exercises on reading, writing and converting mass measurements (from t to mg) involving decimal numbers up to 2 decimal places and its application to daily life
Lesson 3: Addition and subtraction of mass measurements of whole and decimal numbers (up to 2 decimal places) and its application to daily life			
Lesson 4: Multiplication of mass measurements of whole numbers			
Lesson 5: Exercises and problems on addition, subtraction (involving decimals) and multiplication of mass measurements of whole numbers			
Lesson 6: Assessment of the unit	Assessment	Period 1	Period 2
			Feedback and remediation

Unit warm-up activities and games

- 1) **Which is heavier?** Say 2 mass measurement units and ask pupils which is heavier (e.g. 100 grams or 50 grams, 1 gram or 500 milligrams, 1 gram or 1 kilogram, etc).
- 2) **Which is lighter?** Say 2 mass measurement units as above and ask which is lighter.
- 3) **Which makes more sense?** Explain you are going to bake a cake (or give another example that uses mass/weight measurements). Pupils need to tell you which makes more sense – e.g. 125 kg of butter or 125 g of butter, 100 g or 100 cg of sugar, 20 g or 2 gm of salt, 150 g or 150 mg of flour, ...?
- 4) **What tool would you use?** Give an example of something related to capacity, length or mass and ask what tool or object could be used to measure it. e.g. water in a jug (measuring cup); weight of rice you are buying in the market (scale); length of a piece of wood (ruler or metre stick); etc.
- 5) **Which units?** Ask which units should be used to measure ... mass (kg, g, mg, etc), ... capacity (l, ml, dal...), ... length (m, cm, km, ...)
- 6) **Give an equivalent amount:** Give a unit of measurement and have pupils give an equivalent amount using a different unit. e.g. 5 kg (Possible answers: 5 000 g, 50 hg. Give measurements of mass but it can also be used for capacity and length.

Unit Lessons

Lesson 1

Concept of mass measurements (estimating and measuring kg and g and extending to t)

Topic area	Topic Area: Metric measurement
Unit8	Mass measurements
Key Unit competence	Convert between units of mass and apply them in solving mathematical problems related to daily life situations.
Learning objectives	<p>By the end of the lesson, pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • State the units of mass and relate them with objects they best measure. • Estimate the mass of different objects through observation. <p>Skill:</p> <ul style="list-style-type: none"> • Select and use the appropriate tool/ material to measure mass of different objects. • Read and write correctly units of mass measurements. • Convert accurately mass measurements between themselves. <p>Attitude and values:</p> <ul style="list-style-type: none"> • Appreciate the importance of mass measurements in daily life situations. • Show confidence when working out mass measurements. • Respect one another when working in groups and welcome their ideas as well. • Show the spirit of hard work in groups. • Value the need for accuracy when measuring masses.
Key words	Measurements, mass, kilogram (kg), dram (g), tonne (t).
Cross cutting issues	<ul style="list-style-type: none"> • Gender enhanced through assigning tasks in group activities and presentations. • Peace and values education developed through discussing in group and leading to consensus.

Competences developed	<ul style="list-style-type: none"> - Communication developed through presentations, reading, writing and speaking activities - Cooperation developed through working in pairs and groups. - Critical thinking developed through estimating the weight of different objects.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives	Using a weighing machine scale, pupils will be able to measure different objects in units of mass after estimating their weight accurately, confidently and in required time.		
Class setting/ organization	Outside: in semi-circle		
Materials	2 weighing scales, 0.5kg of beans, 1kg of stones, 1kg of used papers, an envelope full of used papers, 2kgs of potatoes, about 1 kg of small stones, 500g of sugar, 250 gr of salt.		
References	<ul style="list-style-type: none"> - Byamukama, J, al. L(2010).New Upper Primary Maths. Pupil's book for Grade 4. P. 66 - https://www.mathsisfun.com visited Thursday, October 20, 2015 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Review Game: 1) How many millimetres are in 2 liters? 2) How many $\frac{1}{2}$ liter containers can 2 000 millilitres fill?	Answer questions asked: 1) In a 2 litres there are 2 000 ml 2) Answer: (2 000 ml = 2 l \rightarrow 1 l = 2 one half liter containers \rightarrow 2 l = 4 one half liter containers)	Communication developed through playing games.
Development (25 minutes)	<ul style="list-style-type: none"> - Display the following on the table: 1kg of stones, 1kg of used papers, 1kg of potatoes - Display a scale on the table 	Pupils estimate the weight of the objects displayed and write the estimates in their notebooks. <ul style="list-style-type: none"> - Pupils, one by one, measure the different objects(1kg of stones, 1kg of used papers, an envelope full of used papers, 1kg of potatoes) using the scale while others observe and provide suggestions as needed. - Each pupil who has weighed an object using the scale writes the results on the board. 	<ul style="list-style-type: none"> - Cooperation developed through walking in pairs and groups. - Critical thinking developed through estimating the weight of different objects.

Display 500 g of sugar, 250 g of salt

Ask pupils types of weighing scales they know:

- Pupils compare their estimations and findings. They discuss if they were surprised that the paper weighed the same amount as the stones or potatoes and explain why the objects weighed the same.
- Pupils give examples of other objects that can be measured in kg (salt, cassava flour, maize, sorghum.....).
- Pupils estimate the weight of the displayed bags of sugar and salt and write it in their notebooks.
- Two pupils, one by one, measures sugar and salt using a scale while others observe and provide suggestions as needed.
- Pupils compare the findings and their estimations.
- Pupils give examples of other objects that can be measured in 500g, 250g (cassava flour, beans.....).
- Pupils imagine a big sack of beans and estimate its weight (100kg).
- Pupils estimate the weight of 10 sacks of 100kg of beans (1 000kg).
- What is the unit of mass that corresponds to 1 000 kg? (tonne (t)).
- Pupils give examples of objects that can be measured in tonnes (coffee, tea, rice, sorghum..., potatoes...).
- Pupils give types of weighing scales: beam balances , baby scale, spring balances, weight balances, electronic balance ...).



	<p>Summary Help pupils to draw conclusions on the concept of mass measurements</p>	<p>- Pupils in pairs respond to the following questions:</p> <p>a) Which object do we use to measure mass?(weighing scale)</p> <p>b) What are the units of mass learnt? These are the most common measurement units:</p> <ul style="list-style-type: none"> • Grams (g) • Kilograms (kg) • Tonnes (t) 	
	<p>Application Distribute 2 weighing scales to 2 groups of pupils and objects to be measured.</p>	<p>1) Pupils in 2 groups estimate and measure the following objects: Stones, beans, salt, potatoes....</p> <p>Then they compare their estimations and findings.</p> <p>2) Pupils say objects that can be measured in tonnes (cars)</p>	<p>Critical thinking developed through estimating the weight of different objects.</p>
<p>Conclusion (10 min)</p>	<p>Assessments</p> <ul style="list-style-type: none"> - Write assessment questions on the board. - Find 2 scales and place an object on each. Pupils will come up, one by one, and read the weight. Those at their seats continue with the other questions. 	<p>1) Pair after pair read the weight of the objects on the scales at the front of the room. They write down their answers. While at their seats, they continue with the remaining assessment questions.</p> <p>2) Respond by true or false</p> <ul style="list-style-type: none"> a) Kankindi’s baby weighs 50kg at birth. b) Kalisa’s car weighs 50kg. c) Manzi’s mother weighs 5 kg. d) One sack of sugar weighs 50g. e) A man can carry 500kg on his head. f) An adult person weighs one tonne. <p>3) What is the tool used for measuring weight?</p> <p>4) What are the mass units you have learnt?</p>	<p>Critical thinking developed through finding if a statement is true or false.</p>
	<p>Homework Write homework questions on the board.</p>	<p>Pupils answer the following:</p> <p>1) Pupils to estimate their weight. If a scale is available, weigh yourself.</p> <p>2) Answer by true or false:</p> <ul style="list-style-type: none"> a) A person consumes 500g of sugar for breakfast. b) A mosquito weighs 1kg. c) A pen weighs 250g. d) One litre of water weighs 1 kg. e) One big sack of potatoes weighs 100kg. 	<p>Critical thinking developed through finding if a statement is true or false.</p>

Lesson 2

Reading, writing and converting mass measurements (from t to mg) involving decimal numbers (up to 2 decimal places)

Topic area	Topic Area: Metric measurement
Unit 8	Mass measurements
Key Unit competence	Convert between units of mass and apply them in solving mathematical problems related to daily life situations.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain how to read and write mass measurement units. • Recognize the relationship between the units of mass measurements. Skills: <ul style="list-style-type: none"> • Read and write correctly units of mass measurements. • Convert accurately mass measurements between themselves. Attitude and values: <ul style="list-style-type: none"> • Show confidence when working out mass measurements. • Appreciate the importance of mass measurements in daily life situations.
Key words	Quintal, decigram, centigram, milligram.
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning tasks in group activities and presentations. - Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> - Cooperation developed through working in pairs and groups. - Critical thinking developed through applying what was learned in the capacity and length lessons regarding conversion tables to mass measurements.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Reading, writing and converting mass measurements (from t to mg) involving decimal numbers up to 2 decimal places)

Instructional objective

Using a conversion table, pupils will be able to convert mass measurement units involving decimal numbers (up to 2 decimal places) as well as read and write them correctly, confidently and in required time.

Class setting/organization

Arrange desks so that pupils can work

individually, in pairs or in small groups.

Materials

Conversion table

References:

Arineitwe G, Understanding mathematics 94 -95
<http://www.mathisfun.com/elementary-math.html> visited Thursday, October 20, 2015

Introduction/ Review

Correction of homework.

Game: **What tool would you use?**

Development

Presentation

Activity 1: Pupils answer the following questions:

1) Which mass measurement units did we use or talk about in the previous lesson?

Possible answers: *t, kg, g*

2) What are the other mass measurement units you know or have heard being used in the market, in the news, at home, etc.?

Possible answers: *quintals (q), milligrams (mg), centigrams (cg)...*

Some pupils present their responses on the board.

Together the class read aloud the units written on the board. Ask if there are any other units they have heard of. (**Answer:** *hectogram, decagram, decigram*).

3) Pupils write the names of the mass units that are on the board in full in their notebooks. Some pupils to present on the board.

Answers:

- t = tonne*
- q = quintal*
- kg = kilogram*
- hg = hectogram*
- dag = decagram*
- g = gram*
- dg = decigram*
- cg = centigram*
- mg = milligram*

4) Ask pupils to think back to the conversion tables used during the lessons on capacity and length. Based on that, what do they think the conversion table should look like for mass? Pupils work in pairs to figure it out. What is the difference between the values of each column? (**Answer:** *Each column is 10 times greater than the column to its right and ten times smaller than the unit at its left.*)

5) Pupils work in pairs do the following exercises using a conversion table:

- a) $1t = \dots \text{kg}$
- b) $1\text{kg} = \dots\text{g} = \dots\text{q}$
- c) $1\text{g} = \dots\text{mg}$
- d) $1\text{g} = \dots\text{cg}$
- e) $35\text{g} = \dots\text{hg}$

t	q	tens of kg*	kg	hg	dag	g	dg	cg	mg
1	0	0	0						
	0.	0	1						
			1	0	0	0			
					0.	1			
						1	0	0	0
						1	0	0	
				0.	3	5			

* There is not a unit for the tens of kilogramme column but we put a place for it in the conversion table.

Answers:

- a) $1t = 1\,000\text{kg}$
- b) $1\text{kg} = 1\,000\text{g} = 0.01\text{q}$

- c) $1\text{g} = 1\,000\text{mg} =$
- d) $1\text{g} = 100\text{cg} = 0.1\text{dag}$
- e) $35\text{g} = 0.35\text{kg}$

Math Facts!

- One mass measurement unit is ten bigger than the following. For example, $1\text{g} = 10\text{dg}$. It would take 10decigrams to make a single gram. A gram is ten times bigger than a decigram.
- When converting from a larger unit to a smaller unit, multiply by 10 for each unit (or move to the right the number of times it takes to reach that unit. e.g. $2\text{kg} = 2\,000\text{g}$ (move to the right 3 columns).
- When converting from a smaller to a larger unit, do the opposite – divide by 10's or move the decimal point to left the appropriate number of times. e.g. $35\text{g} = 0.35\text{hg}$

Application

Pupils work out the following individually and then in pairs:

- 1) $10\text{cg} = \dots\text{mg}$
- 2) $50\text{hg} = \dots\text{dag} = \dots\text{g}$
- 3) $70\text{dg} = \dots\text{cg} = \dots\text{mg}$
- 4) $21\text{t} = \dots\text{q} = \dots\text{kg}$
- 5) Muhorakeye's mother had 15 kg of sugar. How many q did she have?

Review answers as a class.

Explain how to use the conversion table when changing from tonnes to quintals to kilograms (see table above with asterisk). There is not a unit for the tens of kilogramme column but we put a place for it in the conversion table.

Conclusion

Assessment

Pupils convert the following:

- 1) $5\,500\text{g} = \dots\text{dag} = \dots\text{kg}$
- 2) $25\text{kg} = \dots\text{dag} = \dots\text{g}$
- 3) $31\text{hg} = \dots\text{dg}$
- 4) $50\,000\text{dg} = \dots\text{kg}$
- 5) A hen eats 200 g of maize flour every day. How many decigrams does it eat?

Homework

Work out the following:

- 1) $112\text{cg} = \dots\text{dg}$
- 2) $34\text{dg} = \dots\text{cg} = \dots\text{mg}$
- 3) $20\text{q} = \dots\text{kg} = \dots\text{hg}$
- 4) $3\,000\text{dag} = \dots\text{kg} = \dots\text{t}$
- 5) $53\text{t} = \dots\text{q} = \dots\text{kg}$
- 6) A seller sold 95 000kg of white flour. How many tonnes did he sell?

Topic area	Topic Area: Metric measurements
Unit:8	Mass measurements
Key Unit competence	Convert between units of mass and apply them in solving mathematical problems related to daily life situations
Learning objectives	<p>By the end of the lesson, pupils will be able to:</p> <p>Knowledge</p> <ul style="list-style-type: none"> • Recognize the relationship between the units of mass measurements. • State the rule of how to convert between units of mass measurements. • State the process of how to add or subtract different units of mass measurements. <p>Skill</p> <ul style="list-style-type: none"> • Apply the knowledge of addition or subtraction by solving mathematical problems involving mass measurements. • Convert between units of mass and then add or subtract. <p>Attitude and values</p> <ul style="list-style-type: none"> • Appreciate the importance of mass measurements in daily life situations. • Show confidence when working out mass measurements. • Respect one another when working in groups and welcome their ideas as well.
Key words	Measurement; mass; add; subtract; equal to.
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning task in group activities and presentation. - Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering activities. - Cooperation developed through working in pairs and in groups. - Critical thinking developed through converting, adding and subtracting mass units. - Problem solving developed when trying to balance a scale with objects that have measurements provided in different units.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives

Using a table pupils will be able to add and subtract mass measurements of whole and decimal numbers correctly, confidently and in required time.

References:

Arineitwe G, Understanding mathematics 96 -99
<http://www.mathisfun.com/elementary-math.html> visited Thursday, October 20, 2015

Introduction/Review

Correction of homework.

Game: **Which makes more sense?**

Development

Presentation

Pupils work in pairs to solve the following problems:

Activity 1: Addition of mass measurements

A mother cooked 2kg of rice for lunch and she cooked 1kg and 500g of rice for supper. How many grams of rice did she cook on that day?

One of the pairs solves it on the board and explains the process they used.

Answer:

1) *First convert the units so that they are all the same. Convert kg to g.*

kg	hg	dag	g	dg
2	0	0	0	
1	0	0	0	
	5	0	0	
3	5	0	0	

2kg = 2 000g

1kg = 1 000g

500g

2) *Once the units are the same, add the amounts together.*

i) *Calculations:*

$$2000\text{ g} + 1\ 000\text{g} + 500\text{ g} = 3\ 500\text{ g}$$

ii) *Solution:*

The mother cooked 3 500g of rice that day.

Activity 2: Subtraction of mass measurements

You need to balance a scale that has 2 sides. The left side has objects that weight 3kg and 800 g. The right side has a 3 500 g object. How much more weight do you need to add to balance it?

One of the pairs solves it on the board and explains the process they used.

(Note to teacher: If you have a scale you can use it to demonstrate, that would be ideal.)

Answer:

First, convert all units to grams. So the left side has: 3 000 g + 800 g = 3 800 g.

The right side has 3 500 g.

a) Calculations:

$$3\,800\text{g} - 3\,500\text{g} = 300\text{g}$$

b) Solution:

It will take 300g to balance the scale.

Teacher asks pupils to say what must be done when adding or subtracting different units of mass based on the two problems. (**Answer:** They must convert them first)

Math Facts!

- When adding or subtracting different units of mass, it is necessary to convert them to the required units first.

Application

In small groups, pupils do the following:

- 1) $2\text{ kg} - 300\text{ g} = \dots\text{g}$
- 2) $50\,000\text{ dg} + 4\text{ kg} = \dots\text{g}$
- 3) $1\,014\text{ kg} + 5\text{ t} = \dots\text{kg}$
- 4) In a basket there are 10 kg of mangoes and 3 000 g of avocados. How many kg of fruits are there altogether?
- 5) A cooperative harvested 64 t of maize. If they planted 180 kg and they sold 35 000 kg, how many tonnes did they remain with?

Conclusion

Assessment

Work out the following:

- 1) $700\text{g} - 1\,900\text{mg} = \dots\text{g}$
- 2) $330\text{dag} + 51\text{kg} = \dots\text{g}$
- 3) $8\,000\text{kg} + 5\text{t} = \dots\text{kg}$
- 4) $30\text{t} - 450\text{hg} = \dots\text{kg}$
- 5) A truck is loaded with 8 200kg of beans, 3 500kg of soy beans, 4 300 kg of peas. How many tonnes of crops is the truck carrying?

Homework

Work out the following:

- 1) $20,000\text{kg} - 300\text{q} = \dots\text{t}$
- 2) $22\text{hg} + 35\text{ kg} = \dots\text{kg}$
- 3) $77\,000\text{kg} - 12\text{t} = \dots\text{kg}$
- 4) A bakery purchased 3 850 kg of white flour. It used 1.5 t for producing bread. How many kg of white flour were remained?

Lesson 4 Multiplication of mass measurements by a whole number

Topic area	Topic Area: Metric measurements
Unit 8	Mass measurements
Key Unit competence	Convert between units of mass and apply them in solving mathematical problems related to daily life situations

Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Recognize the relationship between the units of mass measurements State the rule of how to convert between units of mass measurements State the process of how to multiply different units of mass. Skill: <ul style="list-style-type: none"> Apply the knowledge of multiplication by a whole number in solving mathematical problems involving mass measurements Convert between units of mass and then multiply Attitude and values: <ul style="list-style-type: none"> Appreciate the importance mass measurements in daily life situations. Show confidence when working out mass measurements. Respect one another when working in groups and welcome their ideas as well.
Key words	Measurements; mass; maximum; weight.
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning tasks in group activities and presentation. Peace and values education developed through discussing in group and leading to consensus. Financial education developed through discussing the importance of planning ahead (estimating number of customers and how much food will be needed) in a business so one doesn't lose customers.
Competences developed	Problem solving developed when trying to work out problems that have multiple steps.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives

Using conversion tables pupils will be able to multiply mass measurements of whole numbers correctly, confidently and in required time.

Materials

Multiplication table; Manila paper; conversion table

References

Arineitwe G, Understanding mathematics 100
<http://www.mathisfun.com/elementary-math.html> visited Thursday, October 20, 2015

Introduction/ Review

Correction of homework.

Math games: Give an equivalent amount

Development

Presentation

Pupils work in pairs to solve the following problem:

Activity 1: Multiplication of mass measurements by a whole number

There are 15 packets of rice. Each packet weights 2kg. What is the total weight of the rice in g?
 One pair to solve it on the board.

Answer:

- a) Calculations: $2\text{ kg} \times 15 = 30\text{ kg} = 30\text{ 000g}$
- b) Solution: There are 30 000g in 15 packets.

Activity 2: Multiplication of mass measurements by a whole number

A ferry can hold 21 tonnes of weight. If 9 cars, each weighing 2 000kg, are already on the ferry, can a 10th car get on too? If so, what can be its maximum weight? Explain your answer.

One pair solves the problem on the board and explains to the class the process used.

Answer:

First convert the kg to tonnes. 2 000 kg = 2t. Then multiply this by 9. So the cars weigh 18 tonnes.

Another car could therefore fit on as long as it was no more than 21t – 18t = 3t.

Teacher asks pupils if they have ever seen a ferry or a vehicle overloaded. What are the dangers in this? Why does it happen and how can it be prevented?

Answer:

Overloading ferries can be dangerous because it can cause an accident such as the ferry sinking.

Overloaded vehicles can be unsafe in different ways – not enough room for passengers to safely sit, the vehicle can become damaged because of too much weight and cause an accident, etc. It can happen for different reasons – owners and drivers needing/wanting the money, lack of sufficient means of transport in some places, etc. It can be prevented by creating awareness of the potential dangers and costs and enforcing the rules.

Teacher asks pupils: What do we need to consider when multiplying units of mass by a whole number?

Math Facts!

- When multiplying units of mass by a whole number, we multiply the numbers and re-write the units.
- When the answer is required in a different unit, we first do the multiplication and then we convert or we first convert and then multiply.

Application:

In groups, pupils work out the following:

- 1) 17 kg × 7 =kg
- 2) 204 dag × 3 = ...g
- 3) A restaurant ordered 8 tins of powder milk. Each tin weighed 12kg. How much did the 8 tins weigh in g?
- 4) A restaurant typically serves 100 dinners a night. If 1 kg of rice typically serves 10 people, and the restaurant has 9 000 g of rice, will there be enough for 100 people? Why is it important for a restaurant to do such calculations?

Conclusion**Assessment:**

- 1) 733mg × 10 =g
- 2) 270kg × 5 =kg
- 3) 4t × 12 =kg
- 4) A building company bought 356 sacks of cement. If each sac weighs 50 kg, how many tonnes of cement are there?

Homework

Solve the following:

- 1) 1 950g × 8 =kg
- 2) 201kg × 15 =t
- 3) 2001dg × 21 =g
- 4) A school consumes 155 kg of maize flour every day. How many tonnes will be consumed after 14 days?

Lesson 6 Assessment of the unit

Topic area	Metric measurements
Unit 8	Mass measurements
Key unit competence	Convert between units of mass and apply them in solving mathematical problems related to daily life situations
Assessment criteria	Pupils are able to accurately, confidently in given time convert, add, subtract and multiply mass measurements through solving problems related to daily life situations.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing, take into consideration different abilities and needs of slow, gifted, talented learners and pupils with disabilities; e.g: pupils with writing problems, pupils with visual impairments, pupils with hearing impairment,...

Assessment questions

20 marks

Pupils to work out the following:

Question 1)

Solve the following:

- $9t - 70kg = \dots kg$
- Nyiramatungo's eraser has a mass of 20 grams. How many milligrams does the eraser weigh?

Question 2)

Mary the baker has been hired to bake cakes for a large party that will have 200 guests attending.

She has a cake recipe that will serve 10 people. The ingredients include:

- 225 g butter
 - 125 g sugar
 - 200 g flour
 - 4 g salt
- a) Mary wants your help to calculate the amount of ingredients she will need for 200 people.
- butter: _____
 - Sugar: _____
 - flour: _____
 - Salt: _____

Mary has some ingredients in the store but not enough of everything. She has:

- 2 kg butter
 - 250 dag sugar
 - 40 000 cg flour
 - 9 000 mg salt
- b) For each ingredient, help her decide if she has enough or if she needs to buy more. If she needs to buy more, calculate the amount she should buy. Fill in the table with your responses. Show your calculations.

Ingredient in store	Enough or not enough?	If not enough, how much more is needed?
i) 2 kg butter		
ii) 250 dag sugar		
iii) 40 000 cg flour		
iv) 9 000 mg salt		

Unit 9: Area and land measurements

Unit at glance

Topic area: Metric Measurement .

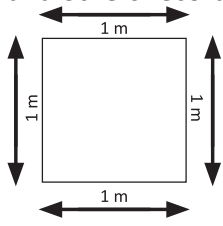
Key competence: To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems.

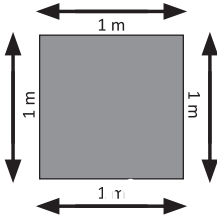
	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6
Lesson 1: Area measurement units	The concept of square unit: meter square (m^2)	The concept of area measurements (from km^2 to mm^2)	Reading and writing units of area measurements	Converting units of area measurements and its application to daily life	Exercises on converting units of area measurements and its application to daily life	Comparing area measurements units and arranging them in ascending and descending order
Lesson 2: Land measurement units and its relationship with area measurement	Period 1 - The concept of land measurements (ha, a, ca) - Relationship between units of area and land measurements	Period 2 Reading, writing and converting land measurements	Period 3 Word problems and exercises on conversion of area units to land units (vice versa)	Period 4 Comparing units of area and land measurements (using word problems)	Period 5 Exercises and word problems on comparing units of area and land measurements of whole and decimal numbers	
Lesson 3: Addition of Area and land measurements	Period 1 Addition of units of area and land measurements of whole and decimal numbers and its application to daily life (problems)			Period 2 Word problems and exercises on addition of units of area and land measurements of whole and decimal numbers and its application to daily life		
Lesson 4: Subtraction of area and land measurements	Period 1 Subtraction of units of area and land measurements and its application to daily life (problems)			Period 2 Word problems and exercises on subtraction of units of area and land measurements		
Lesson 5: Calculating area of rectangle (informally)	Period 1 Calculating the area of a rectangular piece of land (without using formula and using formula)			Period 2 Word problems and exercises on area of a rectangular piece of land (without using formula and using a formula)		
Lesson 6: Revision of the unit						
Lesson 7: Assessment of the unit	Period 1 Assessment			Period 2 Feedback and remediation		

Lesson 1 Area measurement units

Topic area	Metric Measurements
Unit 9	Area and land measurements
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems.
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain the concept of square units. • State the units of area measurements. • Establish the relationships between the units of area measurements. • List the units of area and land measurements in ascending and descending order. • Read and write correctly units of area measurements. <p>Skills:</p> <ul style="list-style-type: none"> • Practically, differentiate measurements of area from measurement of length (through measuring lengths and areas) • Convert, add, subtract or compare area measurements. <p>Attitude:</p> <ul style="list-style-type: none"> • Appreciate the importance of measurements of area in daily life. • Show concern on how to use properly different area measurements in daily life situations.
Key words	Square, square units
Cross cutting issues	<ul style="list-style-type: none"> - Environment developed through discussing the importance of planning trees in the school compound. - Peace education development through discussions in groups leading to consensus. - Gender balance developed through real life examples and assigning equal roles in groups. - Financial education developed through activities related to discussing the importance of coffee for the development of a country.
Competences developed	<ul style="list-style-type: none"> - Communication developed through reading and writing area measurements as well as using comparison terms. - Cooperation developed through working in pairs and groups. - Critical thinking and problem solving developed through analyzing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed, and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities.

Instructional objectives	Given a situation pupils will be able to measure and recognize a square unit accurately, confidently and in a given time.
Class setting/ organization	<ul style="list-style-type: none"> - Organize pupils in groups of 4 so that they can measure and record. - Make sure each group is mixed in terms of gender.
Materials	Meter rulers, manila paper of 1 m each (to be used for measuring), chart.
References	<ul style="list-style-type: none"> - Busy at Math Rang 5, P22. - http://wwwmathisfun.com - http://wwwmathgodies.com

Steps / Timing	Teacher's activity	Pupils' activity	Generic competences and cross cutting issues to be addressed							
Introduction (5min)	Asks questions about length measurements.	<p>Answer questions about length measurement units:</p> <p>Question 1 What is the instrument we can use to measure the sides of our class? Answer: <i>To measure the sides of our class we use a meter ruler.</i></p> <p>Question 2 What is the standard unit of length? Answer: <i>The standard unit of length is the meter.</i></p> <p>Question 3 Using a table write units of length measurements. Answer: <i>The different units of length measurement are:</i></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>km</td> <td>hm</td> <td>Dam</td> <td>m</td> <td>dm</td> <td>cm</td> <td>mm</td> </tr> </table>	km	hm	Dam	m	dm	cm	mm	
km	hm	Dam	m	dm	cm	mm				
Development (25 min)	<p>Presentation</p> <ul style="list-style-type: none"> - Put pupils in groups of 4. - Give a meter ruler to one pupil in each group of 4. - Give each group a manila paper to be measured. - Guide pupils to measure. <p>Asks the name of the manila shape.</p>	<p>One pupil in each group measures and others record.</p>  <p>Basing on dimensions of the manila shape, pupils give the name of the shape. <i>(Answer: The name of the manila shape is a square).</i></p>	<ul style="list-style-type: none"> - Cooperation developed through working as a team. - Critical thinking developed through problem solving and measuring and recording data. 							

	<p>Help pupils to show the region enclosed by a square of 1m a side.</p> <p>Summary: Facilitate pupils to draw conclusions on the concept of square unit (m^2)</p> <p>Application Take pupils out of the class give them instructions, guide them to measure and answer questions.</p>	<p>The region enclosed by a 1m square is a metre square:</p>  <p>Pupils conclude that a square metre is a surface which is enclosed by a square of 1 metre on each side. In Math, metre square is written as m^2.</p> <p>Pupils measure a square of 2 meters on each side. Then they divide it into 4 equal parts.</p> <p>i) What is the length of the side of each part? ii) How many square of 1 meter square did you find?</p>	<ul style="list-style-type: none"> - Communication developed through discussing while measuring. - Peace and values developed through discussions in groups leading to consensus. - Gender developed through assigning equal roles to males and females. - Critical thinking developed through discovering the surface area of a square. - Critical thinking developed through finding the number of 1 metre squares which are within the given square.
<p>Conclusion (10 minutes)</p>	<p>Assessment Write assessment questions on the board.</p>	<p>Assessment Amina would like to plant orange fruits in her field of 4 meters each side. Each orange fruit must be planted in $1m^2$. How many orange fruits is she going to plant?</p>	<p>Critical thinking developed through solving word problems.</p>
	<p>Homework Write homework questions on the board.</p>	<p>Homework Peter has a plot whose shape is a square with 50 m of side. He wants to build 4houses on equal area. What is the area occupied by each house? If he rents a house 20 000 Frw per month, how much does he make?</p>	

Instructional objectives

Given a shape pupils will be able to calculate the area in a given unit correctly, confidently and in given time.

Materials

Manila paper, meter ruler, tape measure, rope, sticks, squared papers.

References

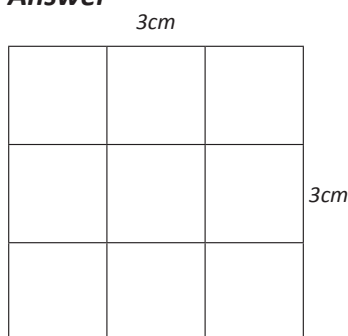
- Tom Roche. 1984. Busy at Maths, P.30.
- websites: <http://www.mathisfun.com>;
- www.elementary-math.html,
- www.Math.schoolspecialty.com

Introduction/review

Correction of homework.

Development**Presentation****Activity 1: Calculation of the area of a square**

Pupils work in pairs to draw a square of 3cm a side. After, they divide it into sub-squares of 1cm a side. They then give the general rule of calculating the surface area of a square using the number of sub-squares of a unit side.

Answer

Divide each side of a square into 3 equal parts. Connect the points with straight lines.

The total numbers of sub-squares is equal to the number of sub-squares on the horizontal side times the number of sub-squares on the vertical side.

From the figure above, we see that the total number of sub-squares of a unit side is equal to $3 \times 3 = 9$. The surface area of the square is then the number of sub-squares times 1cm^2 . That is, the surface area of a square of a 3cm a side is 9cm^2 .

Activity 2: Calculation of the area of a square

How many sub-squares of one dm a side can we divide into a square of 20 dm a side? Calculate the area of the square.

Answer

The total number of sub-squares of 1 dm a side which are in the square of 20 dm a side is the number of the sub-squares on the horizontal line times the number of sub-squares on the vertical line.

Calculations: $1\text{ dm}^2 \times 20 \times 20 = 400\text{ dm}^2$

Solution: the area of the original square is 400 dm^2 .

From this example, pupils find that the units of the area of a square depend on the units of its sides. Therefore, if the unit of the sides is:

- *mm the unit of the area is mm^2*
- *cm the unit of the area is cm^2*
- *dm the unit of the area is dm^2*
- *m the unit of the area is m^2*
- *dam the unit of the area is dam^2*
- *hm the unit of the area is hm^2*
- *km the unit of the area is km^2*

Note: The area of a square is big if its sides are long. Hence

km^2	hm^2	dam^2	m^2	dm^2	cm^2	mm^2
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Math Facts!

- To calculate the surface area of a square, we count the number of unit sub-squares in it times a unit square.
- The total numbers of sub-squares is equal to the number of sub-squares on the horizontal side times the number of sub-squares on the vertical side.

Application

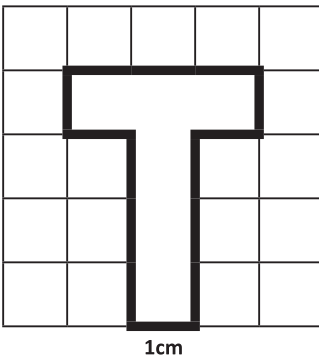
In small groups, pupils solve the following:

A field of cassava has shape of a square of 20dam for each side. Find the area of the field.

Conclusion

Assessment

How many square units does the following shape cover?



Homework

Paul would like to sell a small part of his land. If the part he would like to sell is a square of 10 m a side, how much will he get if a square meter is 600 Frw?

Period 3

Reading and writing units of area measurements

Instructional objectives

Given area measurement units, pupils will be able to read and write them accurately, confidently and in given time.

Materials

Manila paper, scotch, scissors.

References

- Tom Roche. 1984. Busy Math, P33.
- www.mathisfun.com;
- www.elementary-math.html,
- www.Math.schoolspecialty.com

Introduction/review

Correction of homework.

Development

Presentation

Asks pupils questions related to a square and a square unit.

Activity 1: Definition of a square unit

- (i) What is a square?
- (ii) What is a square unit?

Answer:

- (i) A square is a figure with 4 equal sides and 4 right angles.
- (ii) A square unit is a unit of area for various length unit of a side. For example if the length unit is centimetre, the square unit is centimetre square.

Activity 2: Writing square units in short and in full and reading them

Pupils work in pairs and write in full and in short the square units and discuss how they read them. Some pupils present on the board.

Answer:

Depending on the length unit of a side of a square, the square units are: square kilometre, square hectometre, square decametre, square metre, square decimetre, square centimetre and square millimetre.

The square units can be written in short and in full as follows:

km² : square kilometre or kilometre squared

hm² : square hectometre or hectometre squared

dam² : square decametre or decametre squared

m² : square metre or metre squared

dm² : square decimetre or decimetre squared

cm² : square centimetre or centimetre squared

mm² : square millimetre or millimetre squared

Activity 3: Writing area measurements in full

Write in full the following:

- a) 20 hm²
- b) 12 cm²

Answer:

- a) Twenty hectometre squared.
- b) Twelve centimetres squared.

Math Facts!

- We read and write the unit of area depending on the length unit of a side.
- Area measurement units are always written in short form but they are always read in full.
- Area measurement units are always written in small letters.
- When area measurement units are preceded by a number we read and write the number as it is read / written and then we proceed with measurement units.

Application

In small groups pupils write in full and discuss how to read the following:

- a) 15 cm²
- b) 35 dm²
- c) 100 dam²

- d) 150 hm²
- e) 10 km²

Conclusion

Assessment

Pupils write in full and read the following:

- a) 20 204 mm²
- b) 250 dam²

Homework

Write in words the following:

- a) 56 mm²
- b) 63 m²
- c) 257 dm²
- d) 77 mm²
- e) 37 dam²
- f) 180 hm²

Period 4 > Converting units of area measurements

Instructional objectives

Given area measurement units pupils will be able to convert them correctly, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Square measurement units, conversion table, manila paper, marker, scotch.

References

- Tom Roche.1984. Busy at Maths,
- websites: <http://www.mathisfun.com>; www.elementary-math.html
- www.Math.schoolspecialty.com

Introduction/review

Correction of homework.

Development

Presentation

In groups, teacher helps pupils to find the relationship between area units by asking questions about comparison of area units.

Activity 1: Converting area measurement units

Pupils work individually to solve the following:

- a) Find the area of a square of 1m a side.
- b) Give the answer in dm², cm².
- c) Compare the results in a) and b).
- d) Mutoni has a squared piece of land which has 30 m of side.
 - i) How many metre squares does she have?
 - ii) How many dam² does she have?
 - iii) How many hm² does she have?

Some pupils present on the board.

Answer:

- a) *The area of the square is $(1 \times 1) \times 1m^2 = 1m^2$*
- b) *We first convert m into dm, cm. Thus $1 m = 10 dm = 100 cm$. Therefore, the area in dm² is $(10 \times 10) \times 1 dm^2 = 100 dm^2$. The area in cm² is $(100 \times 100) \times 1 cm^2 = 10\,000 cm^2$.*
- c) *Comparing the area of the same square in m², dm², cm², we find that the area of a square from a*

unit to the next is a hundred times bigger.

Thus, $1\text{m}^2 = 100\text{dm}^2 = 10\,000\text{cm}^2$.

To move from a unit to the next unit, multiply that unit by 100. Therefore:

$$1\text{km}^2 = 100\text{hm}^2$$

$$1\text{hm}^2 = 100\text{dam}^2$$

$$1\text{dam}^2 = 100\text{m}^2$$

$$1\text{m}^2 = 100\text{dm}^2$$

$$1\text{dm}^2 = 100\text{cm}^2$$

$$1\text{cm}^2 = 100\text{mm}^2$$

Using the conversion table, we have:

km ²		hm ²		dam ²		m ²		dm ²		cm ²		mm ²		
1	0	0												$1\text{km}^2 = 100\text{hm}^2$
		1	0	0										$1\text{hm}^2 = 100\text{dam}^2$
				1	0	0								$1\text{dam}^2 = 100\text{m}^2$
						1	0	0						$1\text{m}^2 = 100\text{dm}^2$
								1	0	0				$1\text{dm}^2 = 100\text{cm}^2$
										1	0	0		$1\text{cm}^2 = 100\text{mm}^2$

d) i) Calculations: $30 \times 30 = 900$

Solution: Mutoni has a land of 900m^2 .

ii) Calculations: $900\text{m}^2 = 9\text{dam}^2$ (see table below)

Solution: Mutoni has a land of 9dam^2 .

iii) Calculations: $900\text{m}^2 = 0.09\text{hm}^2$ (see table below)

Solution: mutoni has a land of 0.09hm^2 .

km ²		hm ²		dam ²		m ²		dm ²		cm ²		mm ²	
				9	0	0							
		0.	0	9	0	0							

Math Facts!

- To convert are measurements units using a table, complete with zeros the empty place up to the last column of the required unit (bearing in mind that each unit is 100 bigger than the other unit so from a unit to another we multiply 100).
- To convert a smaller square unit into a bigger unit we divided by 100.

Application

In small groups pupils solve the following:

Karake and Mahoro must share a land of 8.5dam^2 , if they must get equal parts how many dm^2 each will get?

Conclusion

Assessment

To have a farm for 10 cows, you need $65\,400\text{m}^2$. How much area do you have in hm^2 ?

Homework

If our class has a shape of a square of 10m a side. Express the surface covered by our class in

(i) dam^2

(ii) dm^2

Instructional objectives

Using a conversion table, pupils will be to compare and arrange units of area measurements correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Conversion table of area measurement units

References

- Tom Roche.1984. Busy at Maths.
- websites: <http://www.mathisfun.com>; www.elementary-math.html
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Development**Presentation**

Asks questions about the comparison between unit of length and unit of area

Pupils know that hm is greater than dam, then, hm^2 is greater than dam^2 . Moreover dam is greater than m hence, dam^2 is greater than m^2 . Therefore, the unit of area is big or small depending on the unit of the side of a square.

Activity: Comparison between units of area measurements

In pairs pupils solve the following:

Kalisa bought a land of 10 dam^2 and Kamali bought a land of 100 m^2 . Compare their lands using:

- a) Greater than ..., smaller than ..., equal to ...
- b) Comparison of symbols (<,>=)

If Mukamana also bought a land of 1 hm^2 , arrange their lands in ascending and descending order. One pupil presents on the board.

Answers:

We compare area measurements if the units are the same, so we have to convert them:

$$10\text{ dam}^2 = 1\,000\text{ m}^2$$

$$1\text{ hm}^2 = 10\,000\text{ m}^2$$

Therefore:

Kalisa's land is: $1\,000\text{ m}^2$

Mukamana's land is: $10\,000\text{ m}^2$

Kamali's land is: 100 m^2

a) *Kalisa's land is greater than Kamali's land because $1\,000\text{ m}^2$ is greater than 100 m^2 .*

b) $1\,000\text{ m}^2 > 100\text{ m}^2$

c)

- *Lands arranged in ascending order: 100 m^2 ; $1\,000\text{ m}^2$; $10\,000\text{ m}^2$.*
- *Lands arranged in descending order: $10\,000\text{ m}^2$; $1\,000\text{ m}^2$; 100 m^2 .*

Math Facts!

To compare or arrange area measurements which are in different units, convert the given units into the same unit, using a table.

Application

Pupils in small groups solve the following:

- 1) Compare the following using: (< ; > ; =)
 - a) 100 m^2 10 dam^2
 - b) 9 dam^2 $80\,000 \text{ dm}^2$
 - c) 88 dam^2 1 hm^2
 - d) $1\,600 \text{ hm}^2$ 16 km^2
- 2) Activity that involves comparison using **greater than** and **smaller than**:
Kagina planted coffee trees on 20 dam^2 . If Karake has 1500 m^2 of coffee trees:
 - a) Compare the coffee plantation of Karake and that of Kagina using greater than or smaller than.
 - b) What is the importance of coffee for the development of a country?
- 3) Bumenyi Primary school playground is $3\,000 \text{ m}^2$ while Bwenge primary school playground is 5.5 hm^2 .
 - a) Which playground is bigger?
 - b) If Bumenyi Primary school planted 125 trees all along its compound while Bwenge primary school planted 178 trees, which school planted more trees?
 - c) What is the importance of planting trees in the school compound?

Conclusion

Assessment

Muteteri bought a land of 5.7 hm^2 .

- a) How many m^2 did she buy?
- b) If her neighbour Mugenzi has a land of 421 dam^2 , who has a bigger land?

Homework

Kimonyo shared equally his $95\,500 \text{ hm}^2$ of land to his son Kamana and his daughter Mutesi. Kamana has two children and Mutesi has three children. Kamana and Mutesi would like, each, to equally share the land they received from their father to their children. Express the land received by Kamana's children in hm^2 . Compare the land of Kamana's children with those of Mutesi in hm^2 .

Lesson 2

Land measurement units and its relationship with area measurement

Topic area	Metric Measurements
Unit 9	Land measurement units
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge <ul style="list-style-type: none">• List the units of area and land measurements in ascending and descending order.• Read and write correctly units of land measurements. Skills <p>Practically, differentiate measurements of land from area measurement.</p> Attitude <ul style="list-style-type: none">• Appreciate the importance of measurements of area and land in daily life.• Show how to use properly different area and land measurements in daily life situations.

Key words	Hectare, are, centiare
Cross cutting issues	<ul style="list-style-type: none"> - Environment developed through discussing the importance of planting trees as well as ways of avoiding erosion. - Peace education developed through discussions in groups leading to consensus. - Gender balance developed through life examples and assigning equal roles in groups. - Standardisation culture developed through discussing the importance of using fertilizers.
Competences developed	<ul style="list-style-type: none"> - Communication developed through reading, writing land measurement units as well as using comparison terms. - Cooperation developed through working in pairs and in groups. - Critical thinking and problem solving developed through analysing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 **The concept of land measurements (ha, a, ca) and its relationships with area measurement units**

Instructional objectives

Given a situation pupils will be able to measure surface area and convert area measurement units into land measurement units correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper with land measurements.

Reference

- Tom Roche.1984. Busy at Maths.
- websites: <http://www.mathisfun.com>; www.elementary-math.html
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Development

Presentation

Activity 1: Finding ha

A squared forest has 300m of length.

- Find the area covered by the forest in hm^2 .
- Which measurements do you use to measure land/big fields/forests?

Answer

a) Calculations: $300 \times 300 = 90\,000$

b) Solution: The area of the forest is $1m^2 \times 90\,000 = 90\,000m^2$. In hm^2 , we have $9\,hm^2$. Therefore the area covered by the forest is $9\,hm^2$.

b) We use ha to measure land/ big fields/forests.

Activity 2: The concepts of ha, a and ca

In small groups pupils do the following activity:

Kampire planted trees in her land which is 894 ha.

- Can **ha** be expressed in another measurement unit? Which one?
- What are the other land measurement units?
- What are their equivalent area measurement units?
- Draw a table showing the relationship between land measurement units and area

measurement units.

e) When/where are the land measurements units used?

Some group representatives present on the board.

Answers:

a) *ha can be expressed in area measurement units, eg, hm².*

b) *The other land measurements are: are(a) and centiare(ca).*

c) *a = dam²; ca = m²*

d) *Table showing the relationship between land measurement units and area measurement units:*

hm ²	dam ²	m ²
ha	a	ca

e) *The land measurements are used for measuring lands such as: forests, big fields, big lands, big compounds, etc.*

Math Facts!

- Land measurement units are used to measure lands.
- The relationship between land measurement units and area measurement units is as follows:
 - ca = m²
 - a = dam²
 - ha = hm²

Application

Runyange’s plot measures 15m². Express this area in unit of land measurement.

Conclusion

Assessment

Our school is compound area is 63m². Express that area in land measurement units.

Homework

A juice production company would like to increase its production. If in 5ha of pineapples the company gets 1 000 litres of juice, how many ha does the company need to increase its production by 2 000 litres?

Period 2

Reading, writing and converting land measurements

Instructional objectives

Using conversion table, pupils will be able to read, write and convert units of land measurements correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper with land measurements in a table.

References

- websites: <http://wwwmathisfun.com>; www.elementary-math.html
- Tom Roche.1984. Busy at Maths.
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Development

Presentation

Activity 1: Reading and writing land measurements

In groups of 4 pupils write the land measurement units in short and in full. Then they discuss how to read them. Some group representatives present on the board.
 Then the whole class read the land measurement units which are written on the board.

Answer:

- ha: hectare
- a: are
- ca: centiare

Activity 2: Reading and writing land measurements

In groups of 4 pupils write the land measurement units in short and in full. Then they discuss how to read them. Some group representatives present on the board.

- a) 56ha
- b) 123 a
- c) 1 200ca

Answer:

- a) 56ha: fifty six hectares
- b) 123 a : One hundred twenty three ares
- c) 1 200ca: One thousand centiares

Activity 3: Conversion of area and land measurement units

Work out:

$1\text{hm}^2 = \dots\dots\dots\text{dam}^2 \dots\dots\dots \text{m}^2$

$1 \text{ ha} = \text{a} \dots\dots \text{ca}$

Answer:

$1\text{hm}^2 = 100 \text{ dam}^2 = 10\ 000 \text{ m}^2.$

$1\text{ha} = 100\text{a} = 10\ 000\text{ca}.$

Activity 4: Conversion of land measurement units

Work out:

$4\text{ha} = \dots\dots\dots \text{a} = \dots\dots\dots \text{ca}$

Answer:

ha		a		ca		
	4	0	0			$4\text{ha} = 400\text{a}$
	4	0	0	0	0	$4\text{ha} = 40\ 000\text{ca}$

From the table we find that $4\text{ha} = 400\text{a} = 40\ 000\text{ca}.$

Math Facts!

- Land measurement units are always written in short form in a table but they are always read in full. eg. ha (hectare), ca (centiare), a (are).
- Land measurement units are always written in small letters.
- When a land measurement unit is preceded by a number, read/write the number as it is usually read/written then proceed with the land measurements.
- To convert from one unit of land measurement unit to the following one, multiply by 100.
- When converting makes sure that the ones are placed in the last column of the given unit and put zeros until the last column of the required unit.

Application

In umuganda of September, we planted 1000 tree of eucalyptus. If a tree is planted in a surface area of 40 cm², calculate the surface area used in ca. What is the surface area in ha? What is the importance of planting trees?

Conclusion

Assessment

John has 2 sons and a daughter. He would like to share his 47037a of land to his children. Express the part of land each child will get in ha.

Homework

Umuhinzimwiza cooperative would like to increase its sweet potatoes harvest by using organic and chemical fertiliser. When 1kg of chemical fertilizers is mixed with 10kg of organic fertilizer they harvest 100kg of sweet potatoes on ca. Calculate the area needed in are if they have used 10kg of chemical fertilizer and 100kg of organic fertilizer. If 1kg of sweet potatoes is 150frw, how much money will they earn after harvest? Discuss the importance of fertilisers?

Period 4

Comparing units of area and land measurements

Instructional objectives

Given a conversion table, pupils will be able to compare units of area and land measurements accurately, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Conversion table of land measurement units

References

- websites: <http://wwwmathisfun.com>; www.elementary-math.html,
- Tom Roche. 1984. Busy at Maths.
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Development

Presentation

Activity 1: Comparison of area and land measurement units

Pupils know that:

- hm² is greater than dam² and hm² = ha, dam² = a, therefore ha is greater than a.
- dam² is greater than m² and dam² = a, m² = ca, therefore a is greater than ca.
- Using comparison symbols we have: hm² > dam² > m². In comparison with the land measurement units we have: ha > a > ca.

This entails the following table:

hm ²	dam ²	m ²
ha	a	ca

This activity intends to lead pupils to make conclusions about the comparison.

Activity 2: Comparison of area and land measurement units

In pairs pupils solve the following:

Gashema wants to give a gift of land to his friend Gakuba. If he gives him 50dam^2 , he remains with 10ha . Who will have a big land?

Answer:

Calculations:

$$50\text{dam}^2 = 50a$$

$$10\text{ha} = 10\,000a.$$

$$50\text{dam}^2 < 10\text{ha}$$

Solution: Gashema will remain with a bigger land than Gakuba.

Math Facts!

- To compare the units of land and area units, we need to change the given units into the same unit (either area units or land units).
- Compare the results.

Application

In small groups pupils solve the following:

- 1) Use the signs ($<$ $>$ $=$) to compare the following:
 - a) 10ca 1.5dam^2
 - b) $35\,000\text{m}^2$ 15ha
 - c) My grandfather's compound has 3m^2 and my father's has 1.5a . Which space is bigger than the other?

Assessment

In the competition against erosion, Kamana constructed radical terraces on $3\,465\text{m}^2$. If Mutesi has constructed them on 9ha , who will get the award? Discuss ways of avoiding erosion.

Homework

- 1) Compare the following by using ($<$, $>$, $=$)
 - i) $100\,000\text{dm}^2$ 10ha
 - ii) 604ca 604dm^2
 - iii) 10km^2 =..... $1\,000\text{a}$
- 2) Two children received land as a heritage the first one received bananas planted on 50m^2 , the second received 5.5ca . which person did receive the biggest land?

Lesson 3

Addition of area and land measurement

Topic area	Metric Measurements
Unit 9	Area and land measurements
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems.
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge Explain the process of adding area and land measurements. Skills <ul style="list-style-type: none"> • Add area and land measurements • Solve mathematical problems related to addition of area and land measurements. Attitude: <ul style="list-style-type: none"> • Appreciate the importance of measurements of area and land in daily life. • Show how to use properly different area and land measurements in daily life situations
Key words	Addition, area, land
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussions in groups leading to consensus. - Gender balance developed through real life examples and assigning equal roles in groups. - Financial education developed through activities related to buying and selling.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Cooperation developed through working in pairs, in group. - Critical thinking and problem solving developed through analysing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Addition of area and land measurement units (whole and decimal numbers)

Instructional objectives

Given different units of area and land measurements, pupils will be able to add units of area and land measurements accurately, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper on which are written some solved exercises.

References

- Tome Roche. 1984. Busy at Math.
- websites: <http://www.mathisfun.com>; www.elementary-math.html,
- www.Math.schoolspecialty.com

Introduction/review

Correction of homework.

Development

Presentation

Activity 1: Addition of area and land measurements units

Pupils do the following individually and then in small groups:

- a) Write 52ca and 3dam² in the same table.
- b) Change 52ca and 3dam² in the same unit (ca).
- c) Add the digits which are in the same column.

Answer:

dam ²		m ²	
a		ca	
		5	2
+	3	0	0
	3	5	2

$3 \text{ dam}^2 = 300\text{m}^2 = 300\text{ca}$

Then, $52\text{ca} + 300\text{ca} = 352\text{ca}$.

To add the area units and the land units, we convert the given units into the same unit using a conversion table. Then, add the digits which are in the same column.

Activity2: Addition of area and land measurements units

In small groups pupils solve the following:

A man has 5ha of land, he bought 3dam². How much land does he have now?

Some group representatives present on the board.

Answer:

Calculations:

Convert the given units into are using a table and then add:

hm ²		dam ²	
ha		a	
	5	0	0
+			3
	5	0	3

$5\text{ha} = 500 \text{ a}$

$500\text{a} + 3\text{a} = 503\text{a}$.

Solution: The man has now 503a.

Math Facts!

- To add the area units and land measurement units convert the given units into the same unit using area/land units conversation table.
- Add the digits which are in the same column.

Application

Pupils work in small groups to solve the following:

- a) $5 \text{ m}^2 + 10\text{dam}^2 = \dots\text{ca}$
- b) $12\text{hm}^2 + 30\text{ca} = \dots\text{a}$

Assessment

- a) $9\text{ha} + 40 \text{ dam}^2 = \dots\text{a}$
- b) Matabaro has planted the following plants on different area: the green bananas on 2 ha, the cassava on 15m² and beans on 5 a. How much land in ca does Matabaro has all together?

Homework

c) $300\text{hm}^2 + 1\text{km}^2 = \dots a$

d) $111a + 7.30\text{m}^2 = \dots ca$

e) Kanani had a plot measuring 30m^2 after one year he bought $15a$. How many centiare did he get altogether?

Lesson 4 Subtraction of units of area and land measurements

Topic area	Metric Measurements
Unit 9	Area and land measurements
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: Explain the process of subtracting area and land measurements. Skills: <ul style="list-style-type: none">• Subtract area and land measurements.• Solve mathematical problems involving subtraction of area and land measurements. Attitude: <ul style="list-style-type: none">• Appreciate the importance of measurements of area and land in daily life.• Show how to use properly different area and land measurements in daily life situations.
Key words	Subtraction, area measurements, land measurements
Cross cutting issues	<ul style="list-style-type: none">- Peace education developed through discussions in groups leading to consensus.- Gender balance developed through real life examples and assigning equal roles in groups.
Competences developed	<ul style="list-style-type: none">- Communication developed through answering questions.- Cooperation developed through working in pairs and in groups.- Critical thinking and problem solving developed through analysing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 Subtraction of units of area and land measurements

Instructional objectives

Given units of area and land measurements pupils will be to subtract them correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper on which some solved exercises are written.

References

- Tom Roche.1984. Busy at Maths
- websites: <http://www.mathisfun.com>;
www.elementary-math.html,
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

Development

Presentation

Pupils do the following in small groups:

Activity 1: Subtraction of units of area and land measurements

- a) Write 3a and 10hm² in the same table.
- b) Change 3a and 10hm² in the same unit (a).
- c) Subtract the digits which are in the same column.

Answer:

hm ²		dam ²	
ha		a	
1	0	0	0
-	0	0	3
	9	9	7

$10 \text{ hm}^2 = 1\,000 \text{ dam}^2 = 1\,000 \text{ a}$

Calculations: $10 \text{ hm}^2 - 3 \text{ a} = 1\,000 \text{ a} - 3 \text{ a} = 997 \text{ a}$

To subtract the area units, we convert the given units into the same unit using a conversion table. Then, subtract the digits which are in the same column.

Activity 2: Subtraction of units of area and land measurements

In small groups pupils solve the following:

Tom gives 1 500 ca from his land. If he has 1 ha, how much land in are does he remain with? Some group representative present on the board.

Answer:

a) *Calculations:*

Convert the given units into are using a table.

hm ²		dam ²		m ²	
ha		a		ca	
	1	0	0	0	0
-		1	5	0	0
		8	5	0	0

$1 \text{ ha} = 10\,000 \text{ ca}$

$1 \text{ ha} - 1\,500 \text{ ca} = 8\,500 \text{ ca} = 85 \text{ a}$.

b) *Solution:* Tom remains with 85 a.

Math Facts!

- To subtract the area units and land measurement units convert the given units into the same unit using area/ land measurement unit table.
- Subtract the digits which are in the same column.

Application

Pupils in small groups solve the following:

- $65 \text{ ca } 53\text{dm}^2 - 19 \text{ ca } 26 \text{ dm}^2 =$
- $42 \text{ m}^2 33 \text{ dm}^2 - 20 \text{ m}^2 31 \text{ dm}^2 =$
- A cooperative had 15 ha of land. It uses 25 dam² to grow coffee and 50ca to grow cabbages. How much land did they remain with?

Conclusion

Assessment

Subtract

- $0.45\text{ca} - 31\text{cm}^2 = \dots \text{dm}^2$
- A farmer planted 250 a of reeds. She already used 180 m² to feed her cows. How much ca of reeds did she remain with?

Homework

- A business man sold the following plots of land to different customers. The first one purchased 25m², the second one purchased 30m². If the business man had 21 a of land, how many ha did he remain with?
- Mukarutesi's piece of land is 84 dam². If she sold 5 ca of land, how many ares\ of land did she remain with?

Lesson 5 Calculating the area of a rectangular piece of land

Topic area	Metric Measurements
Unit 9	Area and land measurements
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge Explain the process of calculating the surface of a rectangle. Skills Calculate the area as space enclosed by a boundary without using a formula. Attitude <ul style="list-style-type: none">Appreciate the importance of measurements of area and land in daily life.Show how to use properly different area and land measurements in daily life situations.
Key words	Piece of land, rectangular, length, width, area
Cross cutting issues	<ul style="list-style-type: none">Peace education developed through discussions in groups leading to consensus.Gender balance developed through real life examples and assigning equal roles in groups.Environment and sustainability developed through discussing the importance of planting flowers.
Competences developed	<ul style="list-style-type: none">Communication developed through answering questions.Cooperation developed through working in pairs and in groups.Critical thinking and problem solving developed through analysing and organizing ideas.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional objectives

Given a meter ruler, tape measure, pupils will be able to calculate the area of a rectangle correctly, confidently and in a given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

meter ruler, tape measure, rope, stick.

References

- Tom Roche.1984. Busy at Maths.
- Websites: <http://wwwmathisfun.com>;
www.elementary-math.html,
- www.Math.schoolspecialty.com

Introduction/Review

Correction of homework.

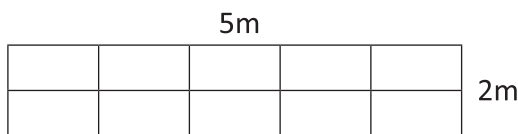
Development

Presentation

Activity 1: Calculating the area of a rectangular piece of land without using formula

Pupils work in pairs to draw a rectangle of 5 m of length and 2m of width. Then, they divide it into sub-squares of 1m a side. They then find the general rule for calculating the surface area of a rectangle using the number of sub-squares of a unit side.

Answer:



Divide the length into 5 equal parts and the width into 2 equal parts.

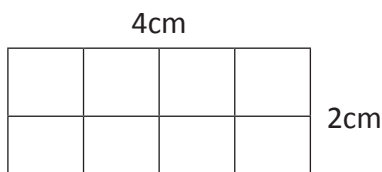
The total numbers of sub-squares is equal to the number of sub-squares on the horizontal side times the number of sub-squares on the vertical side.

From the figure above, we see that the total number of sub-squares of a unit side is equal to $5 \times 2 = 10$.

Therefore, the number of sub-squares is equal to the length times the width.

The area of a rectangle is then the number of sub-squares times $1m^2$. Hence, the area of a rectangle of a 5m of length and 2m of width is : $(5 \times 2) \times 1m^2 = 10m^2$.

Activity 2: Calculating the area of a rectangle using a formula



Answer: *There are 8 squares cm in a rectangle that is 2 cm wide and 4 cm length.*

So the Area of the rectangle is $1cm^2 \times 4 \times 2 = 8 cm^2$.

Math Facts!

- To calculate the area of a rectangle, we count the number of unit sub-squares in it times a unit square.
- The total numbers of sub-squares is equal to the number of sub-squares on the length times the number of sub-squares on the width.
- The area of a rectangle is equal to the length times the width ($A = L \times W$).

Application

In small groups pupils solve the following:

A head teacher and P4 pupils want to construct a garden in front of P4 class. The garden is of a rectangular shape with 20m of length and 10m of width. If a flower is planted in a space of 4m^2 , how many flowers can they plant? Discuss the importance of planting flowers.

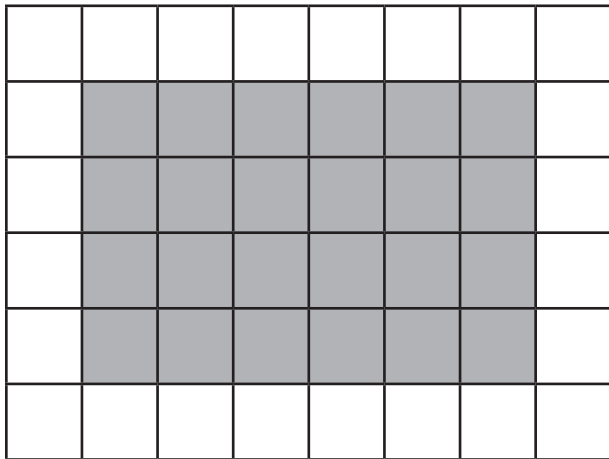
Conclusion

Assessment

Masengesho purchases a mat for her room that is 180 cm long and 15 cm wide. Find the area occupied by the mat?

Homework

This is the bottom plan for a doghouse. In the grid, the side of each little square is 1cm^2 in reality.



- What is the area of the doghouse in square centimetres?
- Figure out the side lengths in cm.

Lesson 7 Assessment of the unit

Topic area	Metric Measurements
Unit 9	Area and land measurements
Key Unit competency	To be able to understand area as the 2D space enclosed by a boundary, and use square and land units in solving mathematics problems
Assessment criteria	Pupils are able to accurately, confidently and in given time: <ul style="list-style-type: none">- Read and write area and land measurements.- Convert, add, subtract and compare area and land measurements through solving problems related to daily life situations.
Competences developed	Critical thinking and problem solving
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Question 1

Write in words the following:

- a) 56 mm^2
- b) 13 m^2
- c) 457 ca

Question 2

A school would like to construct a basketball field and a volleyball field. The basketball field must be a square with 25 m a side. The volleyball field is also a square with 18m a side. Between the two fields there are 125 m^2 . Find the area needed to construct the two fields.

Question 3

Uwera inherited 18 a from her father and 45 m^2 from her mother. How much land did she get? Who gave her a bigger land?

Question 4

An entrepreneur bought 11ha of land. She sold 2 ha and used 200 dam^2 to build a school. How many hectares did she remain with?

Question 5

The dimensions of a rectangular building are 40 m by 30 m. Calculate the total area of the building in ares or in centiares.

Unit 10: Time UNIT AT GLANCE

Topic area: Metric Measurement.

Key competence: Be able to tell, write and convert time appropriately.

Lesson 1: Units of time: Telling time	Period 1	Period 2	Period 3	Period 4	Period 5
	Telling time using a calendar (year, months, week and day)	Reading and writing time using a calendar (year, months, week and day)	Telling time, involving AM and P.M., using a watch(hour, minutes, seconds)	Time plan and time management	Exercises on writing and planning time (a daily plan, a weekly plan, a monthly plan)
Lesson 2: Unit of time: converting	Period 1	Period 2		Period 3	
	Conversion of time : days into hours and hours into minutes and vice versa	Conversion of time: seconds into minutes and vice versa		Exercises and problems on conversion of time	
Lesson 3: Assessment of the Unit	Period 1	Period 2		Period 3	
	Assessment	Feedback and remediation			

Unit warm-ups and games

Say the corresponding day

Show different numbers using fingers and pupils say the day corresponding to the number of fingers shown.

What time is it?

In pairs one pupil writes the time on a sheet of paper and asks his/her partner: "what time is it?" Then they exchange roles.

Unit Lessons

Lesson 1 Telling time

Topic area	METRIC MEASUREMENT
Unit 10	Time
Key competence	Be able to tell, write and convert time appropriately.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none">Recognize different units on time.Explain the meaning of A.M. and P.M. Skills: <ul style="list-style-type: none">Read and tell time accurately.Correctly write units of time. Attitude and values: Appreciate the value of time management in daily situations.
Key words	- Ante Meridiem (a.m.), Post Meridiem (p.m.), calendar, date.
Cross cutting issues	- Gender balanced developed through distribution of roles in different activities. - Peace education developed through group working, discussing and getting to consensus.
Competences developed	- Communication developed through telling time as well as reading and writing it. - Co-operation developed through working in pairs and in groups.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional Objectives	Using a calendar, pupils will be able to tell time (year, months, week and day) correctly.
Class setting/ organization	Indoor: Arrange desks so that pupils can work individually, in pairs and in small groups.
Materials	Calendars displayed on the wall
References	Mwungeri E. et al. 2008. Mathematics, Pupils Book, P. 81-82.

Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Ask pupils questions related to time.	<p>Answer the following questions: How do you know that you must get up from your bed?</p> <p>Possible answer: <i>I listen to birds singing, I see the light in my room, I listen to people starting talking around.</i></p>	
Development (25 min)	Presentation Ask questions related to time (day, month, year)	Activity 1 1) Pupils answer the following questions: a) What is the day of today? b) In which month are we? c) In which year are we? d) How many days are in a week? (7) e) Which are they? (<i>Monday Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday</i>) f) How many days does this month have? g) How many months are in a year? (12) h) Which are they? (<i>January, February, March, April, May, June, July, August, September, October, November, December</i>) i) What is the instrument/tool that helps us to count days and months?(a calendar) j) Who can show us a calendar in this class?	Communication in official language through presenting on board and explaining how they came up with their answers.

	<p>Put pupils in small groups. Distribute calendars to pupils and facilitate them to interpret a calendar through questions.</p> <p>Facilitate pupils to interpret a calendar</p> <p>Facilitate pupils to do the activities in the right column.</p>	<p>2) Pupils observe a calendar and say what they see (there are days, weeks, months, and the year).</p> <p><i>Which month of the year contains few days? How many days it counts?</i></p> <p>Answer: <i>The month of the year which counts few days is February with 28 or 29 days.</i></p> <p>Activity 2 Interpreting a calendar</p> <p>Pupils interpret a calendar through answering questions:</p> <ol style="list-style-type: none"> For which year is this calendar? Who can show us the current month on the calendar? Who can show us the current day on the calendar? Who can show us the current date on the calendar? What is the first month of the year? (January) What is the last month of the year? (December) How many days does each month have? <p>How many days are in a year? Explain. (365 or 366 (when it is a leap year).)</p> <ol style="list-style-type: none"> How many weeks are in a month?(4) How many weeks are in a year? (52) <p>Activity 3: Telling the date</p> <ol style="list-style-type: none"> In pairs pupils discuss how to say dates, eg, the today date using a calendar. <p>One pupil to share the answer with the whole class</p> <p>Answer: <i>Here is an example of a date:</i> <i>January 2nd 2016.</i></p> <ol style="list-style-type: none"> In pairs pupils tell each other important dates that they remember in their childhood. Some pupils to share some important dates. 	
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		<p>Activity 4: Telling the date (including the day) In pairs pupils discuss how to say the date including the day, eg, the today date (using a calendar).</p> <p>Answer: Here is an example of a date (including a day): Monday, February 8th 2016.</p>	Critical thinking developed through identifying date.
	<p>Summary Facilitate pupils to summarise the lesson.</p>	<ul style="list-style-type: none"> • A calendar is a table used for telling dates (it shows days, weeks, months of a particular year). • When telling the date we start by the name of the month, followed by the date which is read as an ordinal number, followed by the year. • When we include the day in the date, we start by the day then we put the date (as sated above). 	
	<p>Application</p>	<p>Application In group pupils work out the following: 1) Tell us your birthday date. 2) On which date will you be 20 years old? 3) Which date will be next Thursday? 4) Which date will be next Sunday? 5) Which date was last Tuesday? Some pupils present on the board.</p>	<ul style="list-style-type: none"> - Communication in official languages developed through presenting on the board and explaining how they came up with their answers. - Cooperation developed through working in pairs/ in groups - Critical thinking developed through identifying dates.
<p>Conclusion (5 min)</p>	<p>Assessment Write assessment questions on the board.</p>	<p>Assessment 1) Tell today’s date. 2) Tell tomorrow’s date. 3) Tell what yesterday’s date was. 4) Tell what will be the date on this Sunday.</p>	
	<p>Homework Write homework questions on the board.</p>	<p>Homework When you reach home tell someone at home: i) Your birthday date. ii) The date of to day.</p>	

Instructional objectives

Given different dates, pupils will be able to read and write time (year, months and day) correctly, confidently in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials:

A calendar.

References

Tom Roche.1984. Busy at Maths, P. 115.

Introduction/Review

Correction of homework.

Game: **Say the corresponding day.**

Development**Presentation****Activity 1: Writing a date**

Have a calendar of the current year or draw it on the board and ask different pupils to find on it the following dates:

- The today's date
- Pupils write the above date in short and in long. (eg. *The today's date is 8/24/2015 or August 24th, 2015*).
- Pupils write the today 's date including the day (eg. *The today's date is Monday, August 24th 2015*).

Activity 2: Reading a date

Pupils in pairs share how to read the following dates:

- 8/24/2015
- 10/30/2015
- Monday, August 24th, 2015

Answer

- 8/24/2015 is read: August twenty fourth, two thousand and fifteen.
- 10/30/2015 is read: October thirteenth, two thousand and fifteen.
- Monday, August 24th, 2015 is read: Monday, August twenty fourth, two thousand and fifteen.

Pupils draw conclusions read and write dates.**1) There are two main methods of writing time (dates) in English:**

- The short date, eg, 8/24/2015
- The long date, eg, August 24th, 2015
- The long date can include a day, eg, Monday, August 24th, 2015

2) How to read/write dates:

- We read or tell the date in short, we start by the name of the month, followed by the date which is read as an ordinal number, followed by the year.
- We write the date in short using cardinal numbers separated by slashes (we start by the number representing the month, followed by the number expressing the date, followed by the number expressing the year).
- We write the date in long starting by the month written in full, followed a comma, followed by the date written as an ordinal number, followed by the year(written in numbers).

- **Note:** The long date can include the day and it is written starting by the day, written in full, followed by a comma and followed by the long date (written as stated above).

Math Facts!

- There are two main methods of writing time:
 - The short date: 8/24/2015
 - The long date: MM DD, YYYY (month+ date + year) eg. August 24th, 2015.
- When reading the date start by the name of the month, followed by the day which is read as an ordinal number, followed by the year.

Application

Pupils in small groups solve the following:

- 1) Read the following dates:
 - a) 12/25/2014
 - b) 01/30/2015
 - c) Friday , September 1st, 2015
- 2) Correct the way in which the following dates are written:
 - a) Tuesday, June 2nd 2015.
 - b) March, Thursday 12, 2015.
- 3) Jane went to the bank to deposit money on the last day of last year.
 - a) Using a calendar find the day on which she deposited money.
 - b) Write that date in short and long.

Conclusion

Assessment

- 1) Read the following dates:
 - a) 7/27/2014
 - b) 12/25/2015
 - c) Wednesday , March 18th, 2015
- 2) Correct the way in which the following dates are written:
 - a) Saturday April 11th 2015.
 - b) November, Sunday 22, 2015.

Homework

- 1) Write the date of today in short and in long.
- 2) Read the following dates:
 - a) 12/31/2015
 - b) Monday , February 1st, 2016
- 3) Correct the way in which the following dates are written:
 - a) Friday September 30th 2016.
 - b) 2015, Tuesday, 20, October
- 4) On December 22nd, 2009 it was on Tuesday. What will be the day and the date after 5 days?

Instructional objectives

Given different times, pupils will be able to tell time, involving a.m. and p.m. correctly, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Manila papers with watches showing different times: 11:50, 1:45 a.m, 1:45p.m, 9:25a.m, 10:45 p.m

References

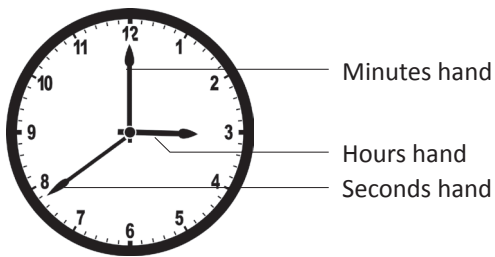
Byamukama J.& Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 42-45.

Introduction/Review

Correction of the homework.

Development**Presentation****Activity 1: Describing the hands of a watch**

Distribute watches to different groups and ask pupils to observe the movements of its three hands (short hand, long big hand and long thin hand) and discuss their functions.

Observations

The short hand indicates hours, the long big hand indicates minutes, the long thin hand indicates seconds. There are 60 minutes in 1 hour.

Activity 2: Telling time

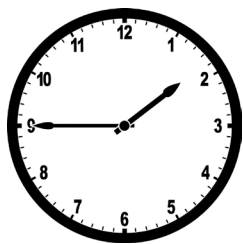
Distribute manilla paper with a watch showing time (as shown below). Pupils in small groups discuss and tell what time it is.

**Answers:**

It is fifty past ten or ten to eleven.

Activity 3: Telling time involving a.m and p.m

Distribute manila papers with 2 watches showing different time (as shown below). Pupils in small groups discuss and tell what time it is and then after they discuss the meaning and when to use a.m and p.m.

a) Morning**b) Afternoon****Answers:**

- a) *The watch shows 1 : 45 a.m*
It is a quarter to 2 a.m or it is forty five minutes past one a.m
- b) *The watch shows 1 : 45 p.m*
It is a quarter to 2 p.m or it is forty five minutes past one p.m

They find that there are 24 hours in a day and that a day ends at midnight and the following day starts at one second past midnight. Therefore, a.m. means Ante Meridiem and p.m. means Post Meridiem.

Activity 3: Telling time

Put 2 watches, showing the following time, on the wall (using scotch) or draw them on the board and pupils in small groups say what time it is.

- a) 9:25a.m
 b) 10: 45 p.m

Answer:

- a) *The time on the first watch shows 9:25a.m.*
 ➤ *It's twenty five past nine.*
- b) *The time on the second watch shows 10: 45 .p.m.*
 ➤ *It's a quarter to eleven p.m.*

Math Facts!

When telling time consider the following:

- *From 1 minute to 30 clockwise we read minutes past hour.*
- *From 31 minutes to 59 clockwise we read minutes to hour.*
- *For 15 minutes we may read a quarter and for 30 minutes we read a half.*

When telling time, from midnight through the morning, use a.m, when telling time in the afternoon, evening or at night before midnight, use p.m.

Application

Pupils in small groups do the following:

- 1) What time is it?
- a) 7:30 a.m.
 b) 8: 14 p.m.
 c) 1:00 p.m.
 d) 12: 00
 e) 5: 34 a.m.

- 2) Draw different watches showing the following time pupils tell time on them:
- 8: 17 a.m.
 - 11: 55 a.m.
 - 9: 15 p.m.
- 3) At which time the Rwanda National Anthem is sung on Rwanda National Radio everyday in the morning? What do you think about the Rwandan National Anthem?

Conclusion

Assessment

- 1) What time is it?
- 7:30 a.m.
 - 6: 11 p.m.
 - 11:00 p.m.
 - 10: 00 a.m.
 - 3: 09 a.m.
- 2) Draw watches and ask pupils to tell time on them.

Homework

Draw different watches showing the following time and pupils answer the following questions:

Say the time it is:

- 1: 01 p.m.
- 12:15 a.m.
- 2: 45 p.m.
- 8: 30 a.m.
- 3: 00 a.m.

Period 4

Time plan and time management

Instructional objective

Using a time table, pupils will be able to plan activities in time and manage their time wisely.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

A timetable drawn on manila paper, a calendar.

References

- *Byamukama J.&Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, 42-45*
- *Tom Roche.1984. Busy at Maths, 155-157.*
- *Mwungeri E. et al. 2008. Mathematics: Pupils Book, 103-106*

Introduction

Correction of the homework

Game: **What time is it?**

Development

Presentation

Draw a weekly timetable of lessons in your class.

Pupils work in pairs to observe it and to answer these questions:

- At which hour do we start learning?
- How often do we learn mathematics? Give precision of days and hours on which we learn Math.
- How many subjects do we have on Monday?
- Why is it important to have this timetable?

Some pupils present their answers on the board.

Pupils draw conclusions about the importance of the timetable:

- The timetable guides teachers and pupils.
- It gives order into activities.
- It helps teachers and pupils to plan their lessons and to plan their daily school activities (to manage their time well).

Application

Basing on the time that your school starts and the distance from your home to school make a plan of your morning activities so that you can arrive at school on time.

Conclusion

Assessment

According to the activities that you are appealed to do at home after class, make a small plan of your evenings from Monday to Friday.

Homework

Make a plan for activities for the week end (Saturday and Sunday).

Lesson 2 ▶ Converting units of time

Topic area	METRIC MEASUREMENTS
Unit 10	Time
Key Unit competence	Be able to tell, write and convert time appropriately.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain rules for converting from one unit of time to another (days into hours and hours into minutes and vice versa). Skills: <ul style="list-style-type: none"> • Apply the knowledge acquired to convert between the units of time. Attitude an values: Appreciate the value of time management in daily situations.
Key words	The revolution of the earth.
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations. - Environment and sustainability developed through discussing the importance of planting trees. - Standardization culture developed through discussing the importance of being punctual (doing things on time) as well as raising awareness on HIV/SIDA.
Competences developed	<ul style="list-style-type: none"> - Communication developed through explaining to other pupils how they came up with their answers. - Cooperation developed through working in pairs and in groups. - Critical thinking developed through solving different problems.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Given some days, hours and minutes, pupils will be able to convert days into hours and hours into minutes and vice versa accurately, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials:

- Real watches drawn on manila papers.
- Manila papers on which are written different units of time and their table of conversion.

References

Tom Roche.1984. *Busy at Maths*, 155-157.

Introduction

Correction of homework.

Development**Presentation****Activity 1: Concept of minutes and hours**

In groups, using a watch with hands, pupils do the following activities:

- a) Observe and count how many minutes are between one number and another.
- b) Extend it to the whole watch and calculate how many minutes make up one hour.

Answer:

- a) *Between one number and another, there are 5 minutes.*
- b) *The minutes hand has to go from 1 to twelve to make up one hour so, $5 \times 12 = 60$. It means that 1 hour is equal to 60 minutes.*

Activity 2: Converting days into minutes

The earth puts 24 hour for accomplishing its revolution. Find out how many minutes it uses.

Answer:

Calculation: $24 \times 60 = 1440$

Solution: to accomplish the revolution the earth uses 1 440 min.

Activity 3: Converting days into hours

A machine worked 3 days. How many hours did it work?

Answer:

Calculation: $24 \times 3 = 72$

Solution: The machine works 72 hours.

Activity 4: Converting minutes into hours

Rukundo drove 360 minutes from Rusizi to Kigali. How many hours did she drive?

Answer:

Calculation: $360 \div 60 = 6$

Solution: She drove 6 hours.

Activity 5: Converting hours to days

A boat used 168 hours to reach its destination. How many days did it use?

Answer:

Calculation: $168 \div 24 = 7$

Solution: The boat used 7 days.

Math Facts!**a) 1 day = 24 h**

- To convert days into hours, we multiply by 24.
- To convert hours into days we divide by 24.

b) 1h = 60 min

- To convert hours into minutes we multiply by 60.
- To convert minutes into hours we divide by 60.

Application

In small groups pupils solve the following:

- 1) How many minutes are in 2 hours?
- 2) Calculate:
 - a) 2 days =h =min
 - b) 360 h = days
 - c) 12h =min
 - d) 3h30min =min
 - e) A conference took 5 days and 10 hours discussing about how to reduce risks of HIV/AIDS contamination among young peoples.
 - i) What time did the conference take in minutes?
 - ii) What do you know about HIV/SIDA? How to avoid it?

Conclusion**Assessment**

- a) 7 days = ...h
- b) 96 h = days
- c) 360 min =h
- d) 2 days 4h =min
- e) $3\frac{1}{2}$ days =hours
- f) $9\frac{1}{2}$ days = ... hours
- g) Thomas used 72 hours to plant 750 trees. What time did he use in minutes and in days? What is the importance of trees?

Homework

- 1) 420 min = ...hours
- 2) 600 min = ...hours
- 3) 180 min = ...hours
- 4) 720 min = ...hours= ...days.
- 5) A bus going on a normal speed uses 2 hours From Kigali to Musanze Town. If Kalisa took that bus this morning at 7:30 a.m., and they stopped once for 30 minutes of break, find the approximate hour on which he will reach Musanze.

Instructional objectives

Given minutes and seconds, pupils will be able to convert seconds into minutes and vice versa correctly, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Digital watches

References

- Byamukama J. & Mulisa L. 2010. *New Upper Primary Maths: Pupils Book for Grade 4*, 42-45.
- Tom Roche.1984. *Busy at Maths*, 155-157.
- Mwuengeri E. et al. 2008. *Mathematics: Pupils Book*, 103-106.

Development**Presentation****Activity 1: Concept of second**

In groups, pupils observe and count how many seconds make up one minute.

Answer: *one minute is made by 60 seconds.*

Activity 2: Converting minutes into seconds

In a race of 3 000 meters, the first athlete used 34 minutes. Find out the time he used in seconds.

Answer:

Calculation: $34 \times 60 = 2\ 040$

Solution: He used 2 040 seconds.

Activity 3: Converting seconds into minutes

Kampire uses 4 680 seconds to walk from home to her office. How many minutes does she use to reach her office? Kampire is never late. She got a prize for punctuality. Discuss the importance of being punctual (doing things on time).

Answer:

Calculation: $4\ 680 \div 60 = 78$

Solution: Kampire used 78 minutes.

Math Facts!**a) 1 minute = 60 seconds**

- To convert minutes into seconds we multiply by 60.
- To convert seconds into minutes we divide by 60.

Application

In small groups solve the following:

1) Calculate

- a) 10 min = ...sec
- b) 30 min = ...sec
- c) 60 min = ...sec
- d) 300 sec = ...min

2) An athlete used 1 hour and 30 minutes to run a distance of 5km. How many seconds did she use?

Conclusion**Assessment**

- a) 360 sec = ...min
 b) 660 sec = ...min
 c) 9 min = sec
 d) 15 min =sec
 e) I start my work at 8:00. I use 25 minutes to reach my work place. When do I have to leave my home in order to arrive at work on time?

Homework

In a running competition Gasirabo has used 1 hour, 15 minutes and 30 seconds to complete a 5km race. How many seconds did he use?

Lesson 3 Unit Assessment

Topic area	Metric Measurements
Unit 10	Time
Key Unit competency	Be able to tell, write and convert time appropriately.
Assessment criteria	Pupils are able to tell, write and convert time accurately, confidently and in required time.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing, take into consideration different abilities and needs of slow pupils, gifted pupils, pupils with disabilities; e.g. pupils with writing problems, pupils with visual impairments, pupils with hearing impairment,....

Assessment questions**20 marks****Question 1**

(Note: Teacher to draw the following watches and put them on the wall before the test)

Look at the following watches and say the corresponding time:

Afternoon



Afternoon



Afternoon



Morning



Question 2

Convert:

- a) 6h =min =.....sec
- b) 300 min =.....h =
- c) 30 days =.....h
- d) 365 days =h
- e) 7200 sec =.....min =.....h =

Question 3

Solve the following problems:

- a) If Kagina is 45 years old now, in which year was he born?
- b) It is 4:15 p.m. now. What will be the time in 45 minutes?
- c) If you are in P4 now, in which year do you plan to finish your primary studies?
- d) The community activity known as Umuganda which took place in our Sector on one Saturday was organized as follows:
 - Planting trees for fighting against erosion: 4 hours and 30 minutes.
 - Population meeting after umuganda for sensitizing people about physical environment and citizenship: 45 minutes.

How many minutes did the whole activity last?

- e) For her week end, Mukabugingo, a Primary 4 pupil at Girubuntu primary school, made a following plan of her activities to be done on Saturday:

5: 00 a. m : getting out from bed.

5: 00 to 6:00 a.m.: cleaning the compound

6:00 am to 7: 00 a.m.: planting flowers

7: 00 to 8:00 a.m.: washing dishes

8:00 to 9:00 a.m. : nourishing hens

9:00 to 10: 00 a. m: cooking water for drinking

10: 00 to 11: 00 a. m: helping my father in cooking

12:00 O'clock: having diner

1: 00 to 2:00 p.m.: resting

3: 00 to 5: p.m.: playing

6: 00 to 9: p.m.: reading and doing school homework

- i) What do you think about Mukabugingo's use of time? Is Mukabugingo a laborious girl or a lazy one?
- ii) Make a critical analysis of Mukabugingo's plan. Is it realistic or ambitious?

Unit 11: Money and its financial application

Unit at glance

Topic area: Metric Measurement .

Key competence: To be able to understand money and its financial applications

	Period 1	Period 2	Period 3
Lesson 1: Rwandan currency	Rwandan currencies: identification of notes and coins	Changing Rwandan currencies.	Exercises and problems on changing Rwandan currencies.
Lesson 2 Source of money, use of money, planning according to needs and wants			
Lesson 3: Buying and selling	Period 1	Period 2	
	Buying and selling (cost price, selling price and profit/loss)	Problems on buying and selling	
Lesson 4: Assessment of the unit	Period 1	Period 2	
	Assessment	Feedback and remediation	

Unit warm-ups and games

Counting in fifties

Pupils count in 50's starting for example from 0. eg: 0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500. (Note: they can redo the game starting by another number).

Unit Lessons

Lesson 1 Rwandan currency

Topic area	Metric Measurement
Unit 11	Money and its financial application
Key competence	To be able to understand money and its financial applications.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge Recognize and identify the various denominations of Rwandan currencies. Skills Carry out calculations in simple business transactions. Attitude and values Appreciate the importance of money in daily life situations.
Key words	Currency, notes, coins, cost price, selling price, budget, needs, wants, profit, loss.
Cross cutting issues	Financial education developed through solving problems about changing Rwandan currency.
Competences developed	<ul style="list-style-type: none">• Communication developed through answering questions.• Cooperation developed through working in pairs and in groups.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional Objectives	Using coins and notes either real or drawn on papers, pupils will be able to identify notes and coins of Rwandan currency.
Class setting/organization	Arrange desks so that pupils can work in groups.
Materials	Real money; pictures and drawings of Rwandan currency; different items to be used for a classroom shop (pens, notebooks, soaps, ...)
References	<ul style="list-style-type: none"> - Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45 - Mwuengeri E. et al. 2008. Mathematics: Pupils Book, P. 92-96

Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Facilitate and play the game with pupils.	Plays the game: Counting in fifties	
Development (25 mins)	<p>Presentation Distribute the following materials to groups:</p> <ul style="list-style-type: none"> - Coins: 5Frw, 10Frw, 20 Frw, 50Frw, 100Frw - Notes: 500Frw, 1000Frw, 2 000 Frw, and 5 000Frw. <p>Facilitate pupils to do activities by guiding them and giving them instructions.</p>	<p>Presentation</p> <p>Activity 1: Identifying Rwandan currency In small groups, pupils observe coins (5 Frw, 10 Frw, 20 Frw, 50 Frw, 100 Frw and notes of 500 Frw, 1000 Frw, 2 000 Frw, and 5 000 Frw) and they identify features and numbers written on each coin and on each note and their sizes.</p> <p>Some pupils to share their answers with the class.</p> <p>Activity 2: Identifying the value of Rwanda currency</p> <p>Pupils say what they can buy with:</p> <ul style="list-style-type: none"> - A coin of 10 Frw. - A coin of 20 Frw. - A coin of 50 Frw. - A coin of 100 Frw. - A note of 500 Frw. - A note of 2 000 Rwf. - A note of 5 000 Rwf. <p>Some group representatives to present on the board.</p>	Communication developed through presenting on the board and explaining how they came up with their answers.

	<p>Summary Facilitate pupils to draw conclusions on Rwandan currency.</p>	<p>Summary</p> <ul style="list-style-type: none"> • Money can either be notes or coins. • Coins are made of metals and are usually in circle form. • Notes are made from special papers. • The value of each note or coin is written on it on both sides. • The Rwandan note which has the highest value is 5 000 Frw and the Rwandan note which has the least value is 500 Frw. • The Rwanda coin which has the highest value is 100Frw and the Rwandan note which has the least value is 1Frw. • The notes can easily be distinguished by their colours. 	<ul style="list-style-type: none"> - Communication in official languages developed through presenting on the board and explaining how they came up with their answers. - Cooperation developed through working in pairs/ in groups
	<p>Application Facilitate pupils to do activities.</p>	<p>Application Pupils in small groups do the following activities:</p> <p>1) What can you buy with:</p> <ul style="list-style-type: none"> - A coin of 50Frw? - A coin of 100Frw? - A note of 500Frw? - A note of 1 000Frw? <p>2) What are the features of:</p> <ul style="list-style-type: none"> - 100 Frw coin? - 5 000 Frw note? 	
<p>Conclusion (5 min)</p>	<p>Assessment Show notes and coins and ask pupils what is their value.</p>	<p>Assessment</p> <p>1) Show coins and notes to pupils and ask them their value.</p> <p>2) What can you buy with?</p> <ul style="list-style-type: none"> - A coin of twenty Rwandan francs. - A note of five hundred Rwandan francs? - A coin of 100 Rwandan francs? 	
	<p>Homework Write exercises on board</p>	<p>Homework</p> <p>1) Ask parents or other persons you live with at home to show you notes and coins of Rwandan currency. Discuss with them the features of the notes or coins shown.</p> <p>2) What can you buy with a note of 1 000Frw?</p> <p>3) What can you buy with a 2 000Frw note?</p> <p>4) What can you buy with a 5 000Frw note?</p>	

Instructional objectives

Using coins and notes either real or drawn on papers, pupils will be able to change Rwandan currencies, accurately, confidently and in required time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs, and in small groups.

Materials:

- Papers cut in size of notes and on which are written: 500Frw, 1 000Frw, 2 000Frw, 5 000Frw

- Circle papers cut as coins on which are written: 5 Frw; 10 Frw; 20Frw; 50Frw; 100Frw.
- Different items to be sold.

References:

- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 42-45.
- Mwungeri E. et al. 2008. Mathematics: Pupils Book, P. 92 -96.

Introduction/Review

Correction of homework

Development**Presentation****Activity 1: Changing Rwandan currencies**

In small groups pupils solve the following:

Your mother sent you to the Bank to withdraw 10 000Frw preferably in notes of 1 000 Frw.

- How many notes of 1000 Rwf will you get from the cashier?
- If at the bank they have only notes of 500Frw, how many notes will you get?

Answers:

a) Calculations: $5\ 000 \div 1\ 000 = 5$

Solution: I will get five notes of 1 000Frw.

b) Calculations: $5\ 000 \div 500 = 10$

Solution: I will get 10 notes of five hundred Rwandan francs.

Math Facts!

Money can be changed from big notes to small notes or from notes to coins, or from coins with greater value to coins with less value.

e.g. the note of 1 000Frw can be changed into:

- 2 notes of 500Frw
- One note of 500 Frw + five coins of 100 Frw.
- 20 coins of 50 Frw, etc.

Application

In small groups pupils solve the following:

- In which different ways can you exchange 100Frw?
- You have a note of one thousand Rwandan Francs and you need to buy 3 notebooks for 100 Frw each and one pencil for 50Frw.
 - Find how much you will be given as balance.
 - Show two ways in which you could get your balance.

Conclusion

Assessment

Show 5 ways in which you can have an amount of 5 000Frw in notes.

Homework

- 1) You have got 100Frw and you need to buy a candle for 50Frw and 2 sweets for 10 Frw each. How much will the shopkeeper give you as balance?
- 2) In her shop, Mukakalisa, realized that 10 boxes of milk had expired. One box of milk costs 500Frw. How much money in coins of 50Frw Mukakalisa lost?

Lesson 2

Simple budgeting (source of money, use of money, planning according to needs and wants)

Topic area	Metric Measurement
Unit	Money and its financial application
Key Unit competence	To be able to understand money and its financial applications
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge <ul style="list-style-type: none">• Classify needs and wants.• Identify sources of money.• Explain the process of simple budgeting basing on priorities. Skills <ul style="list-style-type: none">• Classify needs and wants• Making simple budgeting according to priorities.• Planning according to needs and wants. Attitude <ul style="list-style-type: none">• To spend money wisely.
Key words	Source of money, a plan, a budget, needs, wants
Cross cutting issues	Financial education developed through solving problems related to planning according to needs and wants.
Competences developed	Communication developed through answering questions.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives:

Given a list of needs and wants, pupils will be able to distinguish and classify them, and make a simple plan according to priorities and financial means accurately, confidently in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials:

Manila paper with examples of needs and wants.

References:

- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 146-151.
- Mwuengeri E. et al. 2008. Mathematics: Pupils Book, P. 92 -96.

Introduction/Review

Correction of homework.

Development

Presentation

Activity 1: Source of money

Kamali and Mukamana are planning to start a business together. They have sold part of their harvest. Kamali sold 100 kg of beans at 400 Frw a kilogram, Mukamana sold 150 kg of maize flour at 350 Frw a kilogram.

- How much money are they going to use to start their business?
- Why are they going to start business?
- Discuss their source of money.
- What are other sources of money?

Answers:

a) Calculation: $100 \times 400 = 40\,000$ Frw

Solution: Kamali got 40 000 Frw

Calculation: $150 \times 350 = 52\,500$ Frw

Solution: Mukamana got 52 500 Frw

Calculation: $40\,000 \text{ Frw} + 52\,500 \text{ Frw} = 92\,500 \text{ Frw}$

Solution: They are going to start their business with 92 500 Frw.

- They are going to start business because they want to have more money (they want to gain).
- The source of their money is harvest.
- Some other sources of money are: salary, business, donation

Activity 2: Planning according to needs and wants and budgeting

Kankindi expected to get some money and she made the following plan on how to spend the money. Consider the plan and answer related questions.

- House rent: 20 000 Frw
- Towel: 5 000 Frw
- Food: 15 000 Frw
- Thermos: 3 000 Frw
- A dress: 5 000 Frw

Total: 48 000Frw

- Where does Kankindi expects to get money from?
- If Kankindi manages to get 41 000 Frw only what does she have to do?
- Help Kankindi make a new list according to her priorities.
- How can we call the items newly listed? Why do we call them so?
- How can we call the rest of items? Why do call we them so?
- Give other examples of needs and wants.
- How can we call money Kankindi used to pay house rent and all the other items?
- Kankindi planned her expenses in advance, how do we call that process?
- What are the benefits of budgeting?

Answers:

- Kankindi expects to get money from: profit from business, selling harvest, donation, etc
- Kankindi has to make a new list according to her priorities.
- The new list based on priorities is as follows:
House rent: 20 000Frw
Food: 15 000Frw
A dress: 6 000Frw
Total: $20\,000\text{Frw} + 15\,000\text{Frw} + 6\,000\text{Frw} = 40\,000\text{Frw}$.

- iv) Those items newly listed are called needs. We call them so because we need them for surviving.
- v) The rest of the items are called wants. We call them so because we can survive without them.
- vi)
 - Other examples of needs: water, shelter and air, etc.
 - Other examples of wants: money, shoes, a telephone, a car, a television, education.
- vii) The money she used to pay house rent and all the other items is called expenses.
- viii) The process of planning expenses in advance is called budgeting (note: budgeting also includes source of money because before planning how to spend money you must think of where to get the money from).
- ix) The benefits of budgeting are that you do not misuse money (use money unnecessarily), in other words you use money for priorities.

Math Facts!

- Needs can be defined as things which are necessary to survive such as shelter, food, clothes. We absolutely cannot do without these needs.
 - Wants can be defined as things which are good to have, but aren't necessary to survive, such as video games, candies, movie tickets, cars, televisions, etc. We can do without these wants, even though we might not like it.
 - Budgeting involves source of money and planning how the money will be spent.
- Note: When we are budgeting, we consider needs as our priorities.

Application

- 1) Suppose you have got 5 000 Frw. Make a simple budget of how you can use it.
- 2) List down any 5 wants that you could satisfy now if you get 1 000Frw.
- 3) Here is a list of things that you can buy if you get money. Group them as needs and wants: Food for diner, chewing gums, sweets, a ball for playing, a mobile phone, school materials, water to drink, new clothes for your birthday, a house, music system.

Conclusion

Assessment

- 1) Last week Mukamusoni had three different sources of money:
 - Weekly allowance: 5 000 Frw
 - Weekly payment for working in her neighbour's garden: 8 000 Frw
 - A birthday gift: 20 000 Frw
 - a) How much money did Mukamusoni get?
 - b) Mukamusoni is deciding on how to spend her money and she would like to have 3 000 Frw left for saving. She has come up with the following list:
 - Food for her family: 15 000 Frw
 - Birthday gift for her brother: 5 000 Frw
 - Cell phone: 6 000 Frw
 - House rent: 15 000 Frw
 - c) Does Mukamana have enough money for all of these things? If no help her to make the choice according to the needs?
- 2) As a pupil of P4, list down some activities that you can do to get some money for yourself without interfering with you studies.

Homework

- 1) Here is a list of needs and wants and their prices. List them by priority of your expenses having in mind that you have a limited amount of money:
 - a) A school uniform: 3 000Frw
 - b) A second pair of shoes: 4 000Frw
 - c) A bicycle for going to school: 25 000Frw
 - d) A new school bag: 2 500Frw
 - e) Ball for game: 7 000Frw
 - f) A small radio: 5 000Frw
 - g) Money for restaurant: 1000 Frw/day

- 2) Ask your parents or some other people at home where they get money from.

Lesson 3 Buying and selling

Topic area	Metric Measurements
Unit 11	Money and its financial application
Key Unit competence	To be able to understand money and its financial applications
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain the cost price and the selling price. Skills: <ul style="list-style-type: none"> • Solve problems involving buying and selling. • Carry out calculations in simple business transactions. Attitude and values: <ul style="list-style-type: none"> • Negotiate and carry out transactions in simple business confidently.
Key words	Cost price, selling price, profit, loss
Cross cutting issues	Financial education developed through solving problems related to buying and selling.
Competences developed	<ul style="list-style-type: none"> - Communication developed through discussions in groups. - Cooperation developed through working in pairs or in groups.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Buying and selling (cost price, selling price and profit/loss)

Instructional objectives

Given money, pupils will be able to buy and sell by calculating the cost price, the selling price, the profit or the loss correctly, confidently and in given time.

Class setting/organization

Indoor or outdoor, pupils install a selling table; some will play the role of sellers while other will play the role of customers.

Materials

A table, selling items to be sold, real money or drawn money to be used for paying and giving out balance.

References

- Byamukama J. & Mulisa L. 2010. New Upper Primary Maths: Pupils Book for Grade 4, P. 146-151.
- Mwangeri E. et al. 2008. Mathematics: Pupils Book, P. 92 -96.

Introduction/ Review

Correction of homework.

Development

Presentation

In small groups pupils solve the following:

A shopkeeper bought 2 boxes of 100 pens each on the price of 7 500Frw each. If he sold one pen at the price of 100Frw. Find out his profit.

One pupil presents his/her answer on the board.

Answers:

The cost price = 75 00Frw x 2 = 15 000Frw

The selling price = 100Frw x 200 = 20 000Frw

The profit = 20 000Frw – 15 000Frw = 5 000Frw.

Math Facts!

- The price at which an article is purchased is called its cost price, abbreviated as C.P.
- The price at which an article is sold is called its selling prices, abbreviated as S.P.
- If a seller sells something for more than what he/she paid for it, then the difference is a profit.
- If a seller sells something for less than what he/she paid for it, then the difference is a loss.
- profit = selling price – cost price or (S.P.) – (C.P.)
- loss = cost price – selling price or (S.P.) – (C.P.)

Application

In small groups pupils solve the following:

1) Find the profit or loss:

NO	C.P.	S.P.	P	L
a)	55 000 Frw	64 000 Frw		
b)	62 000 Frw	60 000 Frw		
c)	11 000 Frw	19 000 Frw		
d)	12 000 Frw	10 000 Frw		

- 2) A farmer bought 20 small hens on the price of 1 500Frw each. She bought food for them in a period of 6 months at the price of 5 000Frw per month. After 6 months she sold each hen at the price of 4 000Frw each. Has she profited or lost? How much?
- 3) A shopkeeper buys 5 boxes of scientific calculators for 10 500 Frw each. If each box contains 6 calculators and he sells one at a price of 2 000Frw, calculate the profit he made after selling all the calculators.

Conclusion

Assessment

- 1) A school bookshop sells an outdated biology text book for 4 500Frw, making a loss of 1 500Frw. What was the cost price of the book?
- 2) A fruit vendor bought 300 apples for 70 000Frw. She spent 5 000Frw on transportation. How much should she sell each apple in order to get a profit of 12 000Frw?

Homework

1) Fill in the blanks

NO	C.P.	S.P.	P	L
a)	24 000 Frw	4 000 Frw	
b)	29 000 Frw		1 000 Frw
c)	41 000 Frw		3 000 Frw	
d)	---	60 000 Frw	8 500 Frw	

2) Abraham bought a music system for 65 000Frw and spent 7 500Frw on its transportation. He sold it for 70 000Frw. Find his profit or loss.

Lesson 4 Assessment of the unit

Topic area	Metric Measurements
Unit 11	Money and its financial application
Key Unit competency	To be able to understand money and its financial applications.
Assessment criteria	Pupils are able to honestly and accurately use money in different transactions, like buying and selling.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing, take into consideration different abilities and needs of slow pupils, gifted pupils, pupils with disabilities; e.g. pupils with writing problems, pupils with visual impairments, pupils with hearing impairments,....

Assessment questions

(20 marks)

Question 1

Find 4 different ways in which you can have 5 000 Frw in notes.

Question 2

Make a simple budget for your school materials if you have received 4 000 Frw from your parents.

Question 3

Complete the following table:

NO	C.P.	S.P.	P	L
a)	?	76 000 Frw		1 500 Frw
b)	34 500 Frw	?	3 500 Frw	
c)	55 600 Frw	58 000 Frw	?	
d)	45 000 Frw	44 500 Frw		?

Question 4

A second hand pair of shoes was sold at 9 000Frw, with a loss of 2 500Frw. Find the CP of the pair of shoes.

Question 5

A TV was bought at 58 950Frw and sold with a loss of 4 780Frw. Find the selling price.

Question 6

You are given 12 000Frw. Make a shopping list according to your needs and wants.

Question 7

Gateete bought a second hand bicycle at 28 000Frw. He spent 6 000Frw on repairing it and for 800Frw on repainting it. He then sold it at 40 000Frw. How much did he gain or lose?

Unit 12: Number patterns Unit at glance

Topic area: Metric Measurement .

Key competence: To be able to describe and generate number patterns following a rule.

Lesson 1: Arithmetic and geometric sequence	Period 1	Period 3	Period 5	Period 6	Period 7	Period 8
	Introduction to arithmetic sequence/ progression of numbers: investigations and concept (ordering numbers)	Introduction to geometric sequence/ progression of numbers: investigations and concept	Distinguishing arithmetic and geometric sequences through activities	Mixed daily life situations that follow arithmetic or geometric sequences	Examining sequences and trying to determine the rule and the type of sequence/ progression	Generating arithmetic and geometric sequences/ progression from a rule
Lesson 2: Assessment of the unit						

Unit warm – ups and games

- 1) Pupils order small stones which go increasing in number, they observe them and say what they see.
- 2) Pupils order things with different colours: 2 red+ 3 white + 4 red+ 6 white, etc.
- 3) Counting in fifties:
Pupils count in fifties, eg. 0...50...100...150...200...250...300...350...400...450...500.
You can start from a different number (ending in 00 or 50).

Unit Lessons

Lesson 1 Arithmetic and geometric sequence

Topic area	Algebra
Unit 12	Number patterns
Key competence	To be able to describe and generate number patterns following a rule.
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain how to order whole numbers according to their size in increasing and decreasing order. • Explain the meaning of arithmetic or geometric progression/sequence. <p>Skills:</p> <ul style="list-style-type: none"> • Determine the clue or pattern for a given arithmetic progression / geometric progression. • Differentiate between arithmetic progression and geometric progression. • Arrange whole numbers in different order. <p>Attitude and values:</p> <ul style="list-style-type: none"> • Appreciate the importance of orderliness in daily life.
Key words	<ul style="list-style-type: none"> - arithmetic progressions - geometric progression
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work. - Environment developed through discussing ways of fighting against erosion.
Competences developed	<ul style="list-style-type: none"> - Communication developed through presenting and explaining to classmates how they came up with their answers. - Problem solving developed through ordering numbers in a certain progression. - Cooperation developed through group work. - Critical thinking developed through problem solving.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional Objectives	Given numbers, pupils will be able to order them following arithmetic rule correctly, confidently in given time.		
Class setting/ organization	Arrange desks so that pupils can work individually, in pairs and in groups.		
Materials	Manila papers, scissors and markers to prepare charts.		
References	<ul style="list-style-type: none"> • J.A. Van de Walle et L.A.H. Lovin.2008. L'enseignement des mathématiques: l'élève au centre de son apprentissage, Edition du renouveau pédagogique Inc., tome 2, 307-324. • http://www.regentsprep.org/regents/math/algtrig/atp2/sequencewordpractice.htm. • https://www.khanacademy.org/math/integral-calculus/sequences_series. 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Facilitate and play the game with pupils.	Mental Math game: Counting in fifties.	
Development (25 min)	<p>Presentation Facilitate pupils to do activities by guiding them and explaining instructions.</p>	<p>Presentation Activity 1: Concept of progression/ sequence In groups, pupils arrange stones in a consecutive order by adding 2 stones (starting by 1) on the precedent number of stones, until they make 8 piles. The different piles can be presented as following: 1, 3, 5, 7, 9, 11, 13, 15.</p> <p>Pupils observe the number of stones from one pile to another and say what they have observed (Answer: The number of stones has increased of 2 stones). Pupils conclude that: The stone piles sequence is “an arithmetic progression” because the difference between two consecutive terms is the same.</p> <p>Activity 2: Concept of pattern The date for the first Sunday of May 2015 was the 3rd. a) Find other dates of the same month which fell on Sunday? b) Explain how you have proceeded in order to know the dates that fell on Sunday. One pupil presents on the board.</p>	<p>Cooperation, peace and values education developed through working in groups.</p> <p>Communication developed through drawing a conclusion on the sequence.</p> <p>Critical thinking developed through solving the problem.</p>

	<p>Summary Facilitate pupils to draw conclusion on an arithmetic sequence/ progression.</p>	<p>Answer: a) <i>The dates of May 2015 that fell on Sunday are: The 3rd, the 10th, the 17th, the 24th, the 31st.</i> b) <i>To know the dates that fell on Sunday, we go by adding 7 (because a week has 7 days).</i></p> <p>Summary: An arithmetic sequence/progression is one in which the difference between any two consecutive terms of the sequence is the same. That difference is called “a pattern” or “a rule” or “a clue”. For example, for the sequence: 2, 6, 10, 14, the pattern is 4 since $6 - 2 = 4$, $10 - 6 = 4$, $14 - 10 = 4$, and so on.</p>	<p>Communication developed through answering questions.</p>
	<p>Application Facilitate pupils to do exercises.</p>	<p>Application In small groups pupils solve the following :</p> <ol style="list-style-type: none"> 1) Order the following numbers to make an arithmetic sequence: 21, 3, 6, 12, 9, 15, 18, 27, 24, ... 2) What is the pattern for the following sequence: 1, 11, 21, 31, 41... 3) Consider the sequence of numbers below and find the pattern: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23. 4) Consider the sequence of numbers: 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32. Find their pattern. 	<p>Problem solving developed through finding the rule / pattern</p>
<p>Conclusion (5 min)</p>	<p>Assessment Write assessment questions on the board.</p>	<p>Assessment Order the following numbers to create an arithmetic sequence (Note: add 5 numbers) a) 2, 5, 8, 11, 14, . . . b) 6, 12, 18, 24, 32, ... c) 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23...</p>	
	<p>Homework Write assessment questions on the board.</p>	<p>Homework A display of cans on a grocery shelf consists of 20 cans on the bottom, 18 cans in the next row, and so on in an arithmetic sequence, until the top row has 4 cans. How many cans, in total, are in the display?</p>	

Instructional objectives

Given numbers, pupils will be able to order numbers following a geometric rule.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

References:

- Van de Walle et L.A.H. Lovin.2008. L'enseignement des mathématiques: l'élève au centre de son apprentissage, Edition du renouveau pédagogique Inc., tome 2.
- <http://www.regentsprep.org/regents/math/algtrig/atp2/sequencewordpractice.htm>

Introduction/Review

Correction of the homework.

Development

Presentation

Activity 1: Concept of geometric sequence

Given flash cards having the multiples of 3 to pupils in groups and they do the following activities:

- 1) Arrange the flash cards in ascending order and descending order, and record the number written on them. (Numbers on flash cards: 1, 3, 9, 27, 81, 243, 729.)
- 2) Arrange the flash cards in descending order and record the numbers written on them.
- 3) Discuss about the relation between numbers in the two different cases above.

Answer: 1) The numbers presented on flash cards in ascending order are: 1, 3, 9, 27, 81, 243, 729.

2) The numbers presented on flash cards in descending order are: 729, 243, 81, 27, 9, 3, 1.

3) -

<i>By multiplication</i>	<i>By division</i>
$1 \times 3 = 3$	$729 \div 3 = 243$
$3 \times 3 = 9$	$243 \div 3 = 81$
$9 \times 3 = 27$	$81 \div 3 = 27$
$27 \times 3 = 81$	$27 \div 3 = 9$
$81 \times 3 = 243$	$9 \div 3 = 3$
$243 \times 3 = 729$	$3 \div 3 = 1$

Pupils draw conclusions that:

- In the first case, each number is equal to the previous times 3.
- In the second case each number is equal to the previous divided by 3.

Activity 2: Concept of geometric sequence

In pairs pupils solve the following:

Suppose that the population of one cell keeps doubling each year. The number of the population is 10 000 in the first year, 20 000 in the second year and so on. What will be the total number in that cell after 3 years?

Answers:

a) Calculations:

$$10\ 000 \times 2 = 20\ 000$$

$$20\ 000 \times 2 = 40\ 000$$

$$40\ 000 \times 2 = 80\ 000$$

b) Solution: in 3 years the total number of people will be 80 000.

Pupils draw a conclusion that:

- This sequence has a factor of 2 between each number: Each term (except the first term) is found by multiplying the previous term by 2.
- When we are multiplying by the same number each time, this is a geometric sequence.

Math Facts!

- A geometric sequence goes from one term to the next by always multiplying (or dividing) by the same value.
Note: 0 is not included in terms of a geometric sequence because 0 multiplied by any number gives 0.
e.g, 1, 2, 4, 8, 16,... and 81, 27, 9, 3, 1, 1/3,... are geometric or progressions, since you multiply by 2 and divide by 3, respectively, at each step.
- The number we multiply with or divide with (in geometric progression) is also called a pattern /clue.

Application

In small groups pupils find the type of progression and explain why they call it so.

a) 1, 4, 16, 64, 256, 1024...

b) 625, 125, 25, 5, $\frac{1}{5}$...

Conclusion

Assessment

- 1) a) Find the missing terms in the geometric progression: 6, 12, 24, ..., 1536
b) What is the ratio?
- 2) Some years before, the price of a liter of milk in was 50 Frw in the town of Kigali. In 2000, it was fixed at 100Frw. In 2001, it was at 200Frw and in 20014 it was at 400Frw. Find the increment of milk price through those years?

Homework

- 1) Find the rule for the following sequence and complete it to have eight terms: 3, 9, 18,

Period 5

Distinguishing arithmetic and geometric sequences through activities

Instructional objectives

Given numbers with a certain progression, pupils will be able to distinguish arithmetic and geometric sequences accurately, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Manila paper on which are written numbers in

arithmetic and geometric progressions

References

- Nova Scotia Department of Education and Culture. 1998. Atlantic Canada Mathematics Curriculum Guide: Grades Primary-3, 34-39
- <http://www.regentsprep.org/regents/math/algtrig/atp2/sequencewordpractice.htm>
- https://www.khanacademy.org/math/integral-calculus/sequences_series

Introduction:

Correction of the homework.

Development

Presentation:

Activity 1: Identifying the type of progression/sequence

Which type of sequence is the following?

55, 51, 47, 43, 39, 35 . . .

Pupils individually and then in pairs work out the activity, representatives of some groups present on board.

Answer:

To get the pattern we consider:

a) Calculations:

$$55 - 51 = 4$$

$$51 - 47 = 4$$

$$47 - 43 = 4$$

$$43 - 39 = 4$$

$$39 - 35 = 4$$

b) Solution: The sequence is arithmetic with the rule: $n - 4$ (n is a number).

Activity 2: Identifying the type of progression/sequence

Which type of sequence is the following?

2, 4, 8, 16, 32, 64 ...

Pupils individually and then in pairs work out the activity, representatives of some groups present on board.

Answer:

To discover the rule, we do the following:

a) Calculations:

$$64 \div 32 = 2$$

$$32 \div 16 = 2$$

$$16 \div 8 = 2$$

$$4 \div 2 = 2$$

a) Solution: The progression is geometric with the rule: $n \times 2$ (n is a number).

Math Facts!

- To find the pattern/clue in an arithmetic progression, we go subtracting two consecutive numbers from the greatest to the smallest.
- To find the rule/pattern for a geometric progression we go dividing two consecutive numbers from the greatest term to the smallest one.

Application

In small groups pupils solve the following:

1) Which type of sequence is each of the following?

a) 24, 12, 6, 3, $3/2$, $3/4$. . .

b) 70, 62, 54, 46, 38, 30, 22 . . .

2) You go to the bank to deposit money and the bank gives you the following two options to choose from:

Option A):

Deposit 10 000 Frw.

The second day you receive 10 100Frw.

The third day you receive 10 200 Frw.

The fourth day your receive 10 300 Frw.

And so forth, each day you gain 100 more.

Option B):

Deposit 30 000 FRw.

The second day you receive 10Frw more.

The third day you receive 20 Frw more.

The fourth day you receive 40 Frw more.

And so forth, each day the interest of the last day is doubled.

Which option gives you more money in 10 days?

Conclusion**Assessment**

Which sequence is the following?

a) 3, 8, 13, 18, 23 . . .

b) 1, 2, 4, 8, 16 . . .

c) Each hour, a grandfather's clock chimes the number of times that corresponds to the time of day. For example, at 3:00, it will chime 3 times. How many times does the clock chime at 12 O' Clock? What is the type of sequence?

Homework

Which type of the sequence is each of the following?

a) 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32 ...

b) 32, 64, 128, 256 ...

Period 6**Mixed daily life situations that follow arithmetic or geometric sequences****Instructional objectives**

Given numbers in real life situations, pupils will be able to find arithmetic or geometric rule and apply the rule for discovering missing terms/ numbers correctly, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs and in small groups.

Materials

Manila paper with numbers in progression.

References:

- Douglas H. Clements & J. Sarama. 2009. Learning and teaching Early Math: The Learning Trajectory Approach. Taylor & Francis Group, 189-202.
- <http://www.regentsprep.org/regents/math/algtrig/atp2/sequencewordpractice.htm>
- https://www.khanacademy.org/math/integral-calculus/sequences_series

Introduction

Correction of homework.

Development**Guided practice**

Pupils in groups work out the following problem:

The head teacher of one school has promised rewards to pupils who will get good results as follows:

The fifth pupil in every class will receive 2 blue pens and 2 notebooks, the fourth pupil will receive 4 blue pens and 4 notebooks, the third pupil will receive 6 blue pens and 8 notebooks, the second pupil will receive 8 blue pens and 16 notebooks, and the first pupil will receive 10 blue pens and 32 notebooks.

- a) Describe the progression of pens and the one of notebooks.
- b) Say what you think about the growth of the two progressions

One pupil presents their answer on the board:

Answer:

The progression can be drawn as follows:

Places of pupils	Number of pens as reward	Number of notebooks as reward
The 5 th	2	2
The 4 th	4	4
The 3 rd	6	8
The 2 nd	8	16
The 1 st	10	32

Answer:

- The number of pens increases by adding 2 on the previous number: it is a arithmetic progression.
- The number of notebooks increases by doubling the previous number: It is a geometric progression.

Observation: The geometric sequence grows faster than the arithmetic sequence.

Pupils draw conclusions that: we can find two mixed progression, one arithmetic and another one geometric.

Application

In small groups pupils solve the following:

- 1) Find the first four terms and state whether the sequence is arithmetic, geometric, or neither.
 - a) 5, 8, 11, 14
 - b) 6, 12, 24, 48
- 2) For fighting against erosion, the population of one cell decided to dig terraces and to plant trees on one side of the mountain. Trees are planted in lines in the following order from the top to the bottom:
 - Line 1: 10 trees
 - Line 2: 20 trees
 - Line 3: 40 trees
 - Line 4: 80 trees
 - Line 5: 160 trees
 - Line 6: 320 trees, and so on. Trees from a line to another keep increasing until they make 10 lines.
 - a) Can you find how many trees were planted on line 10th line?
 - b) How did you manage to find the number of trees on different lines?
 - c) Which type of sequence is it?
 - d) Discuss other ways of fighting against erosion.

Conclusion

Assessment

Logs are stacked in a pile with 24 logs on the bottom row and 15 on the top row. There are 10 rows in all with each row having one more log than the one below it. How many logs are in the stack?

Homework

You start a teaching job with a salary of 100 000Frw, which increases by 1 500Frw each year.

- What is your salary after 10 years?
- How much have you earned in total after 10 years?
- Which time of progression is it?

Period 7

Examining sequences: determining the rule and the type of sequence/ progression

Instructional objectives

Given numbers, pupils will be able to determine the rule and type of progression /sequence accurately, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, then in pairs and after in small groups.

Materials

Flash cards on which are written numbers in a certain progression.

References

- Nova Scotia Department of Education and Culture. 1998. Atlantic Canada Mathematics Curriculum Guide: Grades Primary-3, 34-39
- <http://www.regentsprep.org/regents/math/algrig/atp2/sequencewordpractice.htm>
- https://www.khanacademy.org/math/integral-calculus/sequences_series

Introduction

Correction of homework

Development

Guided practice

Activity 1: Finding the type of progression and the rule

Find the type of progression and the rule:

2; 5; 8; 11; 14; 17; 20; 23, ...

Answer

$$23 - 20 = 3$$

$$20 - 17 = 3$$

$$17 - 14 = 3$$

$$14 - 11 = 3, \text{ and so on}$$

The sequence is arithmetic

The rule is: $n + 3$ (n is a number).

Activity 2: Finding the type of progression and the rule

Find the type of progression and the rule:

4; 8; 16; 32; 64; 128; ...

Calculations:

$$128 \div 64 = 2$$

$$64 \div 32 = 2$$

$$32 \div 16 = 2$$

$$16 \div 8 = 2$$

$$8 \div 4 = 2$$

Solution:

This is a geometric progression.

The rule is: $n \times 2$ (" n " is a number).

Application

In small groups pupils solve the following:

- 1) Determine the rule and the type of progression:
 - a) 45, 40, 35, 30, 25, 20, 15, 10, 5
 - b) 8, 64, 512, 4096 ...
- 2) 20 people live on the first floor of the building, 34 people on the second floor and 48 people on the third floor, and so on. Find the sequence and the rule. What's the total number of people living in the building?

Conclusion

Assessment

Find the rule and the type of progression for each sequence:

- 1) 2, 5, 8, 11, 14 . . .
- 2) 6, 36, 216, 1296 . . .
- 3) 43, 35, 28, 21, 14...

Homework

Determine the rule and the type of progression:

- a) 18, 16, 14, 12, 10, 8, 6, 4, 2.
- b) 10, 20, 30, 40, 50, 60, 70, 80.

Period 8

Generating arithmetic and geometric sequences from a rule

Instructional objectives

Given numbers, pupils will be able to generate arithmetic and geometric progression from a rule accurately, confidently and in given time.

Class setting/organization

Arrange desks so that pupils can work individually, in pairs, and in small groups.

Materials

Flash cards on which are written numbers in different progressions.

References

- Douglas H. Clements & J. Sarama. 2009. Learning and teaching Early Math: The Learning Trajectory Approach. Taylor & Francis Group, 189-202.
- Nova Scotia Department of Education and Culture. 1998. Atlantic Canada Mathematics Curriculum Guide: Grades Primary-3, 34-39.

Introduction

Correction of homework.

Development

Presentation

- 1) Write an arithmetic progression with 10 terms from the rule: $n + 4$ (start from 4).
- 2) Write a geometric progression with 7 terms following the rule: $n \times 3$ (start from 3).

In pairs pupils solve the problem.

One pupil presents the answer on the board explaining how they came up with their answer when other pupils are following.

Answers:

- 1) From the rule $n + 4$: we have: 4; 8; 12; 16; 20; 24; 28; 32; 36; 40.
- 2) From the rule $n \times 3$ we have: 3; 9; 27; 81; 243; 729; 2187.

Pupils draw conclusions that:

From different rule like: $n+...$; $n-...$; $n \times ...$; $n \div ...$ we can find an arithmetic or a geometric progression.

Application

In small groups pupils solve the following:

- 1) Find arithmetic progressions of 9 terms following the rules below:
 - a) $n + 9 =$
 - b) $n - 5 =$
- 2) Find geometric sequences with 6 terms following the rules below:
 - a) $n \times 4 =$
 - b) $n \times 5 =$
- 3) Find a geometric progression with 4 terms under the rule $n: 5$ and its first term is 10 000.

Conclusion

Assessment

- 1) Find arithmetic progressions of 9 terms following the rules below:
 - a) $n + 10 =$
 - b) $n - 8 =$
- 2) Find geometric sequences with 6 terms following the rules below:
 - a) $n \times 3 =$
 - b) $n \times 6 =$
- 3) Find a geometric progression with 4 terms under the rule $n: 2$ and its first term is 2 000

Homework

- 1) Find arithmetic progressions of 9 terms following the rules below:
 - a) $n + 6 =$
 - b) $n - 7 =$
- 2) Find geometric sequences with 6 terms following the rules below:
 - a) $n \times 5 =$
 - b) $n \times 4 =$
- 3) Find a geometric progression with 4 terms under the rule $n: 10$ and its first term is 50 000

Lesson 2 Assessment of the unit

Topic area	Algebra
Unit 12	Number patterns
Key unit competency	To be able to describe and generate number patterns following a rule.
Assessment criteria	Pupils are able to order whole numbers (in increasing and decreasing order) or generate number patterns following a rule, accurately, confidently and in given time.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing, take into consideration different abilities and needs of slow pupils, gifted pupils, pupils with disabilities; e.g. pupils with writing problems, pupils with visual impairments, pupils with hearing impairments,....

Question 1

Order the following numbers to make an arithmetic sequence and say the rule which is followed:
8, 40; 16; 5624; 32; 48; 74.

Question 2

Order the following numbers in a geometric sequence:
4, 1024; 16, 64; 256.

Question 3

Determine the rule for the following sequence: 90; 81; 72; 63; 54; 45; 36; 27; 18; 9

Question 4

In a school garden flowers are planted in lines following this sequence: 2 on the first line, 4 on the second line, 6 on the third and so on. There are 10 rows in all.

- Find the number of flowers that are planted in the garden.
- Find the number of flowers which are planted on the ninth line.
- Determine the sequence and the rule followed rule.

Question 5

In order to clean the environment Mutesi decided to bag the plastic bottles for recycling drive. She started by collecting 50 bottles in the first month and was rewarded by the Institution for the Environment Promotion. After she decided to double the number of bagged bottles each month by inviting more and more young people to join her. So they collected plastic bottles as follows: 100 bottles in the second month, 200 bottles in the third month, 400 bottles in the fourth month, and 800 bottles in the fifth month.

- If this pattern continues, how many plastic bottles will the Mutesi association collect in the eighth month?
- Explain how you managed to know that number.
- Determine the sequence and the rule.

Unit 13: Filling in missing numbers Unit at glance

Topic area: Algebra.

Key competence: To be able to solve missing number problems involving addition and subtraction.

Lesson 1: Solve missing number problems involving addition	Period 1	Solve a simple missing number problem involving addition	Period 2	Exercises on solving a simple missing number problem involving addition
	Period 1	Solve a simple missing number problem involving subtraction	Period 3	Exercises on solving a simple missing number problem involving subtraction
Lesson 2: Solve missing number problems involving subtraction	Period 1	Solve a simple missing number problem involving subtraction and addition.	Period 2	Exercises on solving a simple missing number problem involving subtraction
	Period 1	Solving a simple missing number problem involving arithmagon.	Period 3	Exercises on solving simple missing number problem using arithmagon.
Lesson 3: Solving missing number problem involving arithmagon.	Period 1	Solving a simple missing number problem using arithmagon.	Period 2	Exercises on Solving simple missing number problem using arithmagon.
	Period 1	Solving a simple missing number problem using arithmagon.	Period 3	Exercises on Solving simple missing number problem using arithmagon.
Lesson 4: Revision of the unit				
Lesson 5: Assessment of the unit	Period 1	Assessment	Period 2	Feedback and remediation

Unit Lessons

Lesson 1 Solving missing number problem involving addition

Topic area	Algebra
Unit 13	Filling in missing numbers
Key competence	To be able to solve missing number problems involving addition and subtraction
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge Explain how to solve simple missing number problems involving addition.</p> <p>Skills Use relationships between numbers to solve missing number problems. Create missing number problems.</p> <p>Attitude Appreciate the importance of inverse operations when solving missing number problems and checking answers</p>
Key words	Beginning (start), middle (change) and end (result)
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through finding a missing number. - Standardisation culture developed through discussing ways of fighting against unemployment.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional Objectives	Given a situation pupils will be able to solve missing number problems correctly, confidently and in given time.
Class setting/ organization	Arrange desks so that pupils can work individually, in pairs and in small groups.
Materials	Manila paper on which a missing number exercise is written.
References	- Houghton Mifflin. 2002. Mathematics, p 12 -13 - https://www.mathsisfun.com

Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Facilitate pupils to do review activities about addition.	<p>Muhoza went to the market and bought cabbages at 2 545 Frw and 10kg of rice at 7 500 Frw. How much did she spend altogether?</p> <p>Answer: a) Calculations:</p> $\begin{array}{r} 1 \\ 2\ 5\ 4\ 5 \\ +\ 7\ 5\ 0\ 0 \\ \hline 1\ 0\ 0\ 4\ 5 \end{array}$ <p>b) Solution: Muhoza spent 10 045 Frw altogether.</p>	<ul style="list-style-type: none"> - Communication developed through answering questions - Critical thinking is developed through solving a problem.
Development (25 min)	Facilitate pupils to solve the missing number word problem involving addition	<p>Activity 1: Missing number problem involving addition In groups of 3 pupils solve the following:</p> <p>1) Find the missing number: $35 - ? = 99$</p> <p>2) Can you name each part of the number sentence above? Some group representatives present on the board.</p> <p>Answer: 1) When solving the missing number problem we use an inverse operation: a) Calculation: $99 - 35 = 64$ b) Solution: The missing number is 64</p> <p>Beginning (start) ↑ $35 + ? = 99$ → End (result) ↓ Middle (change)</p>	<ul style="list-style-type: none"> - Communication developed through presentations. - Cooperation developed through working in group - Standardization culture developed through general welfare in activities

Facilitate pupils to solve the missing number word problem involving addition

Activity 2: Missing number problem involving addition

Kayihura planted 98 564 seedlings of coffee in two rounds. In the first round, he planted 45 423 seedlings. How many seedlings did he plant in the second round?

Some group representatives present on the board.

Answer:

The missing number can be written as follow:

$$45\,423 + ? = 98\,564$$

This helps us to find easily the missing number.

Then:

a) *Calculations:*

$$98\,564 - 45\,423 = 53\,141$$

b) *Solution:*

Kayihura planted 53 141 seedlings of coffee in the second round.

Activity 3: Missing number problem involving addition

1) Miss Rwanda decided to reward the first two girls in primary national exam. She rewarded the second girl 30 000frw. If she gave 97 000frw altogether, how much did she give the first girl?

Some group representatives present on the board.

Answer:

We need to organize the given as follow:

$$? + 30\,000 = 97\,000$$

This helps us to find easily the reward of the first girl. Then

a) *Calculation:*

$$97\,000 - 30\,000 = 67\,000$$

b) *Solution:*

Miss Rwanda gave the first girl 67 000 Frw as a reward.

	<p>Summary</p> <ul style="list-style-type: none"> • For each problem we have: beginning (start), middle (change) and end (result) Note: These are known as number sentence descriptors. • When there is a plus in the middle, the problem is called addition problem. • When the missing number is the middle (change), it is found by taking the end (result) minus the beginning (start). eg: $35 + ? = 99$: Answer: the missing number is $99 - 35 = 64$. • When the missing number is the beginning (start) it is found by taking the end (result) minus the middle (change), eg, $? + 13 = 23$ Answer: the missing number is $23 - 13 = 10$ 	
	<p>Application</p> <p>In small groups pupils solve the following:</p> <ol style="list-style-type: none"> 1) $? + 968 = 1125$ 2) Out of the 29 870 people in a village, 23 971 are employed. Find the number of unemployed people? How can we fight against unemployment? 	<ul style="list-style-type: none"> - Communication developed through discussing in groups - Critical thinking developed through solving problem - Co-operation developed through working in pairs and in groups.
<p>Conclusion 10min</p>	<p>Assesment</p> <p>Write assessment activities on board</p>	<p>Assesment</p> <ol style="list-style-type: none"> 1) $? + 957 = 6\ 574$ 2) From March to April 2015 the rainfall was 171mm. If the rainfall in April was 97mm, what was the rainfall in March? 3) Muhire had 12 000 Frw. Then his sister gave him some more money. Muhire now has 25 000Frw. How much money did his sister give to Muhire?
	<p>Homework</p> <p>Write homework activities on board</p>	<p>Homework</p> <ol style="list-style-type: none"> 1) $854 + ? = 958$ 2) Mukesha planted some trees last year in her field for protecting it against erosion. This year, she planted other 45 trees. All her trees grew up and now she has got 102 trees. How many trees had she planted in the first round?

Lesson 2

Solving missing number problems involving subtraction

Topic area	Algebra
Unit 13	Filling in missing numbers
Key competence	To be able to solve missing number problems involving addition and subtraction.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge Explain how to solve simple missing number problems involving subtraction. Skills Use relationships between numbers to solve missing number problems. Attitude Appreciate the importance of inverse operations when solving missing number problems and checking answers.
Key words	Beginning (start), middle (change) and end (result)
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations. - Environment developed through discussing the importance of planting trees. - Financial education developed through engagement in activities that promote good planning and saving as well as those which are related to buying and selling. - Standardization developed through activities related to trade and general welfare (eg planting coffee trees).
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Solving a simple missing number problem involving subtraction

Instructional objectives

Given a situation pupils will be able to solve missing number (word) problem correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually or in small groups.

Materials

Manila papers, on which missing numbers exercises, are written.

References

- Houghton Mifflin. 2002. Mathematics, p 18-19
- <https://www.mathsisfun.com> visited 12, August, 2015

Introduction/Review

Correction of homework.

Development

Presentation

Pupils in groups do the following exercises on finding the missing number:

Activity 1: Solving a missing number problem involving subtraction

Find the missing number:

$$? - 17\,978 = 9\,351$$

Answer:

a) Calculations:

$$17\,978 + 9\,351 = 27\,329$$

b) The missing number is 27 329.

Activity 2: Solving the missing number problems involving subtraction

A water tank holds 95 218 litres of water, if 36 190 litres are left in the tank, how many litres of water have been used?

Some group representatives present on the board.

Answer:

The missing number problem can be written as: $95\,218 - ? = 36\,190$.

a) Calculations:

$$95\,218 - 36\,190 = 59\,028$$

b) Solution:

Water that has been used is 59 028 litres.

Activity 3: Solving the missing number problems involving subtraction

Gatete collected avocados from a tree. Out of them 11 avocados have been damaged. After counting the remaining avocados he found 69. How many avocados did Gatete collect?

Answers:

The missing number problem can be written as: $? - 11 = 69$

a) Calculations:

$$69 + 11 = 80$$

b) Solution:

Gatete collected 80 avocados.

Math Facts!

- For each problem we have: beginning (start), middle (change) and end (result).
- When there is a minus in the middle, the problem is called subtraction problem.
- When the missing number is the beginning (start), it is found by taking the end (result) plus the middle (change).
- When the missing number is the middle (change), the missing number is found by taking the beginning (start) minus the end (result).

Application

In small groups pupils solve the following:

- 1) A farmer planted 6 560 coffee trees. When they grew up he counted them and found that they were 6104. How many coffee trees died up? Discuss importance of planting coffee trees.
- 2) $3\,484 - ? = 1\,121$

Conclusion**Assessment**

- 1) After distributing 314 school uniforms to new comers, the school accountant counted the remaining uniform and found that they were 30. How many uniforms had the school bought?
- 2) A shop keeper sold a bicycle at 50 000 Frw with an interest of 3 700 Frw. What was the cost price?
- 3) $? - 13\,468 = 2\,621$

Homework

Solve the following:

- 1) My friend had a credit airtime of 1 000 Frw, after using some credit airtime the balance was 433Frw. How much credit airtime was used?
- 2) Murerwa had saved some money on her account. After a sometime, she withdrew 45 500 Frw for paying school fees for her daughter, and her balance became 15 400 Frw. How much money was on her account before withdrawing?

Period 4

Creating their own missing number problems

Instructional objectives

Given some instructions pupils will be able to create their own missing number problems and find solutions correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila papers

References

- Houghton Mifflin. 2002. Mathematics, p 21
- <https://www.mathsisfun.com> visited 13, August, 2015

Introduction/Review

Correct of homework

Development

Presentation

Activity 1: Creating missing number problems involving addition

Pupils in small group create their own missing number involving addition.
Some pupils correct on the board.

Activity 2: Creating missing number problem involving subtraction

Pupils in small group create their own missing number problems involving subtraction.
Some pupils correct on the board.

Application

In small groups pupils do the following:

Gives manila papers and markers to each group to write on their own problems and facilitate them to create their own missing number problem following the following model:

- a) The first involving addition
- b) The second involving subtraction

After creating them they solve them and some pupils present on the board.

Conclusion

Assessment

Ask pupils to create their own missing numbers following the above model.

- c) The first involving addition
- d) The second involving subtraction

Homework

Pupils create their own missing numbers and solve them (at least two exercises: one involving addition and other one involving subtraction).

Lesson 3 Solve missing numbers using arithmagon

Instructional objectives

Given an arithmagon pupils will be able to solve missing number problems correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila papers, scotch, markers, ruler, and scissors.

References:

- Houghton Mifflin. 2002. Mathematics, p 22
- <https://www.mathsisfun.com> visited 13, August, 2015

Topic area	Algebra
Unit 13	Filling in missing numbers
Key competency	To be able to solve missing number problems involving addition and subtraction.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: Explain how to solve simple missing number problems involving addition and subtraction Skills: <ul style="list-style-type: none"> • Use relationships between numbers to solve missing number problems. • Create missing number problems Attitude: Appreciate the importance of inverse operations when solving missing number problems and checking answers
Key words	Arithmagon
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through filling arithmagons.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 Solving a simple missing number problem using arithmagon

Instructional objectives

Given an arithmagon pupils will be able to solve missing number problems correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila papers, scotch, markers, ruler, and scissors.

References

- Houghton Mifflin. 2002. Mathematics, p 22
- <https://www.mathsisfun.com> visited 13, August, 2015

Introduction/Review

Correction of the homework

Development

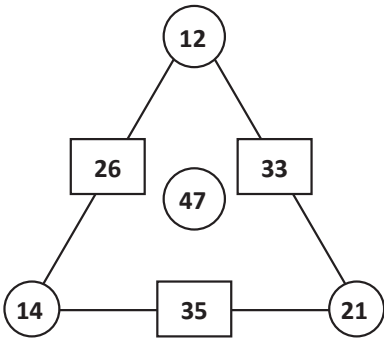
Presentation

Give instructions to pupils

Activity1: Filling the missing number using arithmagon

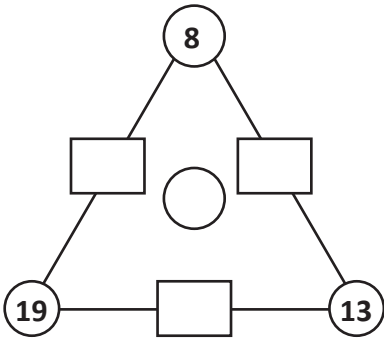
- Draw three circles which are not on a straight line.
- Join them with straight line, put in each circle a number.
- Add numbers in the circles which are on the same line.
- Draw a square in the middle of each line and write the answer in it.
- Add number in all three circles and write it in a circle drawn in the centre.

Answer



The answer depends on the choice of each group.

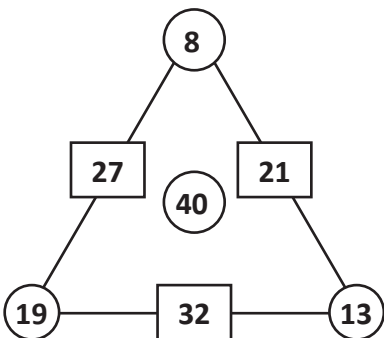
Activity 2: Fill in the missing numbers following the instructions above



Answer:

The centre circle number is given by $13+8+19=40$

The square numbers are given by $19+8=27$; $8+13=21$; $13+19=32$ (see below)



The polygons with a circle number placed at each vertex and a square number on each side so that each square number is the sum of the two circle numbers on the same line is called Arithmagon.

Math Facts!

Arithmagon is the polygons with a circle number placed at each vertex and a square number on each side so that each square number is the sum of the two circle numbers on the same line.

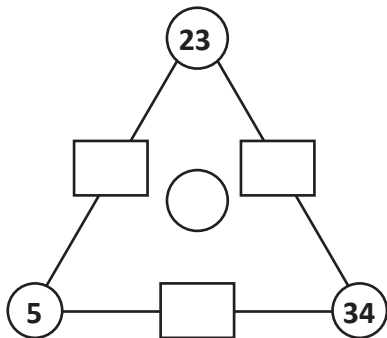
To find the missing number we do as follows:

- The square is equal to the sum of circle numbers which are on the same line.
- The number in the centre circle is equal to the sum of the three circle numbers.

Application

In small groups pupils solve the following:

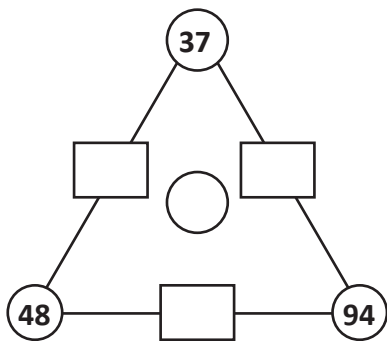
Find the missing number:



Conclusion

Assessment

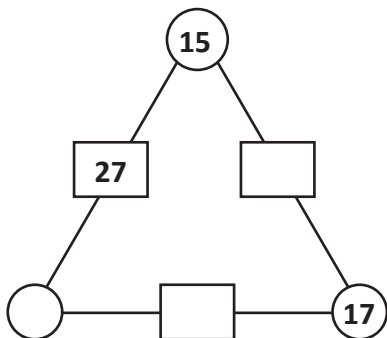
Find the missing number:



Homework

The number in the circles added together makes the number in the linking rectangle.

Find the missing numbers in this arithmagon:



Topic area	Algebra
Unit 13	Filling in missing numbers
Key competency	To be able to solve missing number problems involving addition and subtraction.
Assessment criteria	Pupils are able to solve simple missing number problems involving addition and subtraction accurately, confidently in required time.
Competences developed	Critical thinking
Attention to special educational needs	When preparing assessment, materials needed and when assessing, take into consideration different abilities and needs of slow pupils, gifted pupils, pupils with disabilities; e.g. pupils with writing problems, pupils with visual impairments, pupils with hearing impairments....

Assessment questions**20 marks****Question 1**

125 children took part in a Mathematics competition. 54 of them are girls. How many more boys than girls were there?

Question 2

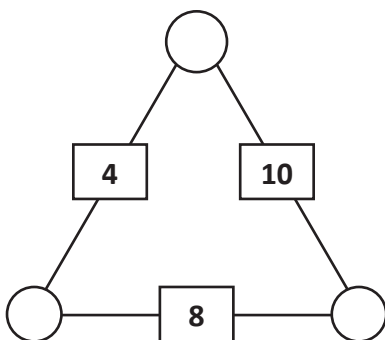
A fan sports club had 2 564 members. 130 members joined the club after a year. How many new members should the club recruit in order to have 3 000 members?

Question 3

50 children attended a birthday party. Some children left during the first hour. After, 9 children came in during the second hour and the total number of children became 46. How many children left during the first hour?

Question 4

The number in each square is equal to the sum of the numbers in the circles on the either side. Fill in the missing numbers.



Unit 14: Types of lines and angles.

Unit at glance

Topic area: Geometry

Key competence: Learner should be able to identify types of lines and angles and use a protractor to measure angles.

Lesson 1: Identifying and drawing lines : straight, intersecting, parallel				
Lesson 2: Types of angles	Period 1	Identifying and measuring angles (acute, obtuse, right, straight, reflex angles)	Period 2	Exercises on measuring angles(right, acute, obtuse, straight angles, reflex angles)
	Period 3	Drawing/construct angles (right, acute, obtuse, straight, reflex angles)	Period 4	Identifying, drawing and measuring complementary and supplementary angles
	Period 5	Exercises on identifying, drawing and measuring acute, obtuse, right, straight, complementary, and reflex angles		
Lesson 3: Revision of the unit				
Lesson 4: Assessment of the unit	Period 1	Assessment	Period 2	Feedback and remediation

Unit warm-ups and games

Line game

Using arms make different types of lines and pupils say the types of lines made.

Up, down, left, right

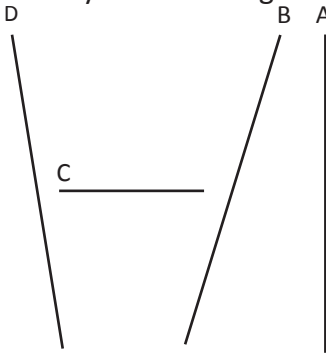
Move the right hand up and then down, left and then right and pupils say the types of lines made.

Unit Lessons

Lesson 1

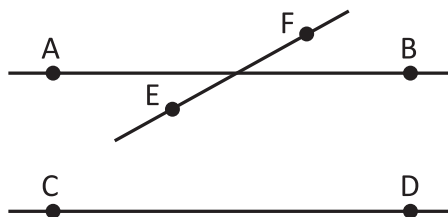
Types of lines (identifying and drawing lines: straight, intersecting, parallel)

Topic area	Geometry
Unit 14	Types of lines and angles
Key competency	Pupils should be able to identify types of lines and angles and use a protractor to measure angles.
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> State different types of lines (straight, intersecting, parallel) Identify and choose appropriate geometrical instruments to draw line segment. <p>Skills:</p> <ul style="list-style-type: none"> Draw straight, parallel and interesting lines. Use lines and angles in daily life. <p>Attitude:</p> <ul style="list-style-type: none"> Appreciate the importance of lines in daily activities. Be confident and accurate when drawing lines and angles.
Key words	Horizontal, vertical, intersecting and parallel lines
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning tasks in group activities and presentation. Peace and values education developed through discussing in group and leading to consensus. Environment and sustainability developed through activities related to using to parallel lines while planting flowers or seeds in gardens.
Competences developed	<ul style="list-style-type: none"> Communication developed through answering questions. Co-operation and interpersonal management developed through working in pairs and in groups. Critical thinking developed through identifying types of lines. Research and problem solving developed through finding situations where we use lines in real life. Analytical skills developed through applying what was learned in drawing different types of lines.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional Objectives	<ul style="list-style-type: none"> Given different statements defining lines, pupils will be able to identify which statement is true or wrong confidently, accurately and in a given time. Using rulers pupils will be able to draw different types of lines (straight, intersecting, parallel) confidently, accurately and in a given time. 		
Class setting/ organization	<ul style="list-style-type: none"> Arrange desks so that pupils can work individually, in pairs and/or in small groups. Make sure that each group is mixed in terms of gender and ability. 		
Materials	Rulers, manila papers, flash cards		
References	<ul style="list-style-type: none"> Houghton Mifflin. 2002. Mathematics, p 123-124 Byamukama, et al,(2010).New Upper Primary Maths, Pupil’s book for Grade 4.P46-52 <p>https://www.mathsisfun.com visited on Thursday, October 20, 2015</p>		
Steps / Timing	Teachers’ activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5 min)	Review Facilitate playing the following game: Up, down, left, right. Make a line using arms.	Pupils play game imitating teacher and say the types of lines made.	- Communication developed through playing a game.
Development (25 min)	Show and ask pupils to observe different lines drawn on a chart /manila paper Facilitate them to discover the types of lines	<p>In pairs or in groups of 3 or 5 pupils do the following:</p> <p>Activity 1: Identifying horizontal, vertical and oblique lines</p> <p>In pairs pupils observe, discuss and classify the following lines:</p>  <p>Some group representatives present on the board.</p> <p>Answer: <i>Line A is a vertical line.</i> <i>Line B is an oblique line.</i> <i>Line C is an horizontal line.</i> <i>Line D is an oblique line.</i></p>	<ul style="list-style-type: none"> Communication developed through discussing during activities. Cooperation developed through working in pairs/in groups. Critical thinking developed through identifying types of lines.

Activity 2: Identifying parallel and intersecting lines

In pairs pupils discuss and classify the following lines:



Answers:

Line AB is parallel to line CD

Line AB is intersecting with line EF

Activity 3: Drawing different lines

Using a ruler draw the following lines:

Horizontal line

Vertical line

Oblique line

Two oblique parallel lines and one line intersecting them.

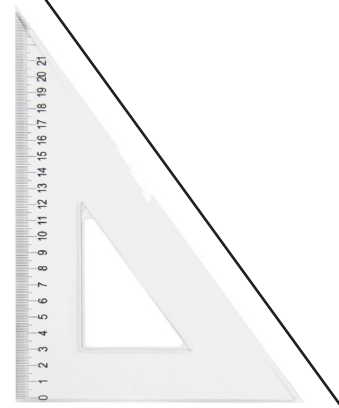
Answers:

Personal answer

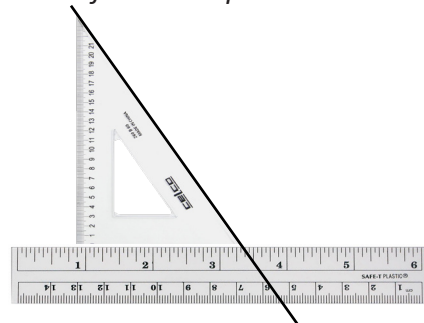
Personal answer

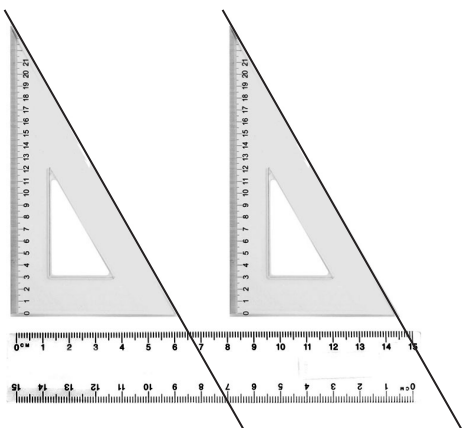
Personal answer

Step 1: Place a set square up right and draw a line along the sloping side.

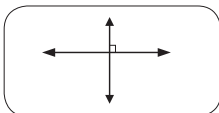
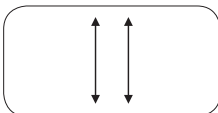
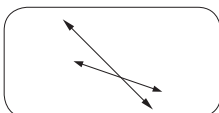
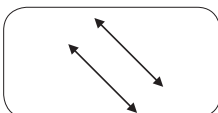
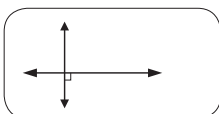
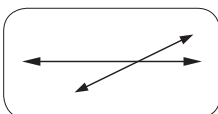


Step 2: Hold a ruler firmly at the base of the set square.



	<p>Step 3: Drag the set square along the ruler and move the sloping side to a new position then draw another line.</p> 	
<p>Facilitate pupils to measure the distance between the 2 parallel lines.</p>	<p>Step 4: Remove the ruler and the set square, the two lines made are parallel.</p> <p>Note: Make sure that pupils follow the instruction and give them enough time to practice on drawing parallel lines individually. After each activity let some pupils present on board.</p> <p>Pupils measure the distance between the 2 parallel lines, they measure it at different points of the lines.</p>	
<p>Summary</p> <p>Basing on pupils answers, facilitate them to make a summary.</p>	<p>Pupils find out that :</p> <ul style="list-style-type: none"> • Horizontal lines are straight lines which run from left to right or vice versa. • Vertical lines are straight lines which run from top to bottom or vice versa. • Oblique lines are straight lines which are neither vertical nor horizontal but slanting. • Parallel lines are lines which are equidistant (equal distance from each other). They never meet. The distance between the lines is uniform throughout at any point along the lines. • Lines that have one and only one point in common are known as intersecting lines. 	<ul style="list-style-type: none"> - Communication developed through discussing during activities and presentation of findings on chalkboard - Cooperation developed through working in pairs

	<p>Application</p>	<p>Application In small groups pupils solve the following:</p> <ol style="list-style-type: none"> 1) Draw any three different straight lines. 2) Draw three parallel lines. 3) Draw two vertical parallel lines intersecting two parallel oblique lines. 4) How many parallel lines are in each of the following letters: E, F, W, Z? 5) Discuss where parallel lines and intersecting lines are used in real life situations. Some pupils present on the board. Note: During co-curricular activities, encourage pupils to use parallel lines in gardens/ agriculture while planting flowers or seeds. 	<ul style="list-style-type: none"> - Communication developed through discussing during activities - Cooperation developed through working in pairs - Critical thinking developed through identifying types of lines. - Research and problem solving developed through finding situations where we use lines.
<p>Conclusion (10min)</p>	<p>Assessment Write assessment questions on the board.</p>	<p>Assessment Individually pupils do the following:</p> <ol style="list-style-type: none"> 1) Decide whether each statement is true or false. <ol style="list-style-type: none"> a) If two straight lines do not intersect, they must be parallel. b) Horizontal lines are drawn from top to bottom. c) Vertical lines are drawn from top to bottom. 2) Using a ruler draw any different five straight lines and name them. 3) Identify objects which make the following lines in class: <ol style="list-style-type: none"> a) A two parallel horizontal lines b) Two intersecting lines c) Two parallel vertical lines 	<ul style="list-style-type: none"> - Critical thinking developed through identifying types of lines as well as properties of different lines as well as their properties.

	<p>Homework Write exercises on the board.</p>	<p>Homework State whether the following lines are parallel or intersecting:</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; text-align: center;">  Answer: _____ </div> <div style="width: 50%; text-align: center;">  Answer: _____ </div> <div style="width: 50%; text-align: center;">  Answer: _____ </div> <div style="width: 50%; text-align: center;">  Answer: _____ </div> <div style="width: 50%; text-align: center;">  Answer: _____ </div> <div style="width: 50%; text-align: center;">  Answer: _____ </div> </div>	<p>Critical thinking developed through identifying types of lines.</p>
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Lesson 2 Types of angles

Topic area	Geometry
Unit 14	Types of lines and angles
Key competency	Pupils should be able to identify types of lines and angles and use a protractor to measure angles.
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Recognize types of angles: acute, obtuse, right, straight, complementary, supplementary and reflex angles. Establish the difference between different angles based on their properties. <p>Skills:</p> <ul style="list-style-type: none"> Measure with precision different angles using a protractor (angle measurer). Draw different angles using appropriate geometrical instruments. Differentiate types of angles based on their properties. <p>Attitude:</p> <ul style="list-style-type: none"> Appreciate the importance of angles in daily activities. Be confident and accurate when measuring angles.
Key words	Acute, obtuse, right, straight, reflex, complementary, supplementary angles
Cross cutting issues	<p>-Gender enhanced through assigning tasks in group activities and presentations.</p> <p>-Peace and values education developed through discussing in group and leading to consensus.</p>
Competences developed	<p>-Communication developed through discussing and answering activities.</p> <p>-Cooperation developed through working in pairs and in groups.</p> <p>- Critical thinking developed through measuring and constructing angles.</p> <p>-Research and problem solving developed though being resourceful in finding answers to questions.</p>

Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...
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Period 1 **Identifying and measuring angles (acute, obtuse, right, straight, reflex angles)**

Instructional objectives

- Given different angles pupils will be able to name them as acute, obtuse, right, and straight or reflex angles confidently, accurately and in a given time.
- Given a pencil and a protractor, pupils will be able to measure different types of angles confidently, accurately and in a given time.

Class setting / organization:

- Arrange desks so that pupils can work individually, in pairs and in small groups.
- Make sure each group is mixed in terms of gender and ability.

Materials:

- Rulers, manila papers on which different angles are drawn, protractor, pencil

References:

- Houghton Mifflin. 2002. Mathematics, p 123-124.
- NCDC.2008. Mathematics Pupil’s book. Primary Four. ISBN 9970-04-303-X
- Byamukama, J, al. L(2010).New Upper Primary Maths. Pupil’s book for Grade 4.P57-59
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Introduction/Review

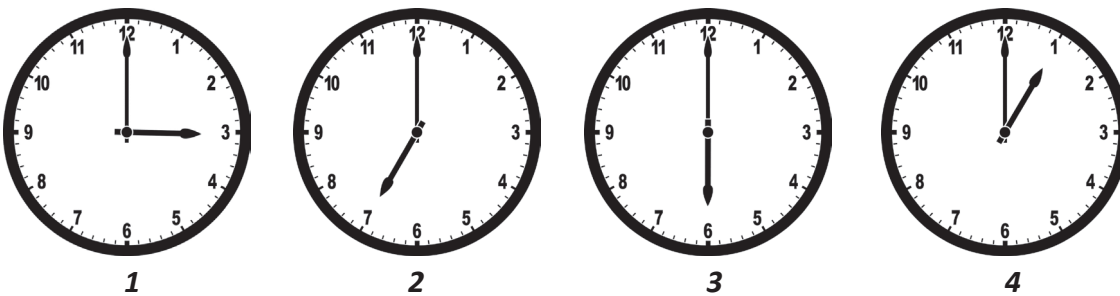
Correction of homework.
Game: **Up, down, left, right**

Development

Presentation

Activity 1: Identifying angles

Pupils in group of 4 discuss the hands of the following clocks and classify the angles basing on the attributes (properties) of angle size (i.e., small angles, medium, large, wide ...) and then they determine their properties.



Answers:

1) We have four angles: right angle (on clock 1) and it is equal to 90 degrees, obtuse angle (on clock 2) and it is greater to 90 degrees and less 180 degrees, straight angle (clock 3), which is equal to 180 degrees and acute angle (on clock 4), which is less than 90 degrees.

Activity 2: Identifying angles

Pupils observe the opening of the classroom door and cupboard door and after comparing the angle made by the classroom door and cupboard door with the above angles, classify it using the attributes/properties of angle size.

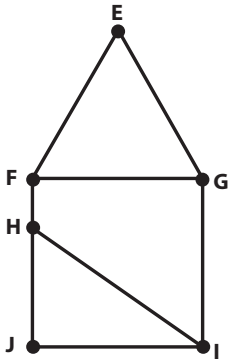
Answer:

The angle made by the opening of the classroom door and cupboard door is bigger than the above

angles and it is called a reflex angle (it is between 180 degrees and 360 degrees).

Activity 3: Identifying angles

Pupils in pairs discuss and compare angles which are made in the following shape and answer the related questions:



- How many acute angles are in this figure?
- How many obtuse angles are in this figure?
- How many right angles are in this figure?

Answers:

- The acute angles are FEG , JHI , HII , IHI , FGE , EGF , EFG , FEG , GEF , HIG , GIH
- The obtuse angle angles are FHI , IHF , HFE , EFH , EGI , IGE
- The right angles are HFG , GFH , GIJ , JIG , IJI , HJI

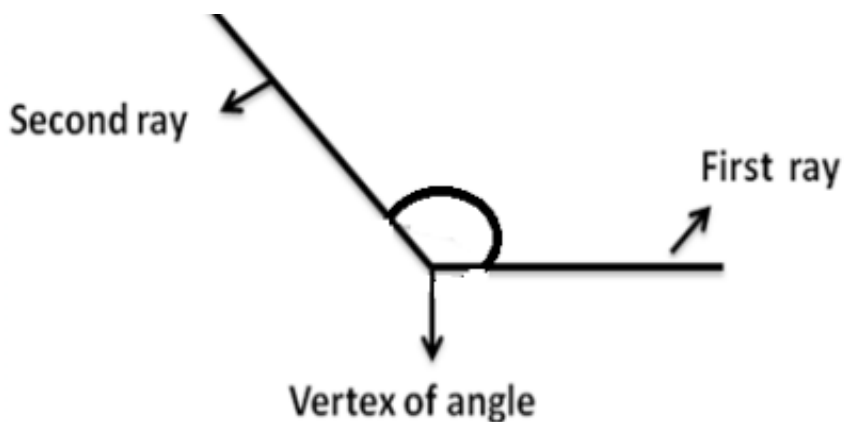
Activity 4: Measuring angles

(Note: the angles must be drawn on flash cards or on manila paper)

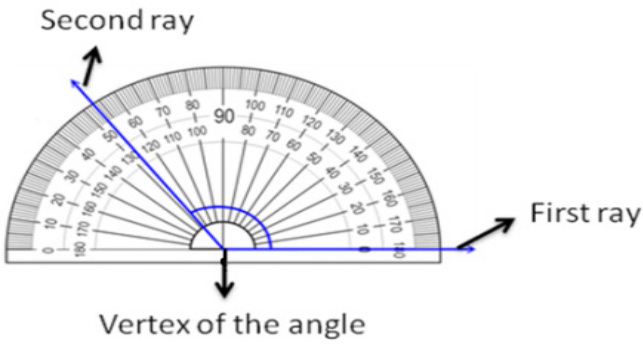
After reading the instructions, use a protractor to measure the given angle.

Instructions

- Place the central point of the protractor on the vertex of the angle,
- Line up the base line of the protractor with the lower ray (first ray or arm) of the angle.
- Measure the angle from the base line using the scale which begins at 0° until you reach the second ray/arm.
- The position of the second ray/arm will be the size of the angle on the protractor.



Answer:



Math Facts!

- An angle is a figure made by two rays meeting at a common point called vertex of angle.
- The angle is measured in degrees and denoted by x° (**Note:** x stands for a number)
- A **right angle** is an angle whose measurement is exactly 90° .
- An **acute angle** is an angle whose measurement is less than 90° .
- An **obtuse angles** is an angle greater than 90° but less than 180° .
- If an angle's measurement is 180° , it is called a **straight angle**.
- A **reflex angle** is an angle between 180° and 360° .

To measure the size of an angle, we follow the following steps:

Step 1: Place the central point of the protractor on the vertex of the angle.

Step 2: Line up the base line of the protractor with the lower ray (first ray or arm) or the angle.

Step 3: Measure the angle from the base line using the scale which begins at 0° until you reach the second ray/arm.

Step 4: The position of the second ray/arm will be the size of the angle on the protractor.

Hint: If the arms are too short to read/measure the angle, make them longer with a pencil and a ruler before measuring the angle.

The angle is 127°

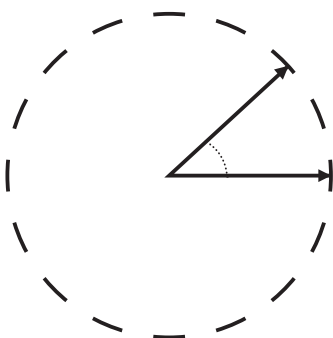
Application

In small groups pupils do the following:

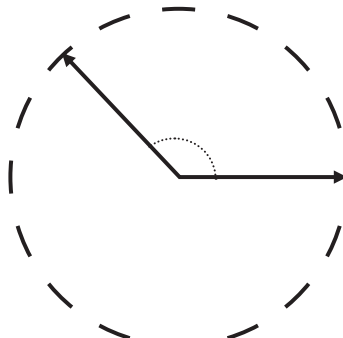
- 1) For each angle below state whether it is acute, obtuse, right, straight or reflex angle:
 - a) 23°
 - b) 90°
 - c) 150°
 - d) 249°
 - e) 360°
 - f) 180°
- 2) The hands of a clock make an acute angle for all the following clock time except one. Can you find the odd one out.
 - a) 5 minutes past 12
 - b) 20 minutes past 3
 - c) Half past 8
 - d) 5 minutes past 6
 - e) 10 O' clock
- 3) Use a protractor to measure the following angles.

(**Note:** the angles must be drawn on flash cards, or on manila paper)

1)



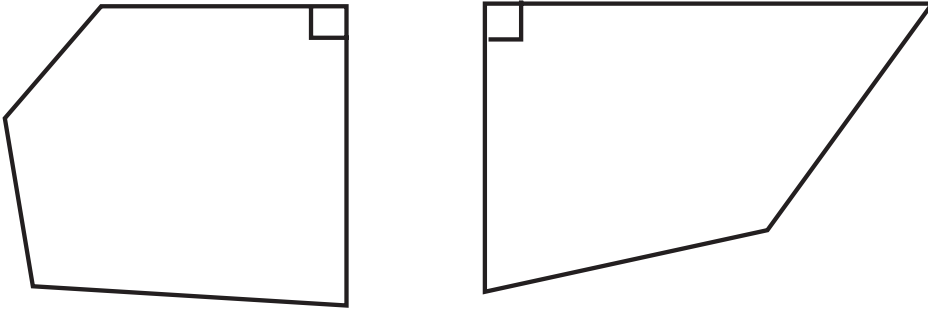
2)



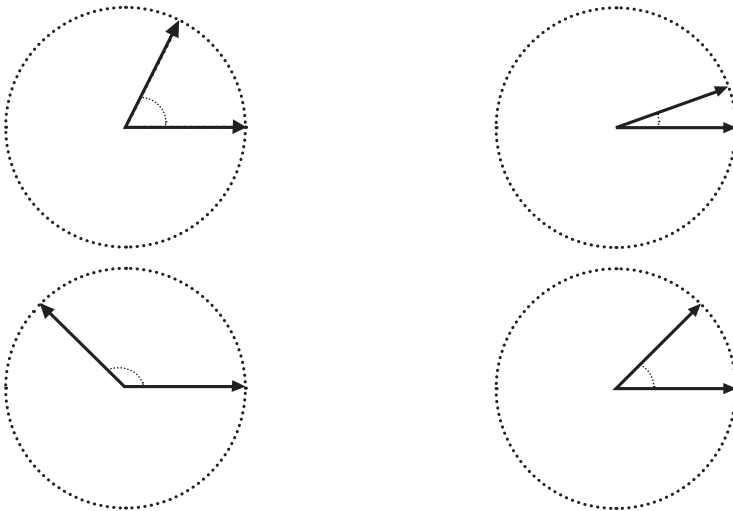
Conclusion

Assessment

1) For each figure below, count the numbers of angles for each type (acute, obtuse and right angles)



2) Using a protractor measure the following angles (**Note:** the angles must be drawn on flash cards, or on manila paper).



Homework

- Identify different angles you see in your garden, house or community.
- Identify types of work in every day life in which one might need to know about angles.

Period 3

Drawing/construct angles (right, acute, obtuse, straight angles)

Instructional objectives

Given a protractor and a pencil pupils will be able to draw/construct different types of angles confidently, accurately and in a given time.

Class setting / organization

- Arrange desks so that pupils can work individually, in pairs and in small groups.
- Make sure each group is mixed in terms of gender and ability.

Materials

Rulers, protractor, manila paper

References

- Houghton Mifflin. 2002. *Mathematics*, p 123-124
- NCDC.2008. *Mathematics Pupil's book. Primary Four. ISBN 9970-04-303-X*
- Byamukama, J&Mulisa, L(2010).*New Upper Primary Maths. Pupil's book for Grade 4.P60*
- <https://www.mathsisfun.com> Thursday, October 20, 2015

Introduction/Review

Correction of homework.

Development

Presentation

Activity 1: Drawing an angle which is less than or equal to 180°

In pairs pupils draw an angle of 50° following the steps written on manila paper or on the chalkboard.

Step 1: Read the instructions. (Instructions make an angle of 50°)

Step 2: Begin by ruling or drawing an horizontal line.

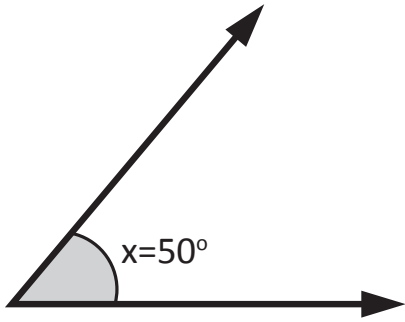
Step 3: Place the centre of the protractor at one end of the line.

Step 4: Mark 50° at the edge of the protractor at X.

Step 5: Rule or draw a line from the end of the first line to the mark X.

Step 6: Label the angle that you have created $x = 50^\circ$.

Answers:



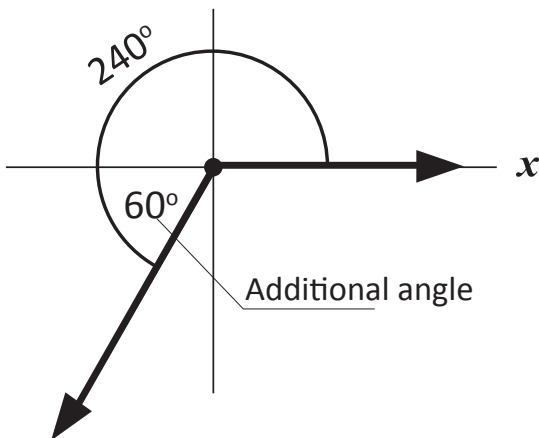
Activity 2: Drawing an angle which is greater than 180°

In pairs pupils draw an angle of 240° .

Answer:

Draw a straight angle (line) and then find and draw an additional angle to be added to 180° to get 240° angle.

$$\text{The additional angle} = 240^\circ - 180^\circ = 60^\circ$$



Math Facts!

Steps to follow when constructing angles

For angles less than 180° :

- Draw a straight line (i.e. an arm of the angle).
- Place a dot at one end of the arm. This dot represents the vertex of the angle.
- Place the centre of the protractor at the vertex dot and the baseline of the protractor along the arm of the angle.
- Find the required angle on the scale and then mark a small dot at the edge of the protractor.
- Join the small dot to the vertex with a ruler to form the second arm of the angle.
- Label the angle (with capital letters).

For angles greater than 180° :

- We draw a straight angle (line)
- Find the additional angle to be added to 180° in order to get the given reflex angle (the given angle - 180°)
- Draw the resulting angle as described above.
- Mark the angle with a small arc.
- Label the angle.

Application

In pairs pupils do the following:

- 1) Draw the reflex angle, 250°
- 2) Draw an angle ABC, which is 55°
- 3) Draw an angle of 14°
- 4) Draw straight or flat angle.

Conclusion

Application

In pairs pupils do the following:

- 1) Draw the reflex angle, 250°
- 2) Draw an angle ABC, which is 55°
- 3) Draw an angle of 14°
- 4) Draw straight or flat angles.

Conclusion

Assessment

Draw the following angles:

- 1) 45°
- 2) 190°
- 3) 90°
- 4) 280°

Homework

- a) Use a ruler and protractor to draw an acute angle of 30° , a right angle (90°) and obtuse angles of 120° .
- b) On your computer draw the angles given in a).

Instructional objectives:

- Given a protector pupils will be able to draw and measure complementary and supplementary angles confidently, accurately and in a given time.
- - Given the measurement of one angle pupils will be able to find out its complementary or supplementary angle confidently, accurately and in a given time.

Materials

Rulers, protractor, manila paper

References

- Houghton Mifflin. 2002. Mathematics, p 123-124
- NCDC.2008. Mathematics Pupil’s book. Primary Four. ISBN 9970-04-303-X
- Byamukama, J&Mulisa, L(2010).New Upper Primary Maths. Pupil’s book for Grade 4.P61
- <https://www.mathsisfun.com> Thursday, October 20, 2015

Class setting / organization

Arrange desks so that pupils can work individually, in pairs and in small groups. Make sure each group is mixed in terms of gender and ability.

Introduction/Review

Correction of homework

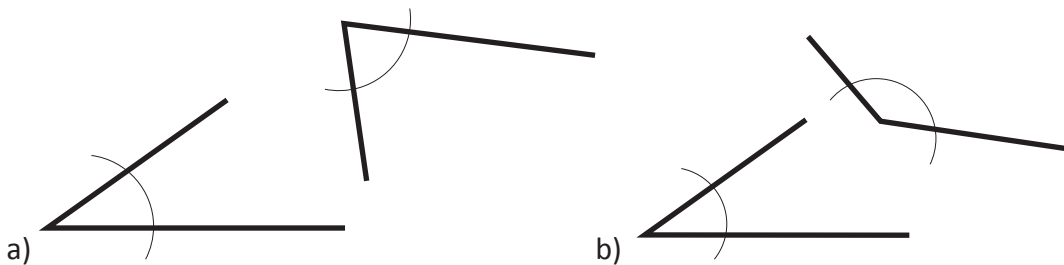
Games: **Angles game**

Development

Presentation

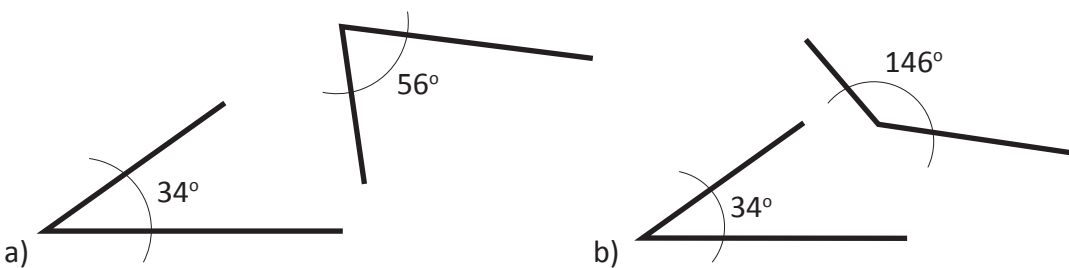
Activity 1: Identifying complementary and supplementary angles

Pupils in pairs measure the following pair of angles and discuss their sum



(Note: make sure the pairs of angles make complementary or supplementary angles)

Answers:



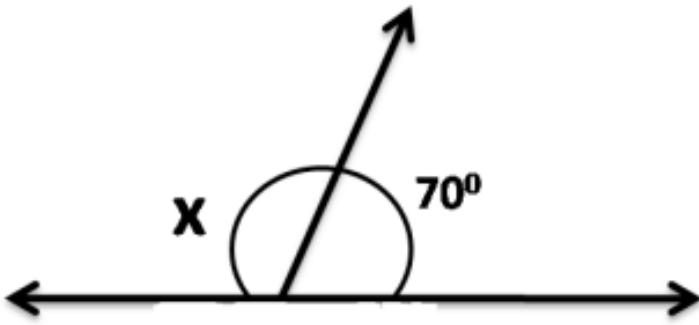
For pair a) $34^{\circ} + 56^{\circ} = 90^{\circ}$

b) for pair b $34^{\circ} + 146^{\circ} = 180^{\circ}$

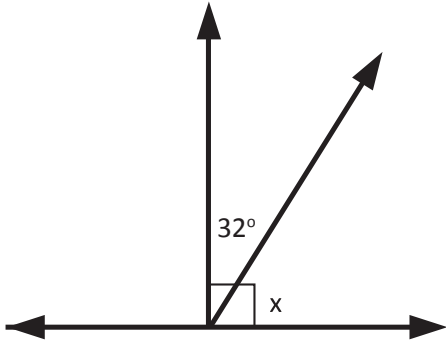
Activity 2: Drawing and measuring complementary and supplementary angles

Redraw the angles given below and measure the unknown angle and complete the given sentences with complementary or supplementary.

a)



Angle x and 70° are.....



The value of angle x is.....

So angle x and 32° are.....

Answers:

a) The two angles are supplementary and $x = 180^\circ - 70^\circ = 110^\circ$

b) The two angles are complementary and $x = 90^\circ - 32^\circ = 58^\circ$

Math Facts!

- Two angles are complementary if the sum of their angles equals 90° . i.e. if a and b are complementary angles then $a + b = 90^\circ$
- If one angle is known, its complementary angle can be found by subtracting the measurement of its angle from 90° .
- Two angles are supplementary if the sum of their angles equals 180° . i.e. if a and b are supplementary angles then $a + b = 180^\circ$. If one angle is known, its supplementary angle can be found by subtracting the measurement of its angle from 180° .
- We measure supplementary and complementary angles using a protractor.

Application

In pairs pupils do the following:

- 1) Write down any 2 pairs of complementary angles.
- 2) Draw any 2 pairs of supplementary angles.
- 3) Angle A and B are supplementary angles. Given that $A = 72^\circ$, find the value of angle B .
- 4) An angle is 21° , find the value of its complement angle.

Conclusion

Assessment

- 1) Draw two complementary angles and two supplementary angles.
- 2) Explain the difference between complementary angles and supplementary angles
- 3) Yamba has a 47° angle and needs to draw an angle that is supplementary to it. What

- should be the measure of the angle that Yaramba draws?
- 4) The measurement of an angle is 43° , what is its complementary angle?

Homework

- 1) What is the complementary angle of an angle of 31° ?
- 2) What is the supplementary angle of 132° ?
- 3) What is the complementary angle of 32° ?
- 4) On your computer represent the angles found in 1), 2) and 3).

Lesson 4 **Assessment of the unit**

Topic area:	Geometry
Unit 14	Types of lines and angles
Key unit competence	Pupils should be able to identify types of lines and angles and use a protractor to measure angles.
Assessment criteria	Pupils are able to accurately, confidently and in required time: <ul style="list-style-type: none"> • Identify different types of lines and angles using their properties. • Measure and draw different angles using a protractor.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the assessment, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Assessment questions

20 marks

(Question 1

Using a ruler draw 3 different straight lines and name them by the letter: a, b, and c.

Question 2

Draw 2 parallel lines and 2 lines intersecting them such that the angles below are identified. Name them respectively by the letters L, M, N and O.

- a) An acute angle
- b) A right angle
- c) A strait angle
- d) An obtuse angle

Question 3

- a) Complete by the correct missing word: "supplementary or complementary":
 - i) If two angles add up to make 180° they are.....
 - ii) If two angles add up to make 90° they are.....
- b) Find the supplementary and complementary angles of:
 - i) 90°
 - ii) 0°
 - iii) 13°

Question 4

Draw the following angles:

- a) 115°
- b) 27°
- c) 210°

Unit warm-ups and games

What am I?

- I am a 3 sided shape, who am I?
- I am a four sided shape, who am I?
- I have three sides and one right angle, who am I?
- I have two equal sides and two equal angles, who am I?
- I have three equal sides and three equal angles' who am I?
- I have three sides but no one is equal to another, who am I?
- I have four equal sides and four right angles, who am I?

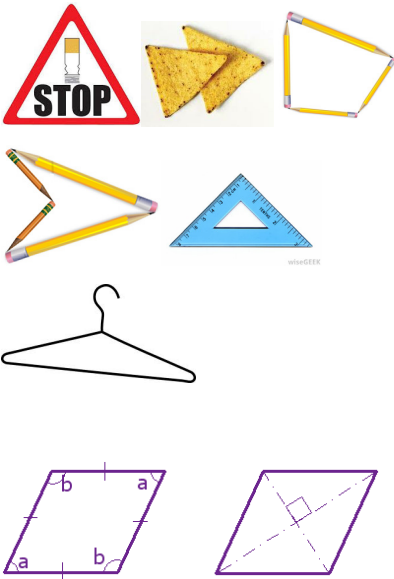
Unit Lessons

Lesson 1

Concept of triangles and quadrilaterals

Topic area	Geometry
Unit:15	2D Shapes and properties
Key Unit competence	To be able to use geometric properties, including symmetry, to sort shapes
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Name triangles and special quadrilaterals Describe a line of symmetry as a fold that produces matching halves <p>Skill:</p> <ul style="list-style-type: none"> Select appropriate geometrical instruments, folding and cutting papers to construct triangles, rectangles (including squares), parallelograms, trapezia and rhombi and use their properties. Identify different geometric figures <p>Attitude and values:</p> <ul style="list-style-type: none"> Display interest , enjoyment and values of learning triangles and quadrilaterals Appreciate the importance of various shapes Recognize that beauty of special quadrilaterals as subsets of quadrilaterals
Key words	Triangle; quadrilaterals ; properties; angles; sides
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning tasks in group work. Peace and values education developed through group discussions and presentations.
Competences developed	<ul style="list-style-type: none"> Communication developed through discussing during activities. Critical thinking and problem solving developed through solving problems related to geometry. Creative /innovative skills developed through folding and cutting paper to construct a shape. Co-operation and interpersonal management developed through working in pairs and in groups. Analytical skills developed through applying what was learned to drawing triangles and quadrilaterals.

Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...		
Instructional objectives	Given different shapes drawn on manila paper pupils will be able to classify each shape into the appropriate classification (as triangles or quadrilaterals) confidently, accurately and in a given time.		
Class setting/ organization	<ul style="list-style-type: none"> – Arrange desks so that pupils can work individually, in pairs and/or in small groups. – Make sure that each group is mixed in terms of gender and ability. 		
Materials	Manila paper on which different triangles and quadrilateral shapes are drawn, ruler, protractor, cards shapes, computer, scissors and papers for making shapes.		
References	<ul style="list-style-type: none"> – Mwungeri E. and al. 2008. Mathematics pupil's book. Primary four. NCDC Rwanda P. 125 – Charles Mbugua, et a. 2005. Certificate Mathematics 1. P. 180 		
Steps / Timing	Teachers' activities	Pupils activities	Generic competences and cross cutting issues to be addressed
Introduction (5min)	<p>Review Game: Use arms to make different angles and ask pupils: which angle is made?</p>	Pupils say the name of the angle made by the arms.	Communication developed through playing game
Development (25min)	<p>Distributes to pupils the following tasks: Asks pupils to fold and cut paper to get shapes and then ask them types of shapes they got.</p> <p>Have shapes drawn on manila papers. Expose them in front of pupils or on the blackboard and ask them to classify and name them according to:</p>	<p>Activity 1: Classification of shapes In small groups, pupils work on the given tasks: They have to classify the geometric shapes according to the number of edge/sides they have.</p> <p>Answer <i>Pupils conclude that the geometric shapes which have 3 sides are triangles; while the geometric shapes which have 4 sides are quadrilaterals</i></p> <p>Activity 2: Classification of shapes Pupils in small group to classify the shapes according to the number of sides and angles.</p>	<ul style="list-style-type: none"> - Communication developed through discussing during activities - Cooperation developed through working in pairs - Critical thinking developed through identifying types of shapes - Creative and innovation skills through paper folding and cutting papers

	<p>a) Number and length of edges/sides b) Number of angles they have.</p>	<p>Answer: <i>The geometric shapes which have 3 sides and 3 angles are triangles.</i> <i>The geometric shapes which have 4 sides and 4 angles are quadrilaterals.</i></p>	
	<p>Summary: Facilitate pupils to draw conclusion on triangles and quadrilaterals.</p> <p>Application</p>	<ul style="list-style-type: none"> • The triangle is a three-sided figure with three angles in its interior(inside): • A quadrilateral is a four-sided polygon with four angles. There are many kinds of quadrilaterals. <p>Application activities: In small groups pupils draw two triangles and two quadrilaterals on their choice.</p>	
<p>Conclusion (10min)</p>	<p>Assessment: Write assessment question on board/ or distributes worksheets</p>	<p>Individually pupils answer the following questions: 1) Classify the following shapes as triangles or quadrilaterals:</p>  <p>2) Identify objects which are in the shapes of triangle or quadrilateral within the classroom.</p>	<p>Critical thinking developed through identifying types of shapes.</p>
	<p>Homework: Write homework questions on the board.</p>	<p>At home pupils identify the objects which are triangle or quadrilateral shaped in their home or garden and draws them on paper or on computer.</p>	<p>Critical thinking developed through identifying types of shapes.</p>

Lesson 2

Types and properties of triangles

Topic area	Geometry
Unit: 15	2D Shapes and properties
Key Unit competence	To be able to use geometric properties, including symmetry, to sort shapes
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Name triangles Describe a line of symmetry as a fold that produces matching halves <p>Skill:</p> <ul style="list-style-type: none"> Use appropriate geometrical instruments to construct and identify geometric shapes constructed. <p>Attitude and values:</p> <ul style="list-style-type: none"> Display interest towards triangles. Appreciate the use of properties to distinguish shapes.
Key words	Properties, angles, lines
Cross cutting issues	<ul style="list-style-type: none"> Gender developed through assigning tasks in group work. Peace and values education developed through discussing in group and leading to consensus. Environment developed through activities related to sensitising pupils about the importance of planting flowers.
Competences developed	<ul style="list-style-type: none"> Communication developed through discussing and answering activities Cooperation developed through working in pairs or in groups. Creative and innovation skills developed through folding papers and cutting them Problem solving skills developed through designing the figures requested to make a triangle.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Types of triangles by their properties: right angled triangle, equilateral (identify and construct)

Instructional objectives

Given different geometrical materials pupils will be able to construct different triangles confidently, correctly and in a given time..

Materials

Manila paper, ruler, A4 papers

References:

- Charles Mbugua, et a.2005. Certificate Mathematics 1. P. 140
- G.Arinitewe .M Nabirye. H.Male. 2010. Understanding mathematics (P. 174)
- MwumvanezaE Kamanzi D , Mukamana J and Luyiga L. 2008. Mathematics: Teacher Guide, Primary Four (P. 91-93)
- websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

Correction of homework.

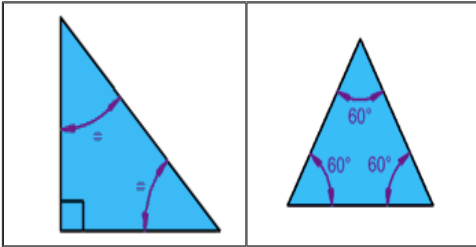
Game: **Who am I?**

Development

Presentation

Activity 1: Identify types of triangles

Have different triangles drawn on manila papers (don't mention their names).



Pupils in pair, differentiate the above two triangles and then discuss their properties.

A volunteer pupil to present on board how they come up with the answer.

Answer:

The two triangles are different: The first has: A right angle (90°), and also two equal angles.

The second triangle has: Three equal sides and three equal angles, the sum of the inside angles is 180° .

Activity 2: The name of triangles

Pupils individually name those triangles.

Answer:

Triangles are named according to their properties:

- *A right triangle: Has a right angle (90°), and also two equal angles.*
- *An equilateral triangle always has three equal sides and three equal angles.*

Activity 3: Construction of an equilateral triangle using a compass

Pupils in pairs construct an equilateral triangle.

Answer:

The process of constructing an equilateral triangle:

- 1) *Draw a line segment*
- 2) *Put the point of your compass at one end of the segment and the pencil point at the other*
- 3) *Without moving the point of the compass and without changing how wide it is set, swing the compass in approximately a quarter-circle (up & away from the line segment).*
- 4) *Without changing how wide the compass is spread, move the compass point to the other end.*
- 5) *Swing the compass so that the arc you are creating crosses the arc you drew in step 3.*
- 6) *Mark the place where the two arcs cross. This is the apex of your triangle.*
- 7) *Using a ruler, draw line segments that connect the spot where the arcs cross to each end of the original line segment.*

Math Facts!

- A triangle has 3 sides and three angles. The 3 angles always add to make 180° .

Types of triangles by their properties:

- **A right triangle:** Have a right angle (90°), and also two equal angles.
- **An equilateral triangle:** Have always three equal sides, three equal angles each having 60° .

Application

- 1) Guided by the teacher, pupils take a (A4 paper, teacher to check if it is a rectangle paper).

Pupils draw a line which matches two different corners of the paper. Folding the paper following that line, pupils construct a right angle.

2) An environment club initiated to grow flowers at Humekaneza primary school, the garden had the following shape:



- State different shapes you see in the garden?
- Is it important to plant flowers at school? Why?

Conclusion

Assessment

- Pupils construct a right angle and an equilateral triangle using a compass.
- Pupils identify and name shapes similar to the right triangle in their classroom.

Homework

- Pupils construct different types of triangles (right angled triangle and equilateral triangle) using a compass or a ruler and a set square.
- At home pupils to identify in their garden, shapes similar to learned triangles.

Period 2

Types of triangles by their properties, Isosceles, scalene (identify and construct)

Instructional objectives

using geometrical instruments pupils will be able to draw isosceles and scalene triangles correctly, confidently and in given time.

Materials

Manila paper, the normal papers, a small stick

References:

- Charles. M, et al.2005. Certificate Mathematics 1. P. 140
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

Correction of homework.

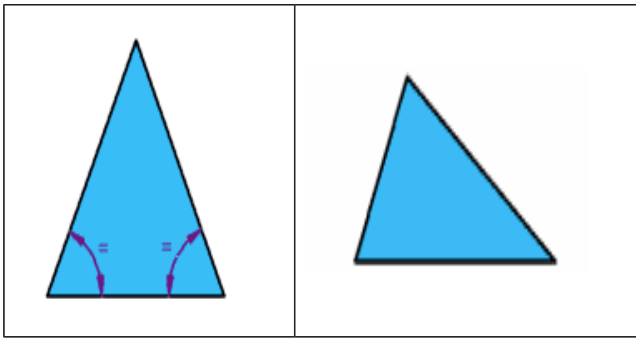
Game: **Who am I?**

Development

Presentation

Activity 1: Differentiate the following triangles according to their properties

Have different triangles drawn on big papers (don't mention their names).



Pupils individually observe those triangles and in pair they write what they can see as differences. Different groups present on the board their answers. The class, helped by the teacher, compare different findings to see what has been found by different groups.

Answers:

For the first triangle two sides are equal and 2 angles are equal. It is called isosceles triangle.

For the second triangle no side is equal to another and no angle is equal to the other, it is called scalene triangle.

Math Facts!

Triangles are named according to their properties:

- **Isosceles triangle:** has two equal sides two and equal angles.
- **Scalene triangle:** has no equal sides and no equal angles.

Application

In small groups pupils do the following activities:

- 1) Draw a triangle ABC with the following sides: 6cm, 7cm, 8cm, and say what type it is?
- 2) Using folding papers make isosceles and scalene triangles.

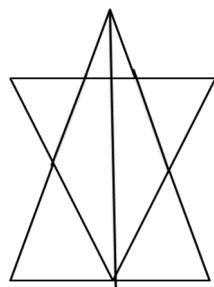
Conclusion

Assessment

Pupils construct isosceles triangles and scalene triangles using a compass.

Homework

- 1) Identify how many triangles are in this picture and name them.



- 2) Draw an isosceles triangle in you notebook, with the two equal sides each having 3cm.

Lesson 3

Types and properties of quadrilaterals

Topic area	Geometry
Unit 15	2D Shapes and properties
Key Unit competence	To be able to use geometric properties, including symmetry, to sort shapes
Learning objectives	<p>By the of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> Name special quadrilaterals. Understand a line of symmetry as a fold that produces matching halves. <p>Skills:</p> <ul style="list-style-type: none"> Identify appropriate geometrical instruments to construct, rectangles (including squares), parallelograms, trapezium and rhombi and examine their properties. <p>Attitude and values:</p> <ul style="list-style-type: none"> Appreciate the usefulness of properties to distinguish shapes. Recognize that special quadrilaterals are a subset of all quadrilaterals.
Key words	Quadrilaterals, properties, angles, lines
Cross cutting issues	<ul style="list-style-type: none"> Gender enhanced through assigning tasks in group activities and presentations. Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> Communication developed through answering questions. Co-operation developed through working in pairs and in groups. Critical thinking developed through identifying properties of quadrilaterals.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Types of quadrilaterals by properties: squares (identify and construct)

Instructional objectives

- Given a figure pupils will be able to identify the number of square which are in it confidently, correctly and in a given time.
- Using geometrical instruments pupils will be able to construct a square confidently, correctly and in a given time

Materials

Manila paper, squared paper

References:

- Charles. M, et al.2005. Certificate Mathematics 1. P. 130
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

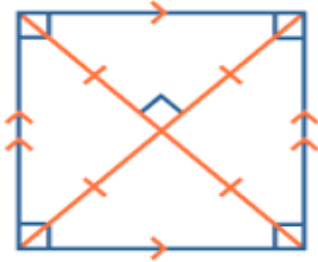
Correction of homework.
Game: **Who am I?**

Development

Presentation

Activity 1: Identification of square properties

Show to pupils some objects that are in a square shape or draw it on the board.
eg:



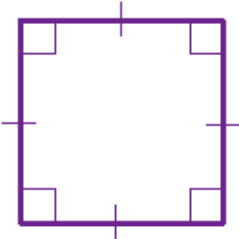
Pupils in groups discuss: its sides and its diagonals.
One pupil measures its sides and its diagonals while others are observing. He/she writes the measurements found.

Answer:

- a) *Opposite sides are both parallel*
- b) *4 equal sides*
- c) *The diagonals are equal and they bisect at 90°.*
- d) *Diagonals bisect each other at their mid point (each diagonal is a line of symmetry).*

Activity 2: Measuring angles of square

Pupils in pairs measure the angles of a square and discuss their answer.



Answer:

Every angle is a right angle (90°).

Activity 3: constructing square

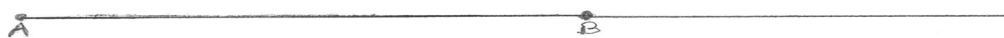
Pupils in pairs construct a square using a compass.

Answer:

Start by constructing a line segment.



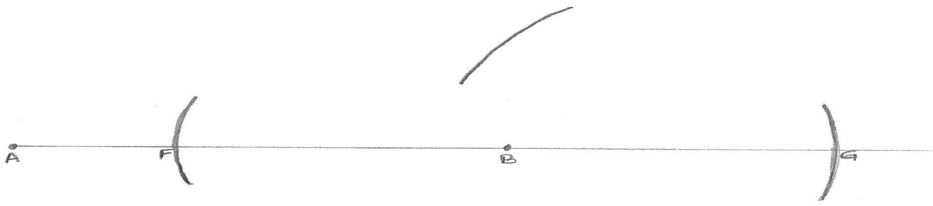
Extend the line AB to the right



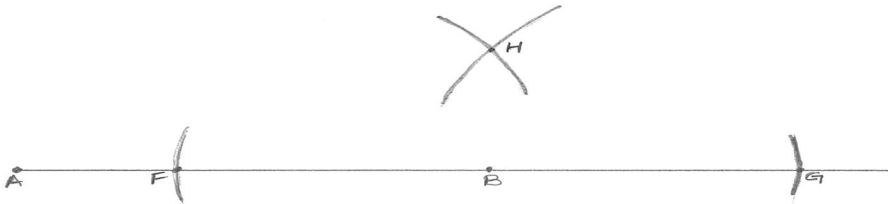
Set the compasses on B and at any convenient width. Scribe an arc on each side of B, creating the two points F and G.



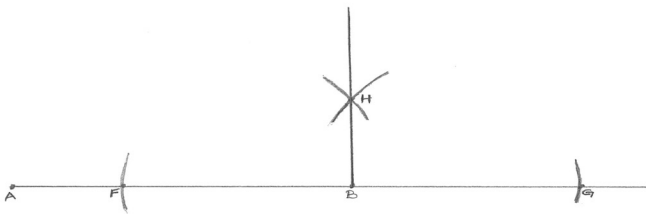
With the compasses on G and any convenient width, draw an arc above the point B.



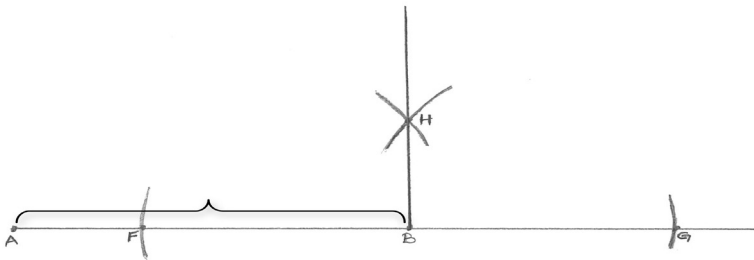
Without changing the compasses' width, place the compasses on F and draw an arc above B, crossing the previous arc, and creating point H



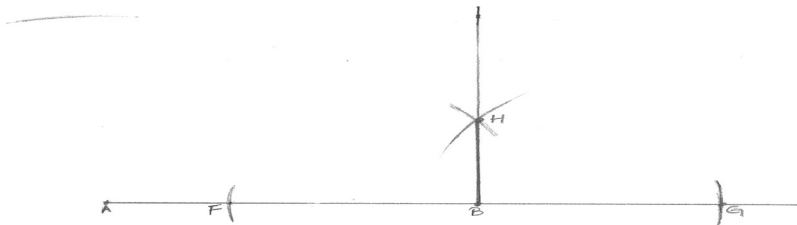
Draw a line from B through H. This line is perpendicular to AB, so the angle ABH is a right angle (90°); this will become the second side of the square



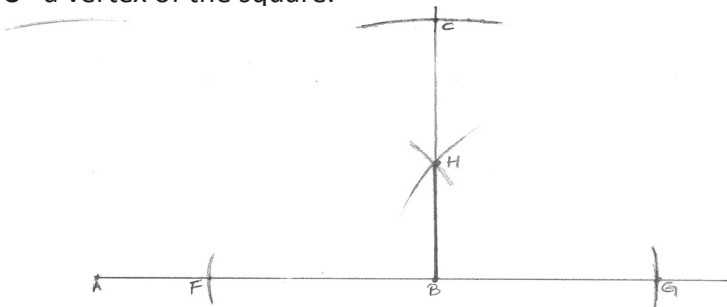
Set the compasses on A and set its width to AB. This width will be held unchanged as we create the square's other three sides.



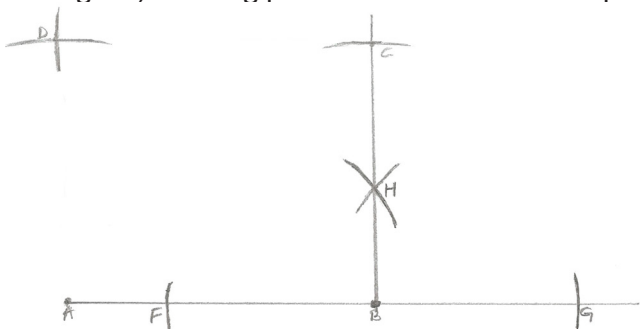
Draw an arc above point A.



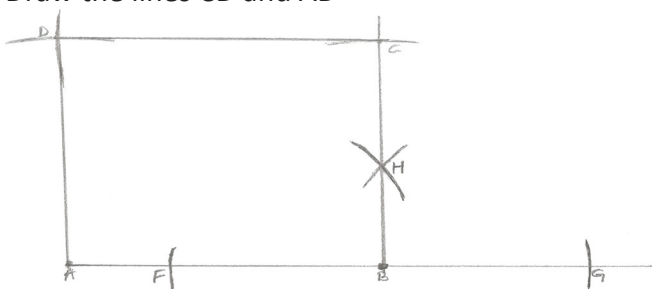
Without changing the width, move the compasses to point B. draw an arc across BH creating point C - a vertex of the square.



Without changing the width, move the compasses to C. Draw an arc to the left of C across the exiting arc, creating point D - a vertex of the square.



Draw the lines CD and AD



Done. ABCD is a square where each side has a length AB.

Math Facts!

- **A square** has four sides and four angles; the 4 sides of the square are equal and the angles of the square are right and also equal.
- The diagonals of a square bisect each other and meet at 90° . The diagonals of a square bisect its angles.
- Opposite sides of a square are both parallel and equal in length.
- All the four angles of a square are equal.
- The diagonals of a square are equal.

Applications

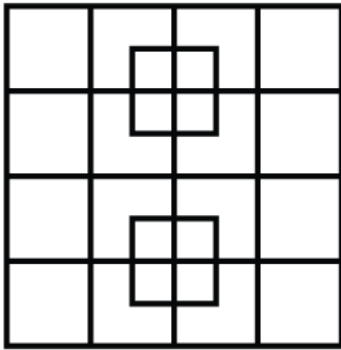
In small groups pupils do the following activities:

- 1) Pupils give different examples of objects that have shape of a square in real life (found in their classroom, bedrooms, school or home garden...)
- 2) Pupils draw a square and say its properties.

Conclusion

Assessment

- 1) How many squares are in the following figure?



- 2) Draw a square whose side is 3 cm.

Homework

- 1) Draw a square which has 4 cm of side in your notebook and write its properties.
- 2) In your house identify objects with square shapes.

Period 2

Types of quadrilaterals by properties: Rectangles (identifying and constructing)

Instructional objectives

Using a protractor, ruler, manila paper and other necessary objects pupils will be able to identify properties of a rectangle and to construct rectangles.

Materials

Manilla paper, metre ruler, chalk, squared paper

References

- Charles. M, et al.2005. Certificate Mathematics 1. P. 130
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

Correction of homework

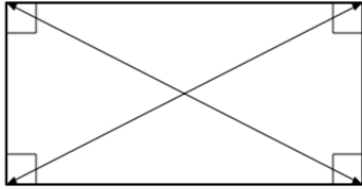
Game: **who am I?**

Development

Presentation

Activity 1: Properties of a rectangle

Present to pupils some objects in a rectangle shape (a paper, the cover of a book, etc,) or draw it on the board.



Pupils in groups discuss the rectangle (its sides, diagonals and angles) and say what they observe. One pupil measures its sides, diagonals and angles on the board while others are observing. She/he writes the measurements found.

Answer:

- It has four sides and four angles
- The 2 parallel sides are equal
- The angles of the rectangle are right and also equal
- Diagonals bisect each other at their mid point (each diagonal is line of symmetry).

Activity 2: Draw/ construct a square/rectangle

Pupils in pairs follow the same instructions (used for a square) and draw a rectangle on flash cards or in their notebooks.

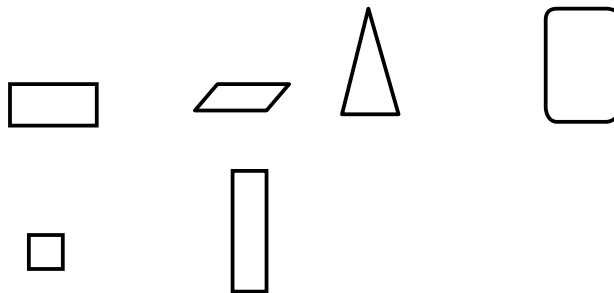
Math Facts!

A rectangle is a flat shape with 4 sides and 4 angles.
The sides which are opposite are equal.
The long side is called the “length” and the short side is the “width”.
Every angle is a right angle (90°) and the four angles are equal.

Application

In small groups pupils do the following activities:

1) Among the following quadrilaterals say which ones are rectangles?



2) Give 5 examples of objects or things which have the shape of a rectangle.

Conclusion

Assessment

In pairs:

- Draw a rectangle which has 3 cm of width and 5 cm of length and say its properties.
- Identify objects or things which are in a rectangle shape in the classroom.

Homework

- Draw a rectangle which has 6 cm of length and 4 cm of width in your notebook.
- Answer by true or false:
 - A rectangle has four equal sides.

- b) A rectangle has four right angles.
- c) Two opposite sides of a rectangle are equal.
- d) A rectangle is a square.

Period 4

Types of quadrilaterals by properties: Rhombus and Kite

Instructional objectives

Given list of criteria pupils will be able to classify the properties of rhombus and kite correctly and in given time.

Materials

Manilla paper; Marker pen; toothpicks

References:

- Charles. M, et al.2005. Certificate Mathematics 1.ISBN 9966-25-205-3 P. 130
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

Correction of homework

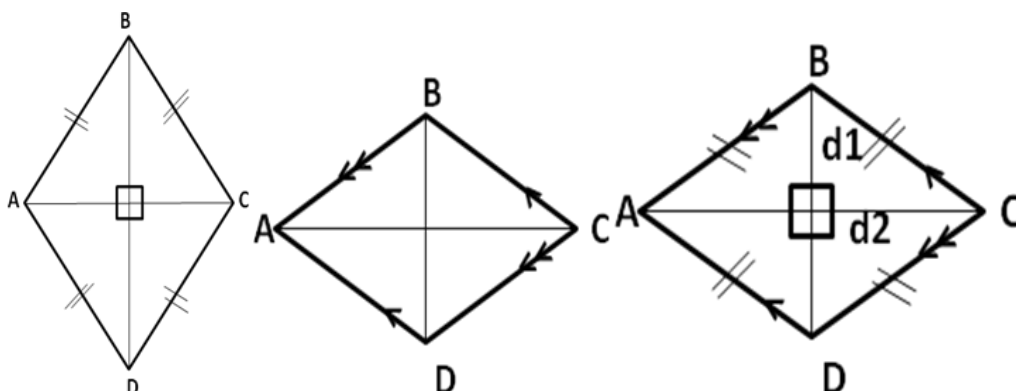
Game: what am I?

Development

Presentation

Activity 1: identifying the properties of rhombus

Draws on board/ Manila paper the following shapes (Rhombus)



Pupils in pairs discuss the drawings and say what they observe on them.
Some pupils to measure the sides of each shape and write the measurements found.

Answer:

The sides on each shape are equal, opposite sides are parallel, the diagonals bisect each other at their mid-point (line of symmetry), two pairs of opposite angles are equal..

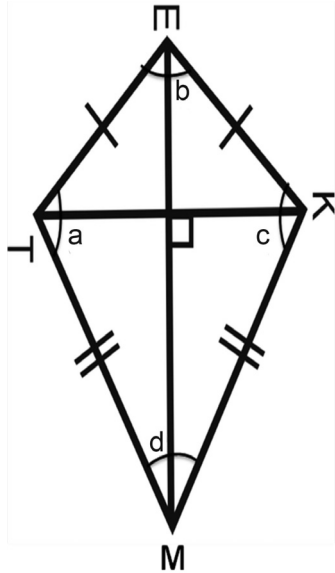
Activity 2: Constructing a rhombus

One pupil to come in front and construct a rhombus using four toothpicks while others are observing and participating (teacher to help where necessary) like this:

- Get four toothpicks.
- Place them on a flat surface.
- Start by moving two toothpicks so that they are parallel to each other.
- Then connect the other two toothpicks so that they close your shape (You may have to move the first toothpick you placed to allow room for the side toothpicks to fit).

Activity 3: Identify the properties of a kite

Draw a kite on the board like this:



Pupils in small groups to discuss its properties. One pupil presents what they have observed.

Answer:

The angles are equal where the two pairs meet.

Pupils respond to the following questions:

What are the properties of a kite?

Answer:

Opposite sides are parallel. The diagonals bisect at 90° .

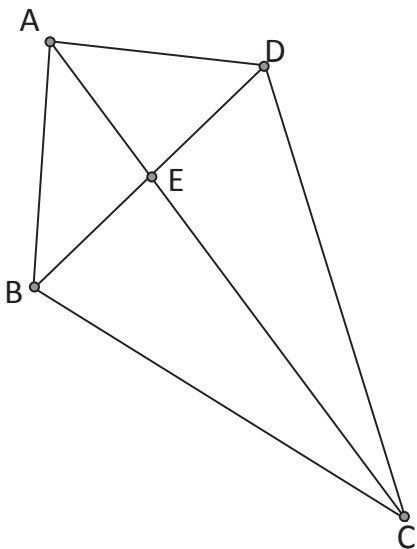
Diagonals bisect each other at their mid-point and it has two lines of symmetry.

Math Facts!

- **A rhombus** is simply a four-sided flat shape whose sides are all the same length and whose opposite sides are parallel. The diagonals bisect at 90° .
Diagonals bisect each other at their mid-point and it has two lines of symmetry.
- **A kite** has two pairs of sides, each pair is made up of adjacent sides (they meet) that are equal in length. The angles are equal where the two pairs meet.
Diagonals cross at the right angles, and one of the diagonals (the small one) bisects (cuts equally in half) the other.

Application

1) Pupils in pairs to prove if the given ABCD is a kite, with $AB = AD$ and $CB = CD$.



2) Pupils practice drawing a kite and a rhombus using a ruler.

Conclusion

Assessment

- 1) Which statement best describes a similarity between a kite and a rhombus?
 - a) Both have all four sides with equal size.
 - b) Both have all four angles with equal size.
 - c) Both have diagonals forming right angles.
 - d) Both have opposite pairs of sides parallel.
- 2) Can you think of where rhombus shapes are used in real life?

Homework

- 1) Pupils at home to cut out/ construct 1 rhombus which has 15 cm of one side using a piece of paper
- 2) Using a ruler construct a kite.

Period 6

Types of quadrilaterals by properties: A parallelogram

Instructional objectives

Given different criteria pupils will be able to identify and construct a parallelogram correctly, confidently and in given time.

Materials

Manila paper, marker pen, A4 paper, pencil.

References

- Charles. M, et al.2005. Certificate Mathematics 1. P. 138.
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/review

Correction of homework.

Game: **Who am I?**

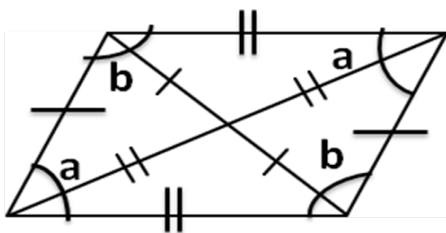
Development

Presentation

Activity 1: Identifying a parallelogram

Pupils in pairs discuss the shape below and respond to the following question:

What do you observe about the lines, the angles, the diagonals? (One pupil measures the lines while others are observing and he/she writes the measurements found. Another pupil measures the angles and writes measurements found).



Answer:

- Two opposite sides are parallel.
- Opposite sides are congruent (equal).
- Opposite angles are congruent (equal).
- Consecutive angles are supplementary.
- The diagonals bisect each other.

Math Facts!

The parallelogram has the following properties:

- Opposite sides are parallel by definition.
- Opposite sides are congruent (equal).
- Opposite angles are congruent (equal).
- Consecutive angles are supplementary.
- The diagonals bisect each other.

Application

In pairs pupils work out the following:

- 1) Use a ruler, a protractor and a set square to draw a parallelogram of long side: 5 cm and short side: 4 cm.
- 2) What are the properties of the drawn parallelogram?

Conclusion

Assessment

- 1)
 - Is a square a parallelogram?
 - Is a rectangle a parallelogram?
 - Is a rhombus a parallelogram?
- 2) Pupils to draw a parallelogram.

Homework

Which of this is not a parallelogram?

a)



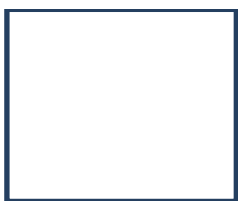
b)



c)



d)



Period 7

Types of quadrilaterals by properties: Trapezium/trapezoid
(identifying and constructing)

Instructional objectives

Given different criteria, pupils will be able to describe trapezium properties and name them correctly, confidently and in a given time.

Materials

Manila paper

References

- Charles. M, et al.2005. Certificate Mathematics 1. P. 150.
- Websites: <http://wwwmathisfun.com> visited on Wednesday, October 07, 2015

Introduction/Review

Correction of homework.

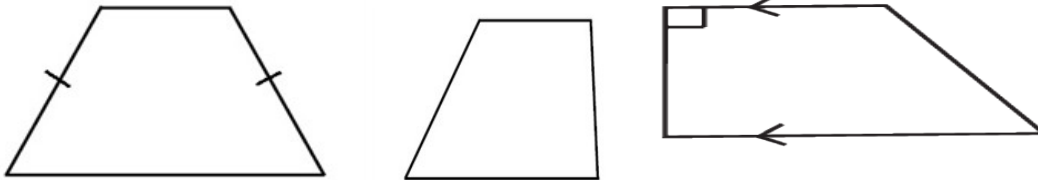
Game: who am I?

Development

Presentation

Activity 1: Identifying properties of a trapezoid/trapezium

Draw on the board or on manila paper the following shapes and pupils in pairs discuss each shape basing on its sides and angles (by measuring its sides and angles) and then they say its name.



Answer:

For the first shape:

- Base angles are equal
- Two of the sides are parallel but not equal.
- Adjacent angles on parallel sides are equal.
- It is called an **isosceles trapezium**.

For the second shape:

- Two sides are parallel.
- All sides are not equal.
- All angles are not equal.
- It is called a **scalene trapezium**.

For third shape:

- Two sides are parallel.
- Two angles are 90° .
- It is called a **right-angled trapezium**.

Math Facts!

- A **trapezium** is a four sided figure which has only 2 parallel sides. Some of the sides can either be equal or not.

There are three types of trapeziums:

Right -angled trapezium :

- It has 2 right angle(90°).
- It has 4 sides and two of the sides are parallel.

Isosceles trapezium:

- It has two parallel sides (which are not equal). The other two non-parallel sides are equal.
- It has two sets of equal angles (adjacent angles).

Scalene trapezium:

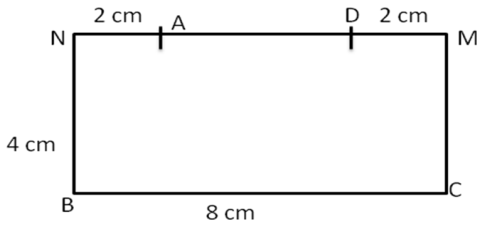
- It has 4 sides which are different in length.
- It has 2 parallel lines.
- It has 4 angles of different sizes.

Application

Pupils in pairs draw a trapezium from triangle by following the following instruction:

Draw a rectangle NBCM which measure 8cm by 4cm
Mark a point A along line NM which is 2 cm from point N.
Mark a point D along line NM which is 2cm from M.

Draw lines AB and DC.

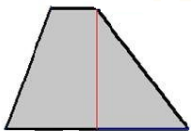
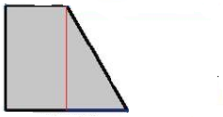


Ask pupils the following:

- To shade triangles ABN and DCM and give them names.
- Which kind of shape remains unshaded?

Conclusion

Assessment



- Name the above trapezium.
- Observe the trapezium above and write True or False for the following statements:
 - All trapeziums have 4 sides.
 - Sides of trapezium must all be equal.
 - Base angles are equal in an isosceles trapezium.
 - A rectangular trapezium has two of the angles which are 60° .
 - The parallel sides of a trapezium are adjacent.
 - All sides of trapezium are parallel.
 - Isosceles trapezium has equal angles on the parallel sides.
 - A right angled trapezium is also called a rectangular trapezium.
 - A scalene trapezium has its sides and angles equal.
 - Any two angles between the parallel sides of a trapezium add up to 180° .
 - A diagonal of right angled trapezium makes two triangles of the same height.

Homework

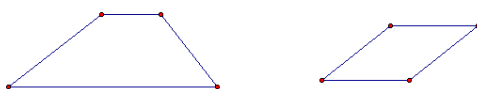
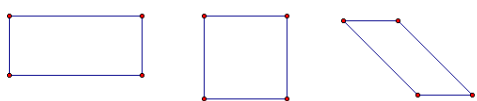
Draw three different trapeziums in your note book using your own measurement

Lesson 5**Assessment of the unit**

Topic area	Geometry
Unit:15	2D Shapes and properties
Key Unit competence	To be able to use geometric properties, including symmetry, to sort shapes.
Assessment criteria	Pupils are able to accurately, confidently and in required time: <ul style="list-style-type: none">• Name triangles and special quadrilaterals.• Distinguish different 2D shapes using their properties.• Identify triangles and special quadrilaterals in everyday situations.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Assessment questions**20 marks****Question 1**

State the name and at least one property of the following quadrilaterals?

**Question 2**

Draw the following shapes:

- Two different types of triangles on your choice.
- A kite

Unit 16: Area of 2D shapes Unit at glance

Topic area: Geometry.

Key competence: To use rectangles to determine the area of triangles and special quadrilaterals.

Lesson 1: Concept of perimeter and area						
Lesson 2: Perimeter and area of quadrilaterals: square and rectangle	Period 1 Perimeter and area of a square		Period 2 Perimeter and area of a rectangle		Period 3 Word problems on perimeter and area of a square and a rectangle	
	Period 1 Perimeter and area of a triangle					
Lesson 3: Perimeter and area of triangles	Period 2 Words problems on perimeter and area of a triangle					
	Period 1 Perimeter and area of a rhombus		Period 2 Word problem on perimeter and area of a rhombus		Period 3 Perimeter and area of a parallelogram	
	Period 1 Perimeter and area of a trapezium, parallelogram, kite,		Period 4 Word problem on perimeter and area of a parallelogram		Period 5 Perimeter and area of a trapezium	
	Period 1 Perimeter and area of a rhombus		Period 4 Word problem on perimeter and area of a parallelogram		Period 6 Perimeter and area of Kite	
	Period 1 Perimeter and area of a rhombus		Period 4 Word problem on perimeter and area of a parallelogram		Period 7 Word problems on perimeter and area of a trapezium and Kite	
	Period 1 Perimeter and area of a triangle					
	Period 1 Perimeter and area of a triangle					
Lesson 5: Revision of the unit						
Lesson 6: Assessment of the unit	Period 1 Assessment					Period 2 Feedback and remediation

Unit warm-up and games

Who am I?

Show different 2D shapes drawn on a flash card or manila paper and ask pupils to describe them following the given properties

I'm a 4 equal sides shape. I have 4 equal angles. Who Am I?

I'm a 4 equal sides shape. Each of 2 of my sides is parallel and equal. I have 4 equal angles. All of my angles are right angles. Who Am I?

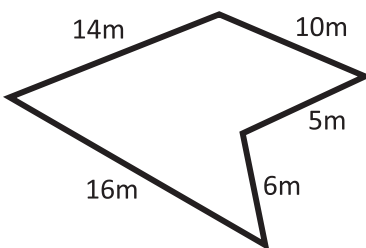
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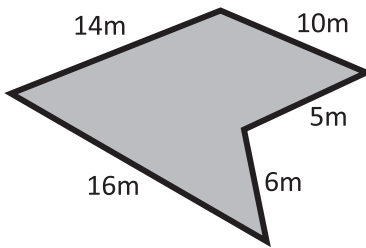
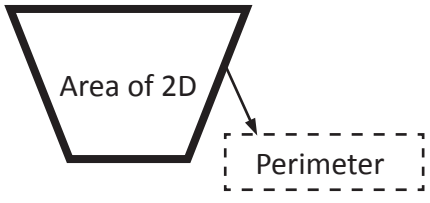
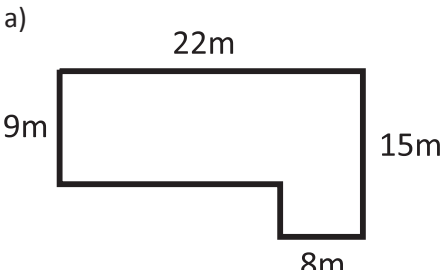
Unit Lessons

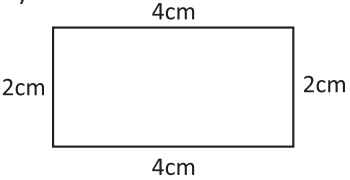
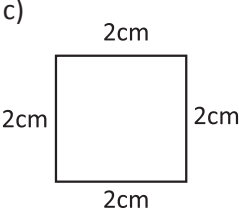
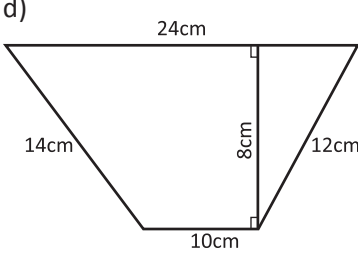
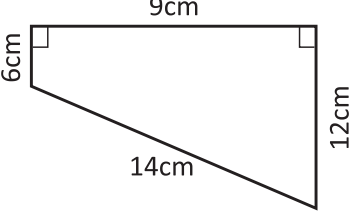
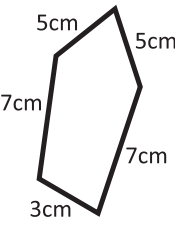
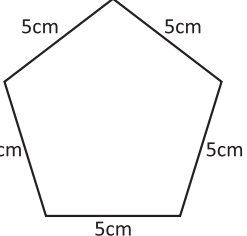
Lesson 1 Concept of perimeter and area

Topic area	Geometry
Unit 16	Area of 2D shapes
Key competence	To use rectangles to determine the area of triangles and special quadrilaterals
Lesson 1	Concept of perimeter and area
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Explain area as the space enclosed by a perimeter. • Distinguish the area and perimeter of a 2 D shape. • Select the correct units to use. <p>Skills:</p> <ul style="list-style-type: none"> • Practically determine the area of triangles and quadrilaterals by relating them to the area of rectangles. • Solve problems involving determination of the area of different 2D shapes. <p>Attitude:</p> <ul style="list-style-type: none"> • Appreciate that the relationship between area and perimeter is simple.
Key words	Perimeter, area, 2D shape, quadrilaterals
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning tasks in group activities and presentations. - Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through determining the perimeter and area of a 2 D shape.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Instructional Objectives	Given different drawn shapes, pupils will be able to calculate their perimeter and their area confidently, correctly and in given time.
Class setting/organization	Organize pupils in groups of 3.
Materials	Flash cards with different 2D shapes
References	<ul style="list-style-type: none"> - Byamukama, J&Mulisa, L(2010).New Upper Primary Maths. Pupil's book for Grade 4. P110 - Arinatwe G. et al.2010. Understanding Mathematics: Primary 4, pupil's book. P. 136.

Steps / Timing	Teachers' activities	Pupils' activities	Generic competences and cross cutting issues to be addressed
Introduction (5min)	Game: Who am I? Say different properties of a 2D shape and pupils discover the name of the shape.	Say the name of the shape described by the teacher.	Communication developed through playing game.
Development (25 min)	Presentation Write the questions on board and facilitate pupils to answer in pair	<p>Presentation Pupils in pairs discuss the following:</p> <p>Activity 1: Concept of perimeter A farmer wants to put a fence on this garden (See the figure below). How many metres does he need to cover the garden?</p>  <p>One pupil presents on board.</p> <p>Answers:</p> <p>a) Calculations: $16m + 6m + 5m + 10m + 14m = 51m$</p> <p>b) Solution: He will need 51 m to cover the garden.</p> <p>Activity 2: Concept of area After putting the fence, the same farmer wants to plant flowers in the garden (drawn above), shade the enclosed space on which he can plant flowers.</p> <p>Pupils in groups analyse the situation and propose a name of the shaded space. Each group representative presents on board their findings</p>	<p>Communication developed through answering questions.</p> <p>Co-operation developed through working in pairs and in groups.</p> <p>Critical thinking developed through differentiating perimeter and area.</p> <p>Communication developed through presentations.</p>

	<p>Facilitate pupils to show and define the perimeter and area of a 2D shape.</p>	<p>Answers: The shaded space is shown here below. It is the area of the 2D shape</p>  <p>Activity 3: In pairs discuss and answer the following questions:</p> <p>a) What is the perimeter of a given 2D shape? How do calculate it?</p> <p>b) What is the area of a 2D shape?</p> <p>Answers:</p> <p>a) The perimeter of a 2D shape is the total distance enclosing this shape. Its perimeter is calculated by adding up together all the length of its sides.</p> <p>b) The area of a 2D shape is the amount of surface it covers.</p>	
	<p>Summary: Basing on pupils' answers, facilitate them to make a summary.</p>	<p>a) The perimeter of a 2D shape is the total distance enclosing this shape. b) It is calculated by adding up together all the length of its sides. c) The area of 2D shape is the amount of surface the 2D shape covers.</p>	
<p>Application Facilitate pupils to calculate the perimeter of different 2D shapes and shade the area correctly.</p>		<p>Application</p> <p>1) Individually, pupils show and define the perimeter and area given a 2D shape drawn on the board or on manila paper:</p>  <p>2) Pupils in pairs find the perimeter of the following shapes and shade its area.</p> <p>a)</p> 	<p>Communication developed through answering questions.</p> <p>Cooperation developed through working in groups.</p>

		<p>b)</p>  <p>c)</p>  <p>d)</p> 	
<p>Conclusion (10min)</p>	<p>Assessment Write questions on the board and facilitate pupils to answer and make corrections.</p>	<p>Assesment Individually pupils solve the following: 1) Find the perimeter and shade the area for each of the following figures:</p> <p>a)</p>  <p>b)</p>  <p>c)</p> 	<p>Communication and critical thinking developed through calculating perimeter and shading area.</p>
	<p>Homework Writes exercises on the board.</p>	<p>Homework Write down 6 examples of where you use perimeters and areas of quadrilaterals in your daily lives.</p>	

Lesson 2 Perimeter and area of quadrilaterals: square and rectangle

Topic area	Geometry
Unit 16	Area of 2-D shapes
Key competence	To use rectangles to determine the area of triangles and special quadrilaterals
Learning objectives	<p>By the end of this lesson pupils will be able to:</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Distinguish the area and perimeter of quadrilaterals. • Select the correct units to use. <p>Skills</p> <ul style="list-style-type: none"> • Practically determine the perimeter and the area of a square and a rectangle. • Solve problems involving determination of the perimeter and the area of a square and a rectangle. <p>Attitude</p> <p>Appreciate that the relationship between area and perimeter is simple.</p>
Key words	Area or surface, perimeter, 2D shape, square, rectangle, quadrilaterals
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning tasks in group activities and presentations. - Peace and values education developed through discussing in group and leading to consensus. - Environment and sustainability developed through discussing the importance of trees and flowers in the school compound.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through calculating the area and the perimeter of a square and a rectangle. - Research and problem solving developed through discovering the formula for calculating the perimeter and the area of a square and a rectangle.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Perimeter and area of a square

Instructional objectives

Using a formula pupils will be able to calculate the perimeter and area of a square confidently, correctly and in given time.

Materials

Paper shapes, squared papers

References:

- Byamukama, J. & Mulisa, L. (2010). New Upper Primary Maths. Pupil's book for Grade 4. 106 - 111
- G. Arineitwe et al. 2010. Understanding Mathematics: Primary 4, pupil's book. P. 137-140

Introduction/Review

Correction of homework.

Games

Through different questions remind pupils the properties of square:
They can play the game: *Who Am I?*

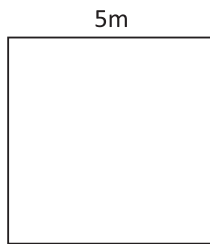
Development

Presentation

Pupils in pairs discuss and answer the following:

Activity 1: Finding the perimeter of a square

A boy walked all around this squared garden. How many meters did he cover?



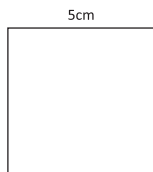
Answer:

a) Calculation: $5m + 5m + 5m + 5m = 20m$ (remember a square has 4 equal sides).

b) Solution: He covered 20m.

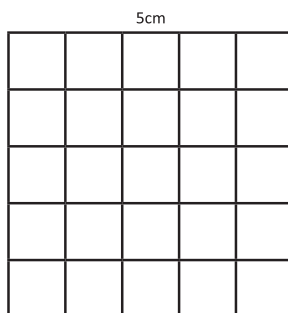
Activity 2: Calculating the area of a square

Draw a square of 5cm of side, and divide the square into smaller units of 1 cm side each. How many unit squares are there inside the large square?



Can you figure out the formula to calculate the perimeter and area of square?

Answer



In the large square there are 25 small square of 1cm which means 25 cm^2
Therefore $25\text{ cm}^2 = 5\text{ cm} \times 5\text{ cm}$.

Math Facts!

- Because all the four sides of a square are of the same length, the perimeter is four times the length of a side. Or as a formula: **P = Side + Side + Side + Side** or **P = 4 x one Side (S x 4)**.
- To calculate the area of a square, multiply the side by itself, which can be expressed as side x side or **A = S x S**.

Application

In small groups pupils solve the following:

- 1) Farmer Kalisa has a square field. Each side measures 120m. He wants to put a fence all around it, find the perimeter of the field to be fenced?
- 2) A mother cultivates a kitchen garden that is 6 meters each side. If the garden is square-shaped:
 - a) Find its perimeter
 - b) Find its area
- 3) The perimeter of a square-shaped pool is 56 meters, find its side.
- 4) The area of a square shaped field is 81 m². Find the side of the field.

Conclusion

Assessment

Individually pupils solve the following:

- 1) A squared garden has a length of 156 m. Calculate the area of the garden.
- 2) A school has a squared compound. Each side measures 100 m. Find the perimeter of the school compound. Part of the school compound is covered with flowers and trees. Is it important to plant trees and flowers in school compound? If yes why?
- 3) Manzi has a square tablecloth. Find the length of one side of the tablecloth if its perimeter is 48 dm.

Homework

- 1) Find the area and perimeter of a square which has a side of 16 cm.
- 2) A squared garden has one side which is 50 m. What is the length of the wire needed to make a fence around it once?

Period 2

Perimeter and area of a rectangle

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of square confidently, correctly and in given time.

Materials

Manila paper on which rectangles are drawn

References

- Byamukama, J&Mulisa, L(2010).New Upper Primary Maths. Pupil's book for Grade 4. P 112 - 115.
- G. Arineitwe et al. 2010. Understanding Mathematics: Primary 4, pupil's book. P.140 -152.

Introduction/Review

Correction of homework

Game: **Who Am I?**

Use a square and rectangle properties.

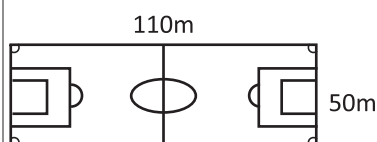
Development

Presentation

In pairs pupils solve the following:

Activity 1: Calculating the perimeter of a rectangle

Before a football match the players have run around the playground 1 time. The football playground is 50 m wide and 110 m long. How many meters did the players run?



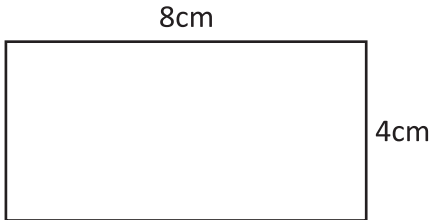
Answers

Calculation: $50\text{ m} + 50\text{ m} + 110\text{ m} + 110\text{ m} = 320\text{ m}$ or $(50\text{ m} + 110\text{ m}) \times 2 = 320\text{ m}$ (remember two parallel sides of a rectangle are equal.)

Solution: The players run 320 m.

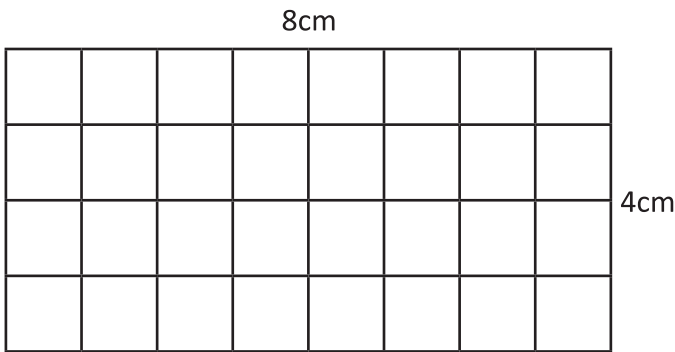
Activity 2: Calculating area of a rectangle

Draw a rectangle of 4 cm wide and 8 cm long and divide it into small equal squares of 1 cm side. How many unit squares are there inside the rectangle? Can you figure out the formula to calculate the perimeter and area of a rectangle?



Answer:

Inside the large rectangle there are 32 small squares which means 32 cm^2 therefore $32\text{ cm}^2 = 8\text{ cm} \times 4\text{ cm}$



Math Facts!

- A rectangle is a shape that has two pairs of equal parallel sides. Its perimeter is: $(\text{Length} + \text{Width}) \times 2$ or $(L + W) \times 2$.
- Its area is: length \times width $(L \times W)$.

Application

In small groups pupils solve the following:

- 1) A farmer has a rectangular field of 15 metres by 21 metres. What is the perimeter of the field?
- 2) Gasana wants a new carpet for her dining room. Her dining room is a rectangle of 4m by 3m. Find the surface area of the carpet needed for covering the entire dining room.
- 3) A small city park has a rectangular lawn that is 20 m long and 10 m wide. What is the area of the lawn?

Conclusion

Assessment

- 1) A classroom has a width of 6 m and a length of 8 m. The headmaster decided that tiles will look good in that class. If each tile has a length of 1 m and a width of 0.5 m, how many tiles are needed to fill the classroom?
- 2) Kamanzi made a rectangular table that has 2 m to 1m. Find its perimeter.

- 3) Ndahiro made a mat whose length was 3m and width was 2m. Find:
 a) The perimeter of Ndahiro's mat.
 b) The area of Ndahiro's mat.

Homework

- 1) A classroom floor is 8 m long and 5m wide. Find:
 a) Its perimeter.
 b) Its area.
 2) Nkubito's flower garden is 9m long and 4 m wide. Find its area.
 3) Find the perimeter of a rectangular tabletop whose length is 180 cm and width is 120cm.

Lesson 3 Perimeter and area of a triangles

Topic area	Geometry
Unit 16	Area of 2-D shapes
Key competence	To use rectangles to determine the area of triangles and special quadrilaterals
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Distinguish the area and perimeter of a triangle. • Select the correct units to use. Skills: <ul style="list-style-type: none"> • Practically determine the perimeter and the area of a triangle. • Solve problems involving determination of the perimeter and the area of a triangle. Attitude: <ul style="list-style-type: none"> • Appreciate that the relationship between area and perimeter is simple.
Key words	Triangle
Cross cutting issues	- Gender enhanced through assigning tasks in group activities and presentations. - Peace and values education developed through discussing in group and leading to consensus
Competences developed	- Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through calculating the area and the perimeter of triangles. - Research and problem solving developed through discovering the formula for calculating the area and the perimeter of a triangle.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of a triangle confidently, correctly and in given time.

Materials

Manila paper on which different types of triangles are drawn.

References

- Byamukama, J&Mulisa, L(2010).New Upper Primary Maths. Pupil's book for Grade 4.P 117 - 120
- <https://www.mathsisfun.com> vested on Tuesday, October 13, 2015

Introduction/Review

Correction of homework.

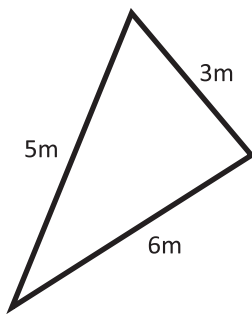
Game: **Who am I?**

Development**Presentation**

Pupils in pairs discuss and answer the following:

Activity 1: Calculating the perimeter of a triangle

A mother wants to make a fence around a triangle kitchen garden whose shape is shown below, find its perimeter.

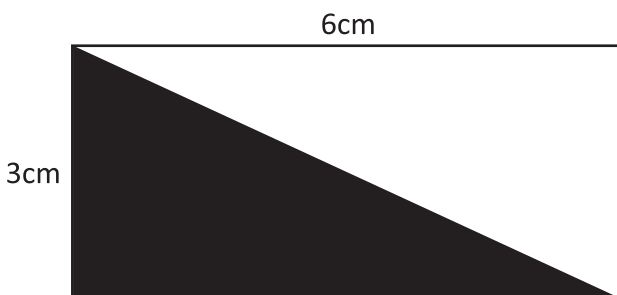
**Answers:**

a) Calculations: $5\text{ m} + 3\text{ m} + 6\text{ m} = 14\text{ m}$

b) Solution: The perimeter of that kitchen garden is 14 m.

Activity 2: Calculating the area of a triangle

In the following rectangle the shaded part is a triangle, the length is the base of a triangle, the width is the height of a triangle. Basing on calculation of the area of a rectangle, find the area of the triangle.



Base of the triangle = length of the rectangle

Height of the triangle = width of the rectangle

Note: pupil should do their own experimentation by folding a rectangular paper following the diagonals and tell the type of shape they got after folding and cutting (The area of the triangle is the half of the area of the rectangle)

Answer:

As we can see the area of the triangle is the half of the area of the rectangle and we know that area of the rectangle is $L \times W = 3 \text{ cm} \times 6 \text{ cm} = 18 \text{ cm}^2$
Therefore the area of triangle is equal to $18 \text{ cm}^2 \div 2 = 9 \text{ cm}^2$.

Math Facts!

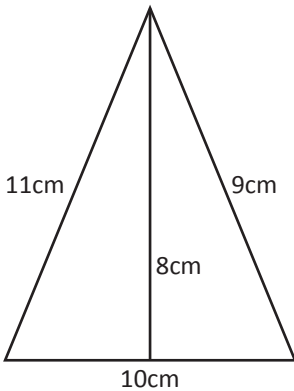
- The perimeter of a triangle is equal to side + side + side ($P = S + S + S$)
- The area of a triangle is the half of the area of a rectangle. So the area of a triangle is:

$$\frac{1}{2} \times b \times h = \left(\frac{b \times h}{2} \right)$$

Application

In small groups pupils solve the following:

1) Find the perimeter and area of the following triangle:



2) A triangular garden has a base of 18 m and a height of 20 m. Find its area.

3) A builder wanted a triangular design with a base of 70 cm and a height of 80 cm. Find the area of the design.

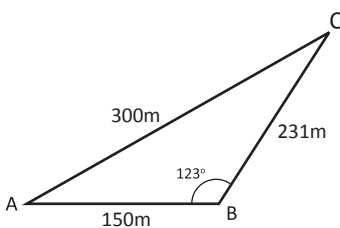
Conclusion

Assessment

- 1) A flower-bed was in the shape of a triangle. If its base was 34m and its height 23m, find its area.
- 2) Find the area of an equilateral triangle whose height is 10cm and side 5cm.
- 3) A triangular garden has height of 40 m and a base of 50m. Find its area.

Homework

- 1) The base of a triangle is 36cm and the height is 54cm find the area of the triangle?
- 2) What is the area of a triangle with a base of 20mm and height 5mm?
- 3) Mr. Karimu has a triangle land as shown below, find its perimeter.



Topic area	Geometry
Unit 16	Area of 2-D shapes
Key competence	To use rectangles to determine the area of triangles and special quadrilaterals
Learning objectives	By the end of this lesson pupils will be able to: Knowledge <ul style="list-style-type: none"> • Distinguish the area and perimeter of a rhombus, parallelogram, trapezium and a kite. • Select the correct units to use. Skills Solve problems involving determination of the perimeter and area of a rhombus, a parallelogram, a trapezium, and kite. Attitude Appreciate that the relationship between area and perimeter is simple.
Key words	Rhombus, parallelogram, trapezium, kite
Cross cutting issues	<ul style="list-style-type: none"> - Gender enhanced through assigning tasks in group activities and presentations. - Peace and values education developed through discussing in group and leading to consensus.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through calculating the area and perimeter of a rhombus, parallelogram, trapezium and kite. - Research and problem solving developed through discovering the formula for calculating the perimeter and area of a rhombus, parallelogram, trapezium and kite
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1

Perimeter and area of a rhombus

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of a rhombus confidently, correctly and in given time.

Materials

Manila paper on which a rhombus is drawn.

References

- Byamukama, J&Mulisa, L(2010).New Upper Primary Maths. Pupil's book for Grade 4.P 126 - 127
- <https://www.mathsisfun.com> vested on Tuesday, October 13, 2015

Introduction/Review

Correction of homework.

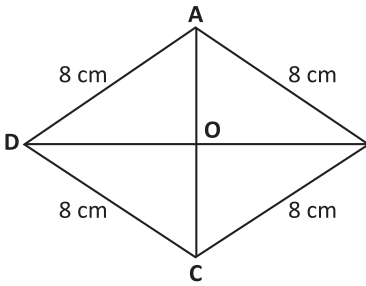
Game: **Who am I?**

Development

Presentation

Activity 1: Calculating the perimeter and area of a rhombus

Observe the following shape and find its perimeter.



Answer:

a) Calculations:

The perimeter = side + side + side + side:

$$8\text{ cm} + 8\text{ cm} + 8\text{ cm} + 8\text{ cm} = 32\text{ cm}$$

b) Solution: *The perimeter of the rhombus is 32 cm.*

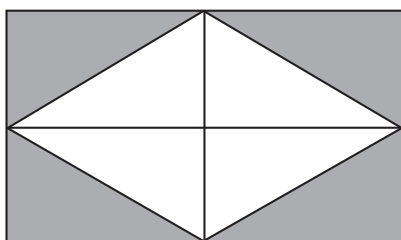
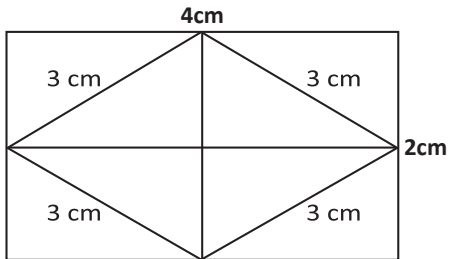
Activity 2: Calculating the area of a rhombus

In pairs pupils draw a rhombus of 3 cm side and draw a rectangle over the rhombus drawn and measure the perimeter of the rhombus.

Measure the dimensions of the rectangle drawn.

Pupils observe both rectangle and rhombus and compare their surface areas.

Answers:



The length of the rectangle over the rhombus is equal to the long diagonal.

The width of the rectangle over the rhombus is equal to the short diagonal.

Math Facts!

- To find the perimeter of a rhombus add the length of the 4 sides or one side times 4.
- When you compare the area of a rectangle with that of a rhombus you note that the area of a rhombus = $\frac{1}{2} \times d \times D = \left(\frac{d \times D}{2}\right)$ (half of the area of a rectangle)

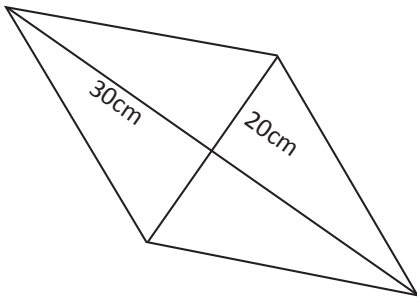
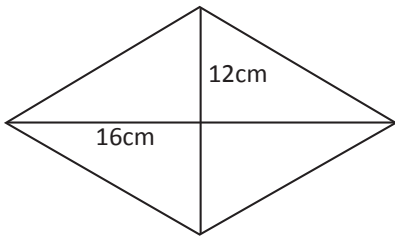
Note: d : short diagonal D: long diagonal

- When the known data are height and base, the area is obtained by multiplying the height by the base (area of a rhombus = height x base).

Application

In small groups pupils solve the following:

1) Find the area of each rhombus:



- Children built a play house in a shape of a rhombus. If it had a side of 20 dm, find its perimeter.
- Kalisa made a rhombus using wires. The base of the rhombus was 18 cm and the height was 15 cm. Find the area of the rhombus.

Conclusion

Assessment

- Find the area of a rhombus PQRS. The horizontal diagonal (PR) is 12 cm and the vertical diagonal (QS) is 26 cm.
- The perimeter of the rhombus is equal to 32cm. Find the length of the side of the rhombus.
- A farmer build a kraal in a shape of a rhombus whose side is 9 m. Find the perimeter of the kraal.

Homework

- The floor of a building consists of 2 000 tiles which are rhombus shaped and each of its diagonals are 40 cm and 25 cm in length. Find the total cost of polishing the floor, if the cost per m^2 is 50Rwf.
- Find the perimeter of the rhombus having each side equal to 17 cm.
- Find the area of the carpet in a shape of a rhombus whose base is 4 m and the height is 3 m.

Period 3

Perimeter and area of a parallelogram

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of a parallelogram confidently, correctly and in given time.

Materials

Manila paper on which the different parallelogram as shown in activity below.

References

- Byamukama, J&Mulisa, L (2010).New Upper Primary Maths. Pupil's book for Grade 4.P 123 - 124
- <https://www.mathsisfun.com> vested on Tuesday, October 13, 2015

Introduction/Review

Correction of homework.

Game: **Who am I?**

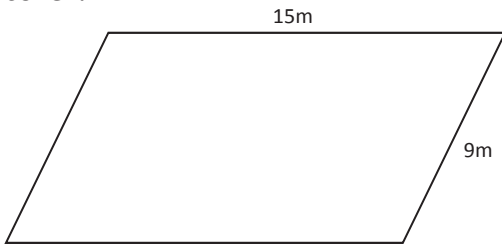
Development

Presentation

Pupils in pairs solve the following:

Activity 1: Calculating the perimeter of a parallelogram

A boy walked all around the parallelogram shaped garden shown below. How many meters did he cover?



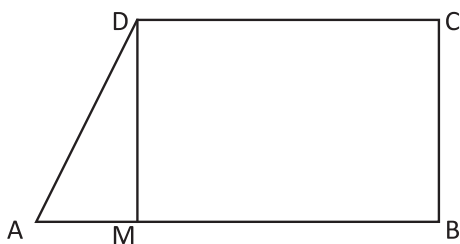
Answer:

a) Calculations: $15\text{ m} + 9\text{ m} + 15\text{ m} + 9\text{ m} = (15\text{ m} + 9\text{ m}) \times 2 = 48\text{ m}$

b) Solution: He covered 48 m.

Activity 2: Calculating the area of a parallelogram

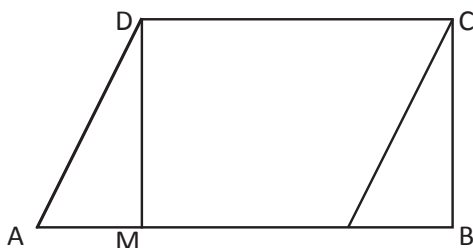
Observe the parallelogram below and answer the questions below:



- If a triangle DAM is cut and placed on the other side such that line DA lies on line CB, what type of figure is made?
- How do we calculate the area of the figure is made?
- Comparing that area to the given parallelogram, can you figure out the formula to calculate the perimeter and area of a parallelogram?

Answers:

1) The figure which is made is a rectangle.



- The area of the figure made is width times length ($W \times L$).
- The area of a parallelogram is equal to the area of a rectangle.

Math Facts!

- For the parallelogram the length is known as base and the width is known as height.
- Because a parallelogram is a shape that has two pairs of equal parallel sides as a rectangle its perimeter = side + side + side + side or (long side + short side) x 2
- To calculate the area of a parallelogram we multiply height by base. So, Area = base x height.

Application

In small groups pupils solve the following:

- 1) A parking lot is constructed in the shape of a parallelogram of 30 m of long side and 25 m of short side. What is the perimeter of the parking lot?
- 2) A parallelogram has a base of 14 cm, a height of 9 cm. What is the area of this parallelogram?
- 3) The base of a parallelogram is 12 cm and the corresponding height is 7 cm. What is the area of the parallelogram?

Conclusion

Assessment

- 1) A yard is shaped like a parallelogram with a base of 27 m and height of 30 m. What is the area of the yard?
- 2) In a parallelogram one side is 45 cm. The corresponding height is 24 cm. Then the area of that parallelogram is cm².
- 3) A rectangular billboard casts a shadow on the ground in the shape of a parallelogram. What is the perimeter of the ground covered by the shadow if the shadow has 5 m long and 3 m wide?

Homework

- 1) The base of a land in parallelogram shape is 15 cm and its height is 13 cm. What is the area of the parallelogram?
- 2) The base of a parallelogram is 11 dm and its height is 2 dm. What is the area of the parallelogram?
- 3) Nkubito wants to fence a parallelogram shaped farm of 30 m and 25 m sides, how many meters will he buy?

Period 5

Perimeter and area of a trapezium

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of a trapezium confidently, correctly and in given time.

Materials

Manila paper on which different types of trapezium are drawn.

References

- Byamukama, J&Mulisa, L (2010). New Upper Primary Maths. Pupil's book for Grade 4.P 128 - 130
- <https://www.mathsisfun.com> vested on Tuesday, October 13, 2015

Introduction/Review

Correction of homework.

Game: **Who am I?**

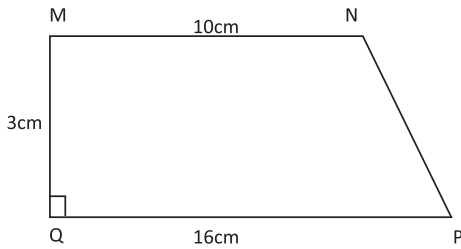
Development

Presentation

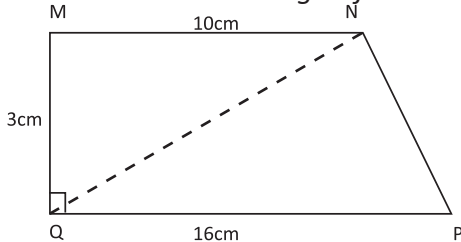
Activity 1: Calculating the area and perimeter of a trapezium

In pair pupils draw a trapezium MNPQ of the following dimensions: long base 16 cm, short base 10 cm and height 3 cm and divide it into triangles from one vertex Q to the other vertex N; and find the surface area of a two triangles MNQ and NPQ.

Answers:



Divide it into two triangles from one vertex Q to the other vertex N.



How can you determine the surface area of the two triangles MNQ and NPQ?

The area of the triangle MNQ = $\frac{1}{2} \times b \times h = \frac{1}{2} \times 10 \times 3 = 15 \text{ cm}^2$

The area of the triangle NPQ = $\frac{1}{2} \times B \times h = \frac{1}{2} \times 16 \times 3 = 24 \text{ cm}^2$

What is the surface area of the trapezium?

The surface area of the Trapezium is the sum of the area of the two triangles: $15 \text{ cm}^2 + 24 \text{ cm}^2 = 39 \text{ cm}^2$, which can be calculated using the following formulae:

$$\left(\frac{1}{2} \times b \times h\right) + \left(\frac{1}{2} \times B \times h\right) = \frac{1}{2} \times (B + b) \times h = \frac{(B + b) \times h}{2}$$

So $\frac{(16\text{cm} + 10\text{cm}) \times 3\text{cm}}{2} = 39\text{cm}^2$

Math Facts!

- The perimeter is the distance round a figure, a trapezium has 4 sides therefore the perimeter of a trapezium is equal to the sum of the four sides.
- The area of the trapezium is equal to $\frac{1}{2} \times$ sum of the parallel sides \times height.

So, $A = \frac{1}{2} (B + b) \times h = \frac{(B + b) \times h}{2}$

Note that the height of a trapezium is the perpendicular distance between the two parallel lines.

Application

In pairs pupils solve the following:

- 1) Kabanda's compound is in the shape of a trapezium. The sides of the compound are 18 m, 40 m, 22 m and 34 m. find the perimeter of the compound.
- 2) The parallel sides of a trapezium are 65 cm and 40 cm; find the perimeter of the trapezium if the other two sides are 53 cm and 62 cm.
- 3) A mirror is in the shape of a trapezium. The two parallel sides of the mirror are 10 cm and 15 cm. The perpendicular distance (height) between the parallel sides is 4 cm. What is the area of the mirror?

Conclusion

Assessment

- 1) Calculate the perimeter of a trapezium whose sides are 168 mm, 179 mm, 186 mm and 141 mm.
- 2) The 2 parallel sides of a trapezoid measures 15 cm and 9 cm. If the height of the trapezoid is 6 cm, what is the area of the trapezoid?
- 3) The parallel sides of a trapezium are 12 cm and 15 cm. Find the area if the height is 8 cm.

Homework

- 1) The slanting (oblique) sides of a trapezium are 11 cm and 9 cm. The parallel sides are 12 cm and 18 cm. Find the perimeter of the trapezium.
- 2) The parallel sides of trapezium are 20 cm and 14 cm. Find its area if its height is 8 cm.

Period 6

Perimeter and area of a kite

Instructional objectives

Using formula pupils will be able to calculate the perimeter and area of a kite confidently, correctly and in given time.

Materials

Rulers, manila paper

References

- <https://www.mathsisfun.com> visited on Tuesday, October 13, 2015

Introduction/Review

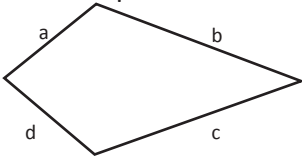
Game: *Who am I?*

Development

Presentation

Activity 1: Calculating the perimeter of a kite

Find the perimeter of the following kite if $a = 3$ cm and $b = 6$ cm:



Answer:

$$\text{Perimeter} = a + b + c + d$$

Since $a = d$ and $b = c$, the perimeter $= 2a + 2b$

$$\text{Perimeter} = 3 \text{ cm} + 3 \text{ cm} + 6 \text{ cm} + 6 \text{ cm} = 18 \text{ cm}$$

Activity 2: Calculate the area of kite

What is the area of a kite with diagonals of length 6 cm and 4 cm? To find the area of a kite, we just need the length of the two diagonals.

Answer: given $D = 6$ cm, $d = 4$ cm

$$A = \frac{1}{2} \times D \times d = \frac{D \times d}{2}$$

$$A = \frac{1}{2} \times 6 \text{ cm} \times 4 \text{ cm} = \frac{6 \text{ cm} \times 4 \text{ cm}}{2} = \frac{24 \text{ cm}^2}{2} = 12 \text{ cm}^2$$

Math Facts!

The perimeter of a kite: side + side + side + side

The area of a kite is $\frac{1}{2} \times D \times d = \frac{D \times d}{2}$

Application

In small groups pupils solve the following:

- 1) Find the area of a kite whose diagonals are 21 cm and 12 cm.
- 2) Find the area of a kite whose diagonals are 7 cm and 4 cm.
- 3) Find the perimeter of a kite whose sides are 4 cm, 4 cm, 10 cm and 10 cm.

Conclusion**Assessment**

- 1) Find the area of a kite whose diagonals are 4 m and 8 m.
- 2) Find the perimeter of a kite whose short side is 5 cm and long side is 10 cm.
- 3) Find the area of a kite whose diagonals is 20 cm and 34 cm.

Homework

- 1) Find the area of a kite whose diagonals are 5 cm and 10 cm.
- 2) Find the perimeter of a kite whose short sides is 13 cm and long side is 20 cm.

Lesson 6 Assessment of the unit

Topic area:	Geometry
Unit 16	Area of 2-D shapes
Key competence	To use rectangles to determine the area of triangles and special quadrilaterals.
Assessment criteria	Pupils are able to accurately, confidently and in required time: solve problems involving determination of the area and perimeter of different 2D shapes.
Competences developed	Critical thinking
Attention to special educational needs	When preparing the assessment, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Assessment questions**20 marks****Question 1**

A mother cultivates a kitchen garden that is 4 meters for each side, if the garden is square- shaped:

- a) Find its perimeter
- b) Find its area

Question 2

A farmer has a field which is rectangular in shape. Two sides are 10 metres each and the other two are 20 metres each. What is the perimeter of the field? What is the area of the field?

Question 3

A triangular garden has the height of 30 m and the base of 40 m. Find its area.

Question 4

The floor of a building consists of 1 000 tiles which are rhombus shaped and each of its diagonals are 20 dm and 15 dm long. Find the total cost of polishing the floor, if the cost per dm^2 is 5 Frw.

Unit 17: Elementary statistics. Unit at glance

Topic area: Statistics and elementary probability.

Key competence: To be able to collect, represent and interpret data.

Lesson 1: Data collection	Period 1	Period 2			
	Data collection using a table	Exercises of data collection using a tables			
Lesson 2: Data interpretation	Period 1	Period 2			
	Interpreting and extracting information from tables	Exercises on interpreting /extracting information from tables			
Lesson 3: Data representation on bar graph	Period 1	Period 2	Period 3	Period 4	Period 5
	Representing information using bar graph	Exercises on representing information using bar graph	Interpretation/ extracting information from bar graphs	Exercises on interpretation/ extracting information from bar graphs	Exercises on interpretation/ extracting information from table and bar graphs
	Lesson 4 : Revision of the unit				
	Lesson 5: Assessment of the unit	Period 1	Period 2		
		Assessment	Feedback and remediation		

Unit warm-ups and games

Play the game with pupils by asking them to stand up or sit down by saying up or down. Pupils who do the opposite of what you said fail and are removed from the group and control the cheating in the remaining pupils. The winner is the last pupil.

Lesson 1 Data collection (using a table)

Topic area	Statistics and elementary probability
Unit 17	Elementary statistics
Key Unit competency	To be able to collect, represent and interpret data.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge: <ul style="list-style-type: none"> • Explain how the data are collected using tables. • Differentiate between quantitative and qualitative data Skills: <ul style="list-style-type: none"> • Analyze and describe the possible ways data is collected. • Apply the knowledge acquired to distinguish between quantitative and qualitative data. Attitude: Appreciate the importance of data collection in daily life situations.
Key words	Data, frequency table, bar graph
Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussions leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations.
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through evaluating ideas logically before making conclusions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1 Data collection using a table

Instructional Objectives	Using table pupils will be able to collect qualitative and quantitative data correctly, confidently and in given time.
Class setting/organization	Indoor: pupils sit in a way to facilitate them to work individually, in pairs and in small group.
Materials	Manila paper with some information (Activity 3 below)
References	<ul style="list-style-type: none"> - Mwumvaneza E. et al. 2008. Mathematics pupil's book primary five (NCDC) P. 164-165. - Phillips, M. 2002. Houghton Mifflin Mathematics. P. 417. - www.tes.co.uk/article.aspx visited on Sunday, October 11, 2015.

Steps / Timing	Teachers' activities	Pupils' activities	Generic competences and cross cutting issues to be addressed																
Introduction (5 min)	Game: Up down game Facilitate pupils to play the game by choosing the number of pupils who play the game and those who record the failed pupils at each step.	1. Up down game 2. Suppose that 35 pupils are chosen to play the game and 5 are recording the number of pupils who fail (zero fail is not considered). Suppose that after 12 steps we get the winner and the following numbers are recorded: 2, 5, 3, 2, 2, 4, 1, 5, 6, 1, 1, 2	<ul style="list-style-type: none"> - Communication developed through answering questions. - Critical thinking is developed through solving problems. 																
Development (25 min)	Presentation Ask questions about the recorded numbers Facilitate pupils to discover how to collect data in the activity given.	Answer the following questions: Activity 1: Concept of data 1. How do we call the recorded numbers? (In the game above) <i>Answer: The recorded numbers are called information or data.</i> 2. How do we collect data? <i>Answer: We collect data by asking questions or by observing a situation.</i> 3. In small groups pupils represent the numbers recorded above (data) in a table and show the number of times each number is repeated. Some group representatives present on the board. <i>Answer: Arrange data in ascending order. Count the number of times a data is repeated (frequency). Then, we have the table below:</i>	<ul style="list-style-type: none"> - Communication developed through answering questions - Critical thinking is developed through solving problem. - Gender developed through assigning equal roles. - Peace and values developed through consensus leading to conclusion. - Cooperation developed through group discussion. 																
	Facilitate pupils to represent raw data by frequency distribution table.	Frequency distributed table: <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th style="width: 50%;">Recorded numbers</th> <th style="width: 50%;">Frequency</th> </tr> </thead> <tbody> <tr><td>1</td><td>3</td></tr> <tr><td>2</td><td>4</td></tr> <tr><td>3</td><td>1</td></tr> <tr><td>4</td><td>1</td></tr> <tr><td>5</td><td>2</td></tr> <tr><td>6</td><td>1</td></tr> <tr><td>Total</td><td>12</td></tr> </tbody> </table>	Recorded numbers	Frequency	1	3	2	4	3	1	4	1	5	2	6	1	Total	12	
Recorded numbers	Frequency																		
1	3																		
2	4																		
3	1																		
4	1																		
5	2																		
6	1																		
Total	12																		

Ask 20 pupils to tell you their age and write each single entry on the board.

Activity 2: Collecting and arranging quantitative data

In groups pupils discuss and represent the information on the table using tally marks.

Answer
(Note: The answer will depend on the number of pupils at each age in your class but here is an example)
 e.g: 10, 11, 11, 12, 10, 10, 12, 11, 11, 12, 12, 12, 10, 10, 11, 11, 10, 11, 11, 10.

Age of pupils	Tallies	Numbers of pupils
10 years	— —	
11 years	— —	
12 years	— —	

Show the third situation to pupils (written on manila paper)

Activity 3: Collecting and arranging qualitative data

In a certain school the teacher has asked 9 pupils: Kamana, Kamariza, Kamanzi, Uwera, Mutoni, Umurisa, Umurerwa, Umwari, Uwase how often they bring their lunch to school; the following are their respective answers: always, sometimes, never, sometimes, sometimes, always, sometimes, sometimes, always.

- 1) Represent the above information in a table
- 2) What is the difference between the data in the previous table and this one?

Some groups demonstrate to the entire class the outcome of the results.

Answer

How often do you bring your lunch to school?	
Kamana	Always
Kamariza	Sometimes
Kamanzi	Never
Uwera	Sometimes
Mutoni	Sometimes
Umurisa	Always
Umurerwa	Sometimes
Umwari	Sometimes
Uwase	Always

2. In the first table we have numbers while in the second we have words.

	<p>Summary</p>	<ul style="list-style-type: none"> - We collect the data through asking question and recording answers. - Data can be represented in form of tallies or numbers. When you use tallies, the number of items is grouped in fives. - When the data are words (cannot be expressed in numbers) are called qualitative data. - Quantitative data are any information that can be expressed as a number. - The number of repetition is called the frequency. 																																									
	<p>Application activities Facilitate pupils to represent data in a frequency distribution table.</p>	<p>Pupils in small groups work out the following:</p> <p>1) The figures below show the number of HIV/AIDS positive patients recorded in 10 health centre:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>5</td><td>8</td><td>8</td><td>10</td><td>5</td><td>8</td><td>12</td><td>12</td><td>5</td><td>5</td> </tr> </table> <p>Present the information in a frequency distribution table. Answer: Arrange data in ascending order. Then:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>No of patients</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>5</td> <td>4</td> </tr> <tr> <td>8</td> <td>3</td> </tr> <tr> <td>10</td> <td>1</td> </tr> <tr> <td>12</td> <td>2</td> </tr> <tr> <td>Total</td> <td>10</td> </tr> </tbody> </table> <p>2) A weather station recorded the daily rainfall during a rain season in mm. The following are the data recorded in 2 weeks: 77 20 20 69 36 67 57 77 36 69 36 20 77 64</p> <p>Represent the data using the frequency distribution table Answer: Arrange the data in ascending order. Then:</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Daily rainfall in mm</th> <th>Frequency</th> </tr> </thead> <tbody> <tr> <td>20</td> <td>3</td> </tr> <tr> <td>36</td> <td>3</td> </tr> <tr> <td>57</td> <td>1</td> </tr> <tr> <td>64</td> <td>1</td> </tr> <tr> <td>67</td> <td>1</td> </tr> <tr> <td>69</td> <td>2</td> </tr> <tr> <td>77</td> <td>3</td> </tr> <tr> <td>Total</td> <td>14</td> </tr> </tbody> </table> <p>3) Say if in question 1 and 2 the information provided is qualitative or quantitative.</p>	5	8	8	10	5	8	12	12	5	5	No of patients	Frequency	5	4	8	3	10	1	12	2	Total	10	Daily rainfall in mm	Frequency	20	3	36	3	57	1	64	1	67	1	69	2	77	3	Total	14	<p>Critical thinking is developed through solving problems.</p>
5	8	8	10	5	8	12	12	5	5																																		
No of patients	Frequency																																										
5	4																																										
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67	1																																										
69	2																																										
77	3																																										
Total	14																																										

<p>Conclusion (10 min)</p>	<p>Assessment Write the assessment questions on board</p>	<p>Assessment Individually pupils do the following:</p> <p>1) The following numbers represent the age of 18 pupils of a football team at a school: 14 12 12 11 13 12 10 12 14 10 12 13 14 10 12 11 12 13 Represent the age of the football team members in a frequency distribution table.</p> <p>2) During break Mwiza counted the different colored cars that passed by/near the school gate in five minutes and he got the following results: Red, Black, Green, Red, White, Blue, Yellow, Red, Blue, White Represent the data in a table.</p>	
	<p>Homework Write the questions on board</p>	<p>Homework Kayitare decided to increase his fitness by doing sports after school. The following are the numbers of decameter he run per day: 138 134 140 140 138 145 145 138 150 140 138 145 140 138 140 140. Represent the data above in a frequency distribution table.</p>	<p>Critical thinking is developed through representing data in a table.</p>

Lesson 2 Data interpretation

Topic area	Statistics and elementary probability
Unit 17	Elementary statistics
Key Unit competency	To be able to collect, represent and interpret data.
Learning objectives	By the end of this lesson pupils will be able to: Knowledge Explain the process of interpreting and extracting information from tables. Skills Interpret and extract information from tables in daily life. Attitude Appreciate the importance of interpreting and extracting information from tables.
Key words	Mode, mean, Scope /range
Cross cutting issues	- Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations.
Competences developed	- Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through evaluating ideas logically before making conclusions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Period 1 Interpreting and extracting information from tables

Instructional objectives

Given real life situation, pupils will be able to interpret/extract information from tables correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper on which a frequency table is drawn.

References

- Mwumvaneza E. et al. 2008. Mathematics pupil's book primary five (NCDC) P. 165-167
- Phillips, M. 2002. Houghton Mifflin Mathematics, P. 419 -420
- www.tes.co.uk/article.aspx visited on Sunday, October 11, 2015

Introduction

Correction of homework.

Development

Presentation

Activity: Interpretation and extraction of information

Mugeni planted trees along a street. The following are the trees she planted per day.

3	4	3	5	7	3	4	4	7	4	3	3	10	5	10
---	---	---	---	---	---	---	---	---	---	---	---	----	---	----

- Represent the data in a frequency distribution table
- How many trees did she plant altogether?
- How many days did she use to plant trees?
- What is the average number of trees she planted per day?
- How many trees did she often plant?
- What is the difference between the highest number of trees planted and the smallest number of trees she planted per day?

Answers:

a) Arrange the data in ascending order. Then,

No. of trees	Number of days (frequency)
3	5
4	4
5	2
7	2
10	2
Total	15

b)

i) Calculations: $3+3+3+3+3+4+4+4+4+5+5+7+7+10+10 = 75$.

ii) Solution: she planted 75 trees altogether.

c) She used 15 days to plant trees.

d)

i) Calculations: $75 \div 15 = 5$

ii) Solution: The average number of trees she planted per day is 5 trees.

e) The number of trees she often planted is 3 trees since she planted them 5 times.

f)

i) Calculations: $10 - 3 = 7$.

ii) Solution: The difference between the highest number of trees and the smallest numbers of trees she planted is 7.

Pupils conclude that a data with the highest frequency is called mode. Therefore, in the above activity the mode is 3 trees.

The sum of data divided by the number of data is called average or mean. Therefore, in the above activity the mean is 5 trees.

The difference between the highest data and the smallest data is called the scope or range. Therefore, in the above activity the range/scope is 7.

Math Facts!

The following terms are used when interpreting data from a table:

- Mode is the data with the highest frequency
- Mean is the sum of the data divided by the sum of frequencies
- Range/scope is the difference between the highest and the smallest data

Application

In small groups pupils solve the following:

The following numbers represent the number of female doctors in 10 hospitals.

10	8	12	10	15	12	12	11	12	8
----	---	----	----	----	----	----	----	----	---

- Represent the data in a frequency distribution table.
- Find the total number of female doctors.
- Find the average number of female doctors per hospital.
- Find the mode.
- Find the range.

Conclusion

Assessment

The following numbers represent the number of Malaria patients a health centre treated for 15 days.

25 37 25 25 40 15 30 15 8 25 37 8 8 25 30

- Represent the data in frequency distribution table
- Find the total number of malaria patients
- Find the average number of malaria patients treated by the health centre
- Find the mode
- Find the range/scope.

Homework

A Farmer records the number of eggs laid by a 50 hens. After 20 days he got the following number

30 40 60 30 70 50 30 60 60 50

70 70 60 70 80 30 70 70 40 60

- Represent the data in a frequency distribution table.
- Find the total number of eggs produced by the hens.
- Find the average number of eggs produced by the hens per day.
- Find the mode
- Find the range/scope.
- Do you think the crease of the number of eggs can affect the development of the farmer? Explain.

Lesson 3

Data representation on a bar graph

Topic area	Statistics and elementary probability
Unit 17	Elementary statistics
Key Unit competency	To be able to collect, represent and interpret data.
Learning objectives	By the end of this lesson, pupils will be able to: Knowledge <ul style="list-style-type: none">Explain the process of interpreting /extracting information.Describe how to represent information using bar graphs. Skills <ul style="list-style-type: none">Explain different ways of representing data.Solve mathematical problems involving representation of data in daily life. Attitude: Appreciate the importance of statistic tables and bar graphs in daily life situations.
Key words	Bar graph, mode

Cross cutting issues	<ul style="list-style-type: none"> - Peace education developed through discussion leading to consensus. - Gender balance developed through distribution of roles in group work and through real life situations. - Standardization developed through discussing ways of increasing productivity in agriculture (general welfare).
Competences developed	<ul style="list-style-type: none"> - Communication developed through answering questions. - Co-operation developed through working in pairs and in groups. - Critical thinking developed through evaluating ideas logically before making conclusions.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learners, pupils with disabilities...

Period 1

Representing information using bar graph

Instructional objectives

Given real life situations, pupils will be able to represent data using bar graph correctly, confidently and in given time.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

Materials

Manila paper, ruler.

References

- Phillips, M. 2002. Houghton Mifflin Mathematics, P. 430
- <http://math.tutorvista.com/statistics/frequency-distribution.html> visited on Sunday, October 11, 2015

Introduction

Correct the homework.

Development

Presentation

Facilitate pupils to represent data using a bar graph.

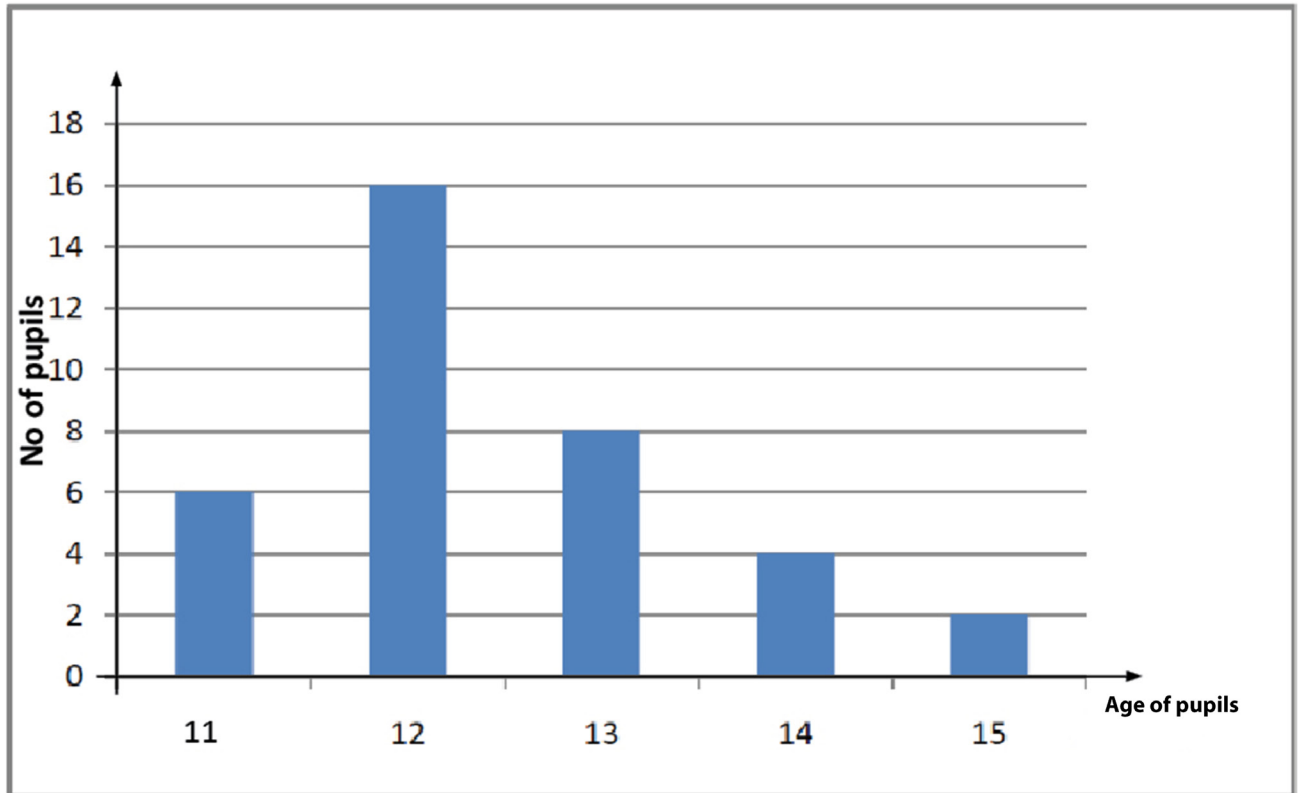
Activity: Representation of data on a bar graph

The table below shows the age of pupils in P6. Represent the data on a bar graph.

Age of pupils in P.6 (in years)	11	12	13	14	15
Frequency (no. of pupils)	6	16	8	4	2

Answer:

Draw two perpendicular lines where the vertical line represents the frequency and the horizontal line represents the data. Put the frequencies on the frequency line and the data on data line such that the numbers are equally spaced



Pupils conclude that the height of the bar is equal to the corresponding frequency.

Math Facts!

When representing data on a bar graph we proceed as follow:

- Draw two perpendicular lines
- Put the frequencies on the vertical line and the data on the horizontal line
- The numbers are equally spaced.
- Draw a vertical bar from each data with the height which is equal to the corresponding frequency.

Application

In small groups pupils solve the following:

The table below shows the number of patients who come for consultation in a health centre on a certain day.

Sickness	Malaria	HIV/AIDS	Cough and flu	Pneumonia
Number of patients	25	15	30	10

- Draw a bar graph representing this information.
- What can be done to avoid a big number of people getting sick (eg. how to avoid malaria, HIV/AIDS, etc).

Conclusion

Assessment

The table below shows Kalisa's daily sale for a week.

Day	Mon	Tue	Wed	Thu	Fri	Sat
Sales in Francs.	20 000	15 000	25 000	30 000	40 000	35 000

Draw a bar graph representing the above data.

Homework

The table below shows the number of visitors to a natural history museum during a 4 day period.

Day	Number of visitors
Friday	1 000
Saturday	1 500
Sunday	1 000
Monday	500

Draw a bar graph representing this information.

Period 3

Interpretation/extracting information from bar graphs

Instructional objectives

Given real life situations, pupils will be able to interpret/extract information from a bar graph correctly, confidently and in given time.

Materials

Manila paper, ruler.

Class setting / organization

Arrange desks so that pupils can work individually, in pairs or in small groups.

References:

- Phillips, M. 2002. Houghton Mifflin Mathematics, P. 430
- <http://math.tutorvista.com/statistics/frequency-distribution.html> visited on Sunday, October 11, 2015

Introduction

Correction of homework.

Development

Presentation

Facilitate pupils in small groups to represent data using a bar graph and discover the mode.

Activity: Finding the mode

The numbers below show the ages of females in 2 football teams:

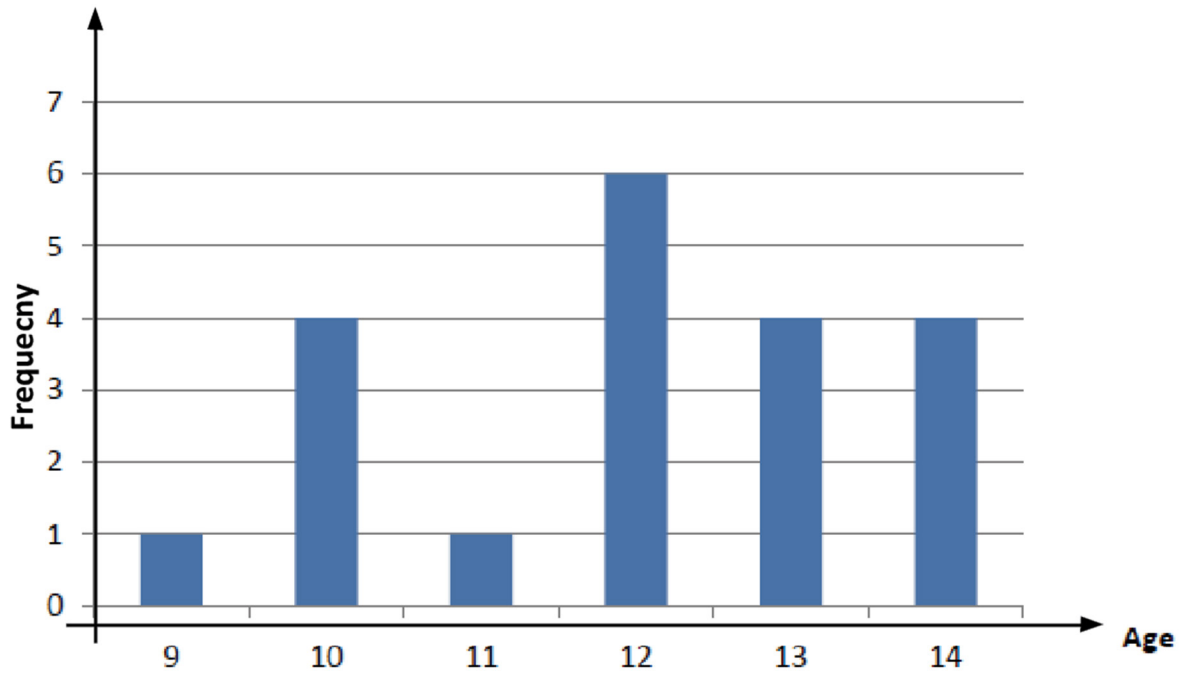
13 12 12 12 14 10 12 10 12 14

13 9 10 13 11 14 10 13 12 14

Represent them on a bar graph and find the mode.

Answer: Arrange the data in ascending order (in a frequency table):

Age	Number of female players(frequency)
9	1
10	4
11	1
12	6
13	4
14	4
Total	20



Pupils conclude that the mode is the data with the highest bar.

Note: If two bars have the same height we say bimodal, three bars with the same height we say trimodal, etc.

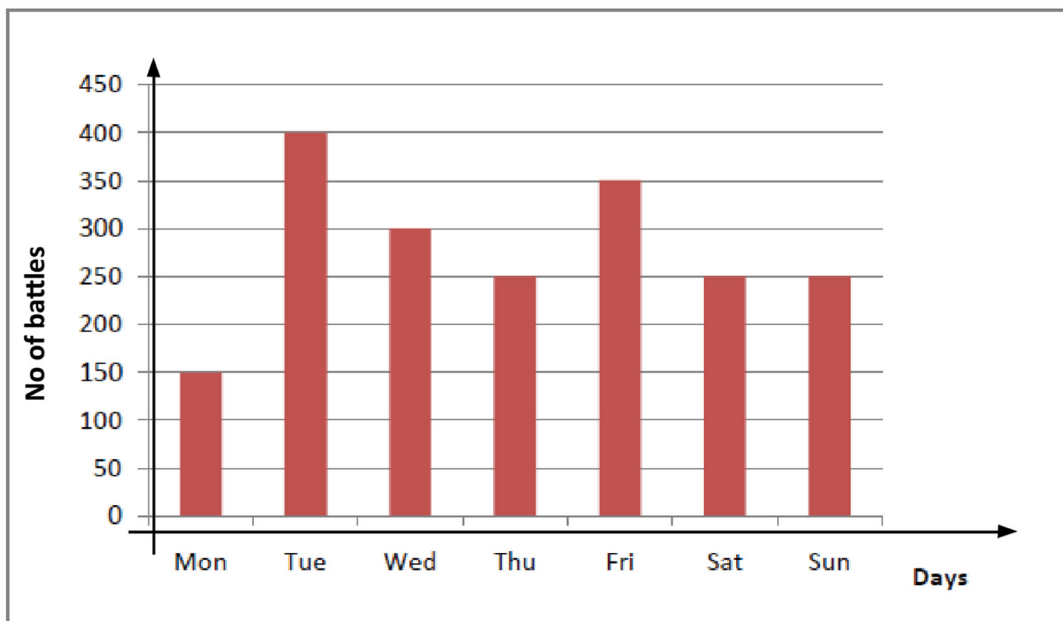
Math Facts!

From the bar graph, the mode is the data with the highest bar.

Application

In pairs pupils do the following activity:

The bar graph below shows the battles produced in a week by a manufacture:



- What was the frequency distribution table of the above data?
- Find the mode.

Conclusion

Assessment

The table below shows the number of trees planted by Umudugudu along streets for the last 10 months:

Month	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Dec
trees	50	84	65	62	40	87	60	61	49	51

Draw the bar graph representing the above data and find the mode.

Homework

a) In 1500m race, 10 pupils used the following minutes:

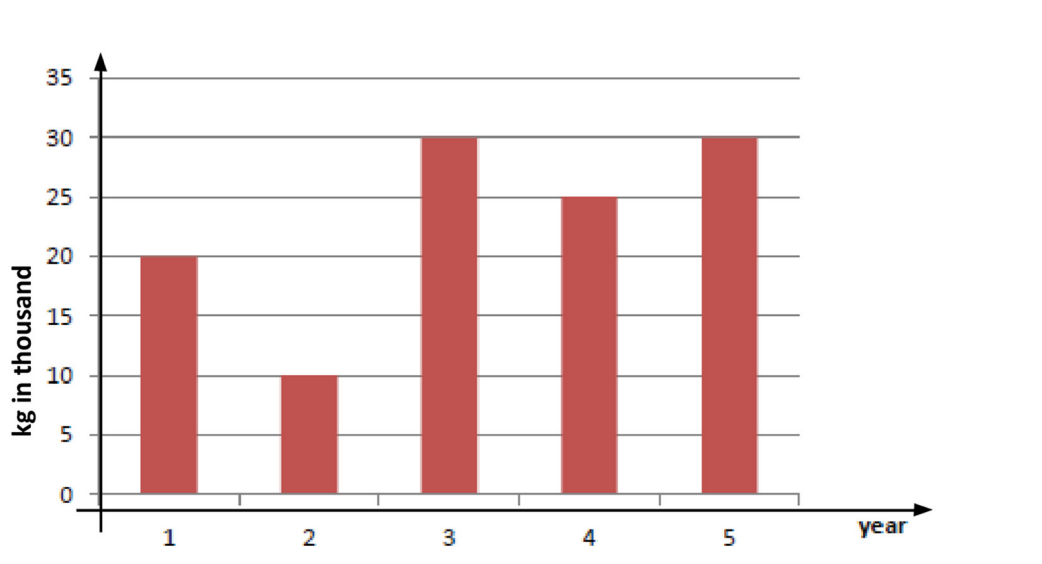
8 6 12 8 10 8 6 12 7 9

Find the mode

b) The following graph shows the amount of cassava in tones harvested by a cooperative in the last five years.

i) In which year did the cooperative harvest the highest amount (modal/mode)?

ii) What can be done to increase productivity in agriculture?



Unit 18: Introduction to probability

Unit at glance

Topic area: Statistics and elementary probability.

Key competence: Play games of chance and decide whether or not they are fair.

	Period 1	Period 2
Lesson 1: Introduction to probability	Decide if a game of chance is fair or unfair	Exercise on game of chance
Lesson 2: Assessment	Period 1 Assessment	Period 2 Feedback and remediation

Unit warm-ups and games

Counting in fifties

Pupils count in 50's starting for example from 0. eg: 0, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500. (Note: they can redo the game starting by another number , eg 50).

Unit Lessons

Lesson 1

Concept of chance through games

Topic area	Statistics and elementary probabilities
Unit:18	Introduction to probability
Key Unit competency	Play games of chance and decide whether or not they are fair
Learning objectives	By the end of the lesson, pupils will be able to: Knowledge: <ul style="list-style-type: none"> Know and explain that games have rules and may or may not be fair. Skills: <ul style="list-style-type: none"> To take turns when playing games of chance involving coins, dice, cards. To decide whether a game is fair or not. Attitude: <ul style="list-style-type: none"> Appreciate the importance of following rules and taking turns when playing games.
Key words	Events, probability, certain, possible, impossible, even chance.
Cross cutting issues	<ul style="list-style-type: none"> Gender balance developed through group organization. Peace education developed through accepting defeat.
Competences developed	<ul style="list-style-type: none"> Communication in official language developed through playing games. Critical thinking and problem solving developed through thinking about how to increase his/her chances of winning a game or when deciding if a game is fair or unfair.
Attention to special educational needs	When preparing the lesson, materials needed and when teaching take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Spin Number	Result	Player 1 Points	Player 2 Points
1			
2			
3			
4			
5			
6			
...			

After 20 times, players compare their results. Who won? Why do they think that happened? Did each player think the game was fair? Why or why not? If the game was not fair, how could you change it to make it fair?

Answer: *Most likely Player 1 has won because there are more opportunities for Player 1 to get points. There are two 2's while only one of each of the other numbers.*

Because Player 1 has more opportunities to score, the game is not fair. In order for the game to be fair, both players need an equal opportunity of scoring.

To make the game fair, the spinner would need to be changed so that they get the same opportunities. One way to do this would be to change the 5 to a 1 or 4. That way both players would have equal chance of winning.

Each group share with others their findings.

Summary:

Facilitate pupils to make conclusion using Mathematical language.

Summary:

A game can be fair and unfair.

- A fair game is a game where both (all) players have exactly the same chance of winning, rules are clearly set to provide equal opportunities to both players.
- An unfair game is the one where there is a distinction between chances of winning; there is no clear rule to follow while playing.

	<p>Application Explain instructions to be used when playing the game.</p>	<p>Application Pupils in pairs or in small groups play the following game: Game: Odd Bean Odd bean are a simple game of chance appropriate for even the youngest players. It is a game of guessing. Players simply need to know the difference between odd and even numbers in order to play. What you'll need</p> <ul style="list-style-type: none"> • A small bag consisting of 12 dried beans for each player. • Two or more players playing the game, each player is given a small bag containing twelve dried beans. • The first player pulls out some beans from the bag. Without showing them to the other players they take notice as to whether the total number of beans in their hand is an odd or an even number and then closes their hand hiding the beans. The first player then asks the second player "Odd or even?" • The second player then tries to guess if the first player is holding an odd or even number of beans. If they guess correctly they are given the beans the first player is holding. If their guess is incorrect they must forfeit the amount of beans the first player was holding to the first player. • It is now the second players turn. They pull a number of beans from their bag and take notice of whether they are holding an odd or even number and then hide them from the view of the other players. • The second player then turns to the third player and asks them "Odd or even?" • It is now the third players turn to guess if the second player is holding an odd or even number of beans. 	<p>Communication in official language developed through playing the games.</p>
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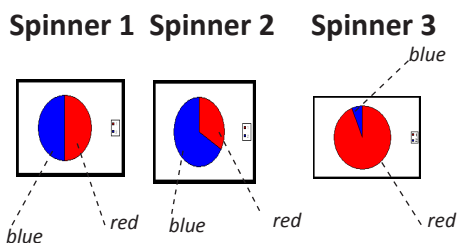
		<p>Play continues in this fashion until a player is out of beans. As soon as a player is out of beans they are out of the game.</p> <p>Winning the Game The player in the end that has collected all the beans is the winner.</p> <p>Questions:</p> <ul style="list-style-type: none"> - Is the game fair or not? - Can we find any rule to follow in order to win the game every time, or to win the game is by chance? 	
<p>Conclusion (10 min)</p>	<p>Assessment Explain the instructions to be used during playing game.</p>	<p>Assessment Divide the class into 2 teams, Team A and Team B. In the front of the room place two bags (one for each team). Team A's bag contains 4 blue objects and 4 red objects. Team B's bag contains 3 blue and 5 red objects. DO NOT let the players look into the bag. One person from each team should record their team's results on the board for each turn that is taken. The winner of the game is the team that has the reddest objects drawn from the bag.</p> <p>One player from each team comes to the front of the class to pull a piece out of their team's bag. The recorder notes if it is red or blue. The object should be put back into the bag. The next team member repeats the process.</p> <p>After each team member has had a turn, tally up the results and see which team had the most red.</p> <p>Discuss:</p> <ul style="list-style-type: none"> – Which team won and why? – Did each team think the game was fair based on the rules? <p>Empty the bags to show what was in each one. Team A's bag has 4 blue and 4 red objects. Team B's team has 3 blue and 5 red objects. Discuss:</p> <ul style="list-style-type: none"> – What is the difference between the 2 bags? – How does the difference impact the results of the game? – Was the game fair? – If the game was not fair, how could it be changed to make the game fair? 	

Homework
Teacher writes the question on board.

Homework
Pupils consider whether the following spinners are fair for a game involving two players. Player 1 wins if the spinner lands on red and Player 2 wins if the spinner lands on blue.

For each spinner, ask pupils to discuss which player has the best chance of winning (or whether each player has an equal chance of winning) and hence whether or not the game is fair.

Hint: In each case there are only two possibilities, red or blue, but they are not always equally likely.



Topic area	Statistics and elementary probabilities
Unit: 18	Introduction to probability
Key Unit competency	Play games of chance and decide whether they are fair or not.
Assessment Criteria	Pupils should be able to use the concepts of probability to determine whether a game is fair or not accurately, confidently in given time.
Competences developed	Critical thinking and problem solving through games and other activities.
Attention to special educational needs	When preparing the lesson and materials needed, and when teaching, take into consideration different abilities and needs of learners: slow, gifted and talented learner, pupils with disabilities...

Assessment questions**20 marks****Question 1**

You are going to play a marble game with a friend. A glass jar contains 5 red, 4 green, 6 blue and 2 yellow marbles. If red or a green marble is selected, you will get a point. If a blue or yellow marble is selected your friend will get a point. You should each pick 10 times and record your points at the end of each turn. The person with the most points at the end wins. Is this game fair or unfair? Explain your answer.

Question 2

Sam and Cynthia are playing a game. Every time the spinner stops on 1 or 2 Sam gets a point. Every time it lands on 3, Cynthia gets a point. Is this game fair? Explain your answer.



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