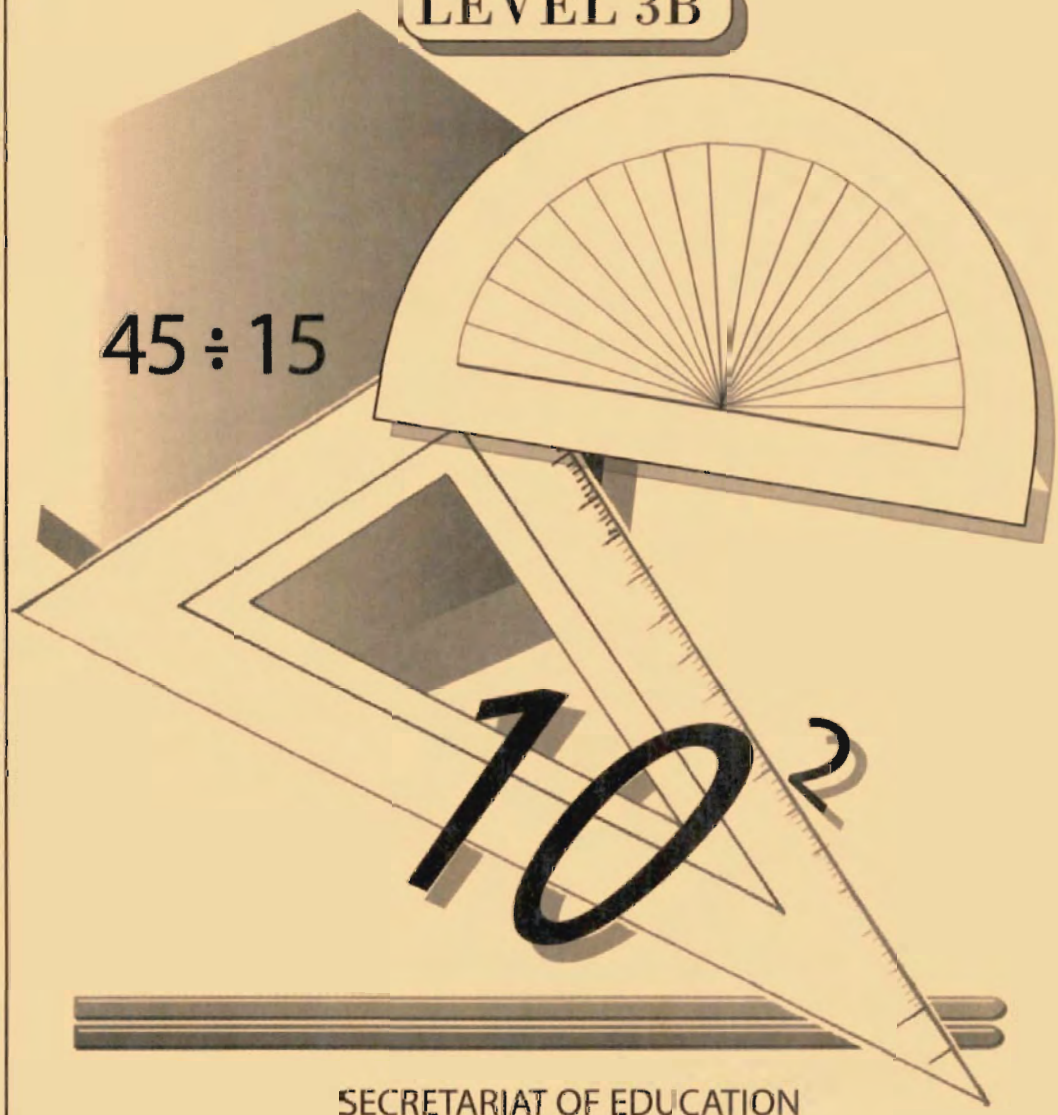
ACCELERATED LEARNING PROGRAM

MATHEMATICS

LEVEL 3B



SECRETARIAT OF EDUCATION
NEW SUDAN

ACCELERATED LEARNING PROGRAM

MATHEMATICS

LEVEL 3B

Secretariat of Education
New Sudan

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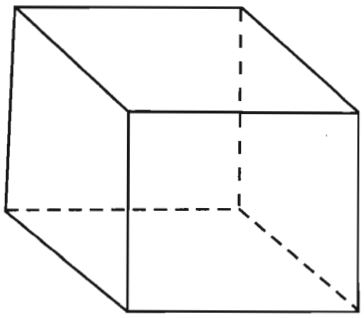
2.3 Volume of cubes and cuboids

2.3 (a) Cubes



Volume = Length x Width x Height

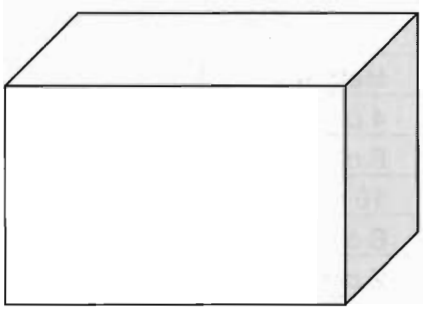
If the length = width = height, the container is a cube

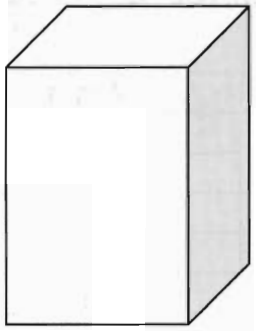
Note that length x width is called Base Area

Therefore, Base Area = length x width

Volume = Base x height

However, if the length is not equal to the width nor equal to the height, the container is called a cuboid.



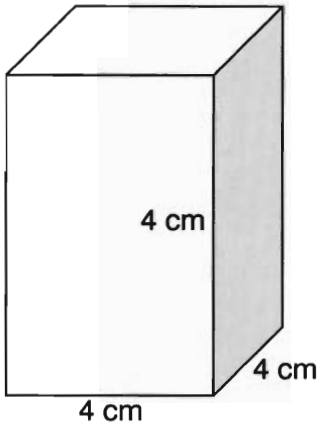


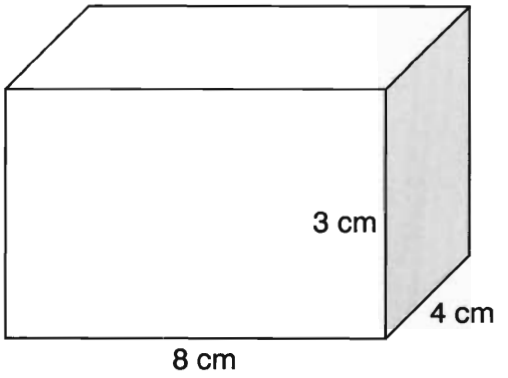
2.3 (b) Identifying cubic centimeter (cm^3) and m^3 as unit of valume

Volume is measured in centimeter cubes (cm^3) or metre cubes (m^3)

Examples

Find the value of the following shapes:





Solution

V = L x W x H

1) volume = 4 cm x 4 cm x 4 cm = 64 cm^3

2) volume = 8 x 4 x 3 = 96 cm^3

Exercise 10

Find the volume of different cuboids with the following dimensions:

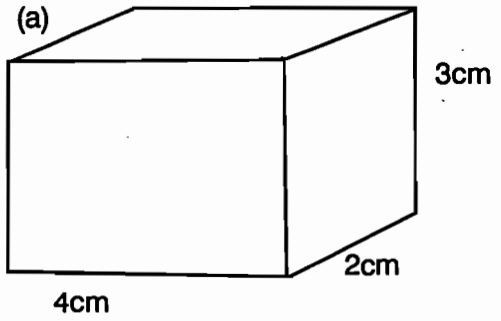
Length	Width	Height
1) 7 cm	3 cm	4 cm
2) 5 cm	3 cm	6 cm
3) 15 cm	15 cm	10 cm
4) 9 cm	3 cm	6 cm
5) 10 cm	5 cm	2 cm

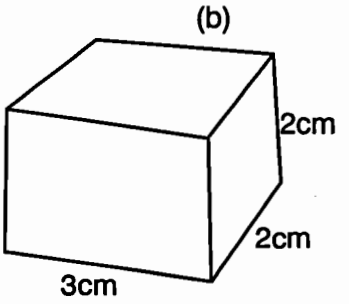
2. A box is 40cm long, 30cm wide and 20cm high. What is the volume of the box?

3. How many cubes with each side measuring 2cm can fit inside a carton which measures 30cm by 20cm by 10cm?

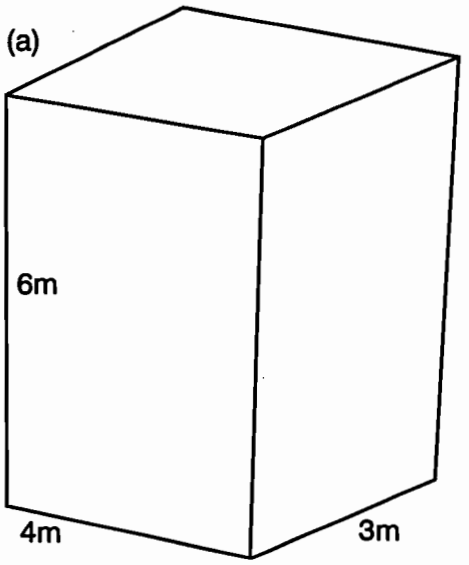
4. Find the volume of a cube measuring 5m by 5m by 5m.

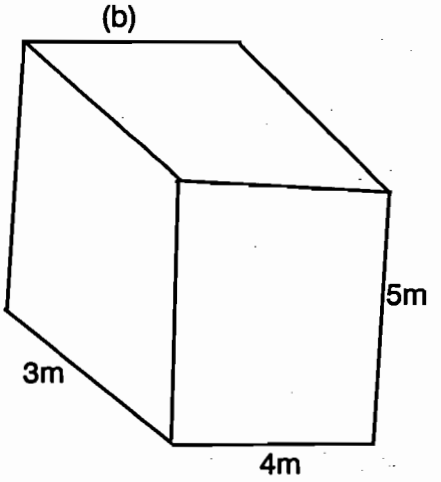
5.Find the volume of each of the following boxes:





6. Find the volumes of the boxes below:





2.3 (c) Converting m^3 to cm^3 and vice versa

$1\ m^3 = 100\ cm \times 100\ cm \times 100\ cm = 1{,}000{,}000\ cm^3$

Or $1{,}000{,}000\ cm^3 = 1\ m^3$

$$1\ cm^3 = \frac{1}{1000000}\ m^3$$

Example 1

Convert the following into cm^3:

1) $3m^3$ 2) $2.5m^3$ 3) $\frac{1}{4}\ m^3$ 4) $\frac{1}{5}\ m^3$

Solution

1. We know that

$1m^3 = 1{,}000{,}000\ cm^3$

Then, $3cm^3 = 3 \times 1{,}000{,}000\ cm^3$

$= 3{,}000{,}000\ cm^3$

2. We know that

$1\ m^3 = 1{,}000{,}000\ cm^3$

Then, $2.5m^3 = 2.5 \times 1{,}000{,}000\ cm^3 = 2{,}500{,}000\ cm^3$

3. We know that

$1\ m^3 = 1{,}000{,}000\ cm^3$

Then, $\frac{1}{4} m^3 = \frac{1}{4} \times 1{,}000{,}000\ cm^3$

$= 250{,}000\ cm^3$

4. We know that

$\frac{1}{5} m^3 = \frac{1}{5} \times 1{,}000{,}000\ cm^3$

$= 200{,}000\ cm^3$

Exercise 11a

Covert the following into cm^3:

1) $1.5\ m^3$ 2) $\frac{1}{8} m^3$ 3) 0.08m

4) $0.0105\ m^3$ 5) $0.03\ m^3$

Example

Convert the following into m^3 :

1) 250,000 cm^3 2) 750,000 cm^3 3) 450,000 cm

Solution

1. We know that

$$1\ cm^3 = \frac{1}{1{,}000{,}000}\ m^3$$

$$\text{Then } 250{,}000\ cm^3 = 250{,}000 \times \frac{1}{1{,}000{,}000}\ m^3 = \frac{250{,}000}{1{,}000{,}000}\ m^3$$

$$= 0.25\ m^3$$

2. We know that

$$1\ cm^3 = \frac{1}{1{,}000{,}000}\ m^3$$

$$\text{Then } 750{,}000\ cm^3 = 750{,}000 \times \frac{1}{1{,}000{,}000}\ m^3 = \frac{750{,}000}{1{,}000{,}000}\ m^3$$

$$= 0.75\ m^3$$

3. We know that

$$1\ cm^3 = \frac{1}{1{,}000{,}000}\ m^3$$

$$\text{Then } 4{,}500{,}000\ cm^3 = 4{,}500{,}000 \times \frac{1}{1{,}000{,}000}\ m^3 = \frac{4{,}500{,}000}{1{,}000{,}000}\ m^3$$

$$= 4.5\ m^3$$

Exercise 11b

Convert the following into m^3

1) 2,500 cm^3 2) 3,000,000 cm^3

3) 105,000 cm^3 4) 800,000 cm^3

2.4 Capacity

2.4 (a) Units of Capacity

Deciliters and milliliters are some of the units for measuring capacity and are related as follows

1 litre	= 1000 millilitre
	= 100 centilitres
	= 10 decilitres
1 decalitre	= 10 litres
	= 10,000 millilitres
	= 1,000 centilitres
	= 100 decilitres
I kilolitre	= 1000 litres
	= 1000 millilitres
	= 100,000 centilitres
	= 10,000 decilitres

2.4 (b) Converting litres, milliliters and deciliters and vice versa

1 millilitre $= \frac{1}{1000}$ litre = 0.001 litre

1 centilitre $= \frac{1}{100}$ litre = 0.01 litre

1 decilitre $= \frac{1}{10}$ litre = 0.1 litre

1 decilitre = 10 litres

1 hecto litre = 100 litres

1 kilolitre = 1000 litres

Definition:

Deci - means one-tenth ($\frac{1}{10}$)

Decilitre (dl) means one-tenth of a litre (l)

Example 1:

How many decilitres are there in 8 litres?

Solution:

1 litre = 10dl

8 litres = (8 x 10)dl

= 80dl

Example 2:

How many litres are there in 50 decilitres?

Solution:

10dl = 1 litre

50 dl $= \frac{50}{10}$ litres

= 5 litres

Exercise 12

1. Find the number of deciliters in the following.

(a) 16 litre (a) $3\frac{1}{2}$ litre (c) $\frac{1}{2}$ litre

(d) $\frac{1}{5}$ litres (e) 2 litres (f) $2\frac{2}{5}$ litres

2. Find the number of litres in:

   (a) 60dl (b) 50dl (c) 35dl (d) 10dl

   (e) 130dl (f) 25dl (g) 4.5dl (h) 9dl

3. How many quarter litres are there in 8 half litres?

4. How many half litre tins can be filled from 81 litres?

5. How many 4dl packets will a two-litre container hold?

6. Kenyi bought 24 bottles of soft drinks. Each bottle contained 50 l of drink. How many litres of the soft drinks did Kenyi buy?

2.4 (c) Changing litres into millilitres and vice-versa

Examples

a) Change the following litres into millilitres:

   i) 2 litres ii) 9 litres iii) 15 litres

When converting litres into millilitres, we multiply the litres by 1000

Solution

Since 1 litre = 1000 ml, then

i. 2 litres = 2 x 1000 ml = 2000 ml

ii. 9 litres = 9 x 1000 ml = 9000 ml

iii. 15 litres = 15 x 1000 ml = 15000 ml

b) Change the following millilitres into litres.

   i) 8000 ml ii) 13000 ml iii) 29000 ml

When changing millilitres to litres, we divide the millilitre by 1000.

Solution:

Since 1ml = $\frac{1}{1000}$ litre, then

i) 8,000ml = $\frac{1}{1000}$ x 8,000 = 8 litres

ii) 13,000ml = $\frac{1}{1000}$ x 13,000 = 13 litres

iii) 29,000 ml = $\frac{1}{1000}$ x 29,000 = 29 litres

Exercise 13

1. Change the following litres into millilitres.
   a) 8 litres b) 13 litres c) 18 litres

   d) 32 litres e) 45 litres f) 69 litres.

2. Change the following millilitres into litres.
   a) 3000 ml b) 5000 ml c) 67000 ml

   d) 2000 ml e) 25000 ml f) 48000 ml

2.4 (d) (i) Addition and subtraction in liquid measure

a) Add and Subtract

Example: Add the following

i)

	Litre	Millilitre
	2	700
+	1	500

ii)

	Litre	Millilitre
	6	975
+	7	154

Solution

i)

	l	ml
	2	700
+	1	500
	4	200

700 + 500 = 1200 ml, write 200 ml under ml column and carry over 1 litre (1000 ml) to litre column. Then add 1 + 2 + 1 = 4 litres

ii)

	l	ml
	6	975
+	7	154
	14	129

Add 975 + 154 = 1129 ml, write 129 and carry over 1000 ml to become one litre under the litre column. Then add 1 + 6 + 7 = 14 litres.

Example: Subtraction

l	ml
9	876
- 4	966
4	910

Looking at example (a), you will notice that 966 cannot be subtracted from 876 millilitres. Therefore, we have to borrow one litre from the column and change it into millilitres to become 1000 millilitres. Therefore, 1000 + 876 - 966 = 910. In the litres column 8 litres remain, so subtract 4.

Therefore, 8 litres - 4 litres = 4 litres.

Exercise 14

1. a)

l	*ml*
13	768
+ 9	231

b)

l	*ml*
27	978
+43	863

c)

l	*ml*
97	627
+14	392

2. Change the following litres into millilitres.
   a) 7 litres b) 18 litres c) 27 litres d) 3 litres

3. Change the following millilitres into litres.
   a) 9000 ml b) 6000 ml c) 14000 ml d) 27000 ml

4. a)

l	*ml*
78	493
-67	582

b)

l	*ml*
19	879
-17	798

c)

l	*ml*
99	873
-97	973

d)

l	*ml*
13	765
-13	764

e)

l	*ml*
35	876
-32	892

5. Add:

(a)

	l	dl	d	ml
	3	6	3	8
+	2	5	7	4

(b)

	l	dl	d	ml
	2	8	8	7
+	3	2	3	1

(c)

	l	dl	d	ml
	5	8	9	7
+	1	4	8	2

(d)

	l	dl	d	ml
	4	9	8	3
+	7	5	2	4

6. Subtract:

(a)

	l	dl	d	ml
	8	4	6	3
-	2	7	8	5

(b)

	l	dl	d	ml
	15	5	3	2
-	6	8	7	4

(c)

	l	dl	d	ml
	5	3	2	1
-	2	7	8	5

(d)

	l	dl	d	ml
	16	6	4	1
-	8	7	8	5

(e)

	l	dl	d	ml
	6	1	6	4
-	2	3	9	8

(f)

	l	dl	d	ml
	13	2	3	5
-	5	8	4	7

Multiplication and Division in Liquid Measures

7. Multiply:

(a)

l	dl	d	ml
3	5	8	7
		X	3

(b)

l	dl	d	ml
6	4	3	2
		X	9

(c)

l	dl	d	ml
5	3	6	8
		X	4

(d)

l	dl	d	ml
7	9	8	6
		X	4

8. Divide:

(a)

	l	dl	d	ml
6)	2	7	5	4

(b)

	l	dl	d	ml
6)	15	8	6	4

(c)

	l	dl	d	ml
9)	17	5	3	2

9. How many 200ml packets will fill a one litre container?

10. Juma bought a carton filled with 50 tins of pineapple juice. Each tin held 500centilitres. How many litres of juice were in the carton?

11. 40 pupils each had a tin of water containing 200ml. How many litres did they have all together?

2.4 (d) (ii) ½ and ¼ millilitres and Litres

Write ½ litre and ¼ litre in millilitres.

½ litre can be changed into millilitres by multiplying it by 1,000 millilitres.

i.e. $\frac{1}{2} \times 1{,}000 \text{ ml} = \frac{1000}{2} = 500 \text{ ml}$

¼ litre can be changed into millilitres by multiplying it by 1,000 millilitres.

i.e. $\frac{1}{4} \times 1{,}000 \text{ ml} = \frac{1000}{4} = 250 \text{ ml}$

Example

i. How many half litres are there in 2 litres?

Solution

1 litre = two half litres
Therefore, 2 litres = 2 x 2 half litres
= 4 half litres

ii. How many quarter litres are there in 2 litres.

Solution

1 litre = two half litres
Therefore, 2 litres = 2 x 4 quarter litres
= 8 quarter litres.

Exercise 15

1. Change the following into millilitres.

(a) 1½ litres (b) $\frac{3}{4}$ litre (c) 1¼ litres

(d) $2\frac{1}{4}$ litres (e) $3\frac{1}{2}$ litres (f) $\frac{5}{8}$ litre

2. How many half litres are there in:

i) 3 litres ii) $1\frac{1}{2}$ litres iii) 4 litres

3. How many quarter litres are there in:

i) ¾ litres ii) 3 litres iii) 1¼ litres iv) 4 litres

2.5 Weight

2.5 (a) Identifying grams and tons as units of weight

The units of weight are related as follows.

1 ton = 1000 kg
1 kg = 1000 grams (gm)

Thus 1 ton = 1000 kg
= 1,000,000 gm

Or 1 kg $= \frac{1}{1000}$ ton

1 gm $= \frac{1}{1000}$ kg

1 gm $= \frac{1}{100000}$ ton

Example

Change the following kg into grams:

i) 5 kg ii) $\frac{2}{5}$ kg

Solution

i) We know that
1 kg = 1000gm
5 kg = 5 x 1000gm
= 5000gm

ii) We know that
1 kg = 1000 gm
$\frac{2}{5}$ kg = $\frac{2}{5}$ x 1000 mg = 400gm

Example

Change the following gm to kg.

I) 600 gm ii) 750 gm iii) 9500 gm

Solution

i) We know that 1 gm $= \frac{1}{1000}$ kg

Then 600 gm $= 600 \times \frac{1}{1000}$ kg

$= \frac{6}{10}$ kg or $\frac{3}{5}$ kg

ii) we know that 1 gm $= \frac{1}{1000}$ kg

Then 750 gm $= 750 \times \frac{1}{1000}$ kg $= \frac{75}{100}$ kg

$= \frac{3}{4}$ kg

Exercise 17a

Change the following gm to kg.

I) 250 gm ii) 125 gm iii) 400 gm iv) 8250 gm

Example

Convert the following tons into gm:

i) ¼ ton ii) $\frac{2}{5}$ ton iii) 3 tons

Solution

I) We know that 1 ton = 1,000,000 gm
Then ¼ ton = ¼ x 1,000,000 gm
= 250,000 gm

ii) We know that 1 ton = 1,000,000 gm

Then $\frac{2}{5}$ ton $= \frac{2}{5} \times 1{,}000{,}000 = \frac{2 \times 1{,}000{,}000}{5}$

= 400,000 gm

iii) We know that 1 ton = 1,000,000 gm
Then 3 ton = 3 x 1,000,000 gm
= 3,000,000 gm

Exercise 17b

Convert the following into grams:

i) $1\frac{1}{5}$ tons ii) 1½ ton iii) ¾ ton

iv) $\frac{1}{8}$ ton v) 0.03 ton

2.5 (b) Measurement of weight in grams

Example

Change the following grams into tons:

i) 250,000 gm ii) 500,000 gm

Solution

i) We know that 1gm = $\frac{1}{1000000}$

Then 250,000 gm = 250,000 x $\frac{1}{1000000}$ ton

= $\frac{250000}{1000000}$ tons or ¼ ton

ii) We know that 1 gm = $\frac{1}{1000000}$

Then 500000 gm = 500000 x $\frac{1}{1000000}$ ton = 0.5 ton

Exercise 17c

Convert the following grams into tons:

i) 30,000 gm ii) 125,000 gm iii) 750,000 gm

iv) 450,000 gm v) 800,000 gm

Converting tons to kilograms; kilograms to grams; grams to tons

I ton (t) = 1000 kilograms (kg), 1kg = 1000 grams (gm)

Example

1. Change 4 tons into kilograms

Solution

1 ton = 1000 kg
4 tons = 4 x 1000 kg = 4000 kg

2. Change 10000 kg into tons

Solution

1000 kg = 1 ton

$1 \text{ kg} = \frac{1}{1000} \text{ tons}$

$10000 \text{ kg} = 10000 \times \frac{1}{1000} \text{ tons} = 10 \text{ tons}$

Exercise 18

1. Change the following tons (t) into kilograms (kg):

a) $1\frac{1}{5}$tons b) $1\frac{1}{4}$tons c) $3\frac{1}{2}$tons d) 4 tons

e) 7 tons f) 3 tons g) 10 tons h) 25 tons

2. Change the following kg into t:

a) 1000 kg b) 8000 kg c) 13,500 kg

d) 10,000 kg e) 500 kg f) 13,000 kg

2.5 (c) Solving problems involving tonnes, kgs, gms using the four basic operations

Addition involving weight

Example

i)

	t	*kg*	*gm*
	4	950	600
+	1	50	465
	6	1	65

ii)

	t	*kg*	*gm*
	5	350	891
+		813	419
	6	164	310

Exercise 19

i)

	t	*kg*	*gm*
	4	60	25
+	7	782	981

ii)

	t	*kg*	*gm*
	9	565	755
+		600	495

iii)

	t	*kg*	*gm*
	3	130	250
+	1	845	650

iv)

	t	*kg*	*gm*
	2	413	619
+		925	852

Subtraction involving weight

Example

i)

	t	*kg*	*gm*
	7	782	250
-		925	852
	6	856	398

ii)

	t	*kg*	*gm*
	2	413	619
-		925	852
	1	487	767

Exercise 20

i)

	t	*kg*	*gm*
	5	65	300
-	4	869	745

ii)

	t	*kg*	*gm*
	1	555	613
-		847	540

iii)

	t	*kg*	*gm*
	16	218	50
-	7	850	680

iv)

	t	*kg*	*gm*
	10	150	950
-	8	340	290

Multiplication involving weight

Example

Five Lorries were carrying 5t 231 kg 674g of maize each. What is the total weight of maize carried by the 5 lorries?

Solution

t	*kg*	*gm*
5	231	674
	x	5
26	158	370

Exercise 21

i)

t	*kg*	*gm*
3	257	692
	x	3

ii)

t	*kg*	*gm*
737	65	1
	x	6

iii)

t	*kg*	*gm*
8	257	676
	x	3

Division involving weight

Example

	6	310	904
4)	t	kg	gm
	25	243	616

i)

	t	kg	gm
5)	18	541	250

ii)

	t	kg	gm
3)	22	842	354

iii)

	t	kg	gm
8)	19	486	952

iv)

	t	kg	gm
7)	13	347	453

v)

	t	kg	gm
21)	42	359	520

vi)

	t	kg	gm
18)	36	414	630

vii)

	t	kg	gm
5)	11	823	555

2.6 Money and Rates

Bills

Below are some of the commodities in the market.
Use the price list to answer the questions.

ITEM	QTY	PRICE(£S)
Sugar	1kg	200.00
Flour (dura)	1kg	400.00
Tea leaves	1kg	176.00
Wheat flour	1kg	450.00
Bread	1	150.00
Match box	1	50.00
Cooking oil	1 litre	1500.00
Garlic	6	100.00
Simsim	1kg	1000.00
Groundnuts	1 tin	1000.00
Salt	1 pkt	100.00
Soap	1 piece	100.00
Meat	1kg	2500.00

Example 1

Kaku went to the market and bought the following items:
1kg sugar; $\frac{1}{2}$ kg tea leaves; $\frac{1}{2}$kg meat; 1 piece soap; 1kg wheat flour.

i) Prepare a bill for the items she bought and find the total
ii) How much change did Kaku get from £s2,900.007

ITEMS	£S	PT
1kg sugar @ £s200.00	200	00
$\frac{1}{2}$ kg tea leaves @ £s176.00	88	00
1 piece soap @ £s100.00	100	00
$\frac{1}{2}$ kg meat @ £s2500	1,250	00
1kg wheat flour @ £s450.00	250	00
TOTAL BILL	2,0588	00

ii) Total money given £s. 2,900.00
Total bill £s. 2,088.00
Change £s 812.00

Exercise 22

1. Deng's mother went to the shop and bought the following items: 2kg dura; 1 kg meat; 1 litre cooking oil; 1kg simsim; 1 match box
   Using the price list on the previous page:

   i) Prepare her bill and find het total expenditure

   ii) If she gave the shopkeeper £s6000. How much change did she get?

2. The following table shows the monthly bill for Riaka's family from a certain shop. Complete the bill.

ITEM	@	£S	PT
4kg dura	400	1,600	00
3kg. Wheat flour	450	___	___
$\frac{1}{2}$kg tea leaves	___	___	___
3 loaves of bread	150	450	00
$\frac{1}{4}$tin groundnuts	___	___	___
$\frac{1}{2}$kg simsim	___	___	___
2 pieces of soap	___	___	___
2 match boxes	___	___	___
TOTAL			

3. Ako went to the market and bought the following items: 1kg carrots @£s50 per kg; 2kg sweet potatoes @£s100 per kg; ½ kg onions @£s50 per kg; 1½ kg vegetables @£s100 per kg.

   i) Prepare Ako's bill and find her total expenditure.

   ii) If she gave the shopkeeper £s500, how much change did she get?

4. Lado's father bought the following items from the market. 4 shirts @£s18,000; 3 pairs of trousers @£s45,000; 2 bed sheets @£s8,000; 3 pairs of shoes @£s7,000
   Prepare Lado's father's bill and find the total.

5. Majok bought the following items from the market:
   ½ kg cooking fat @£s1000 per ¾kg; kg dura @£s1200 per kg; ¼kg salt @£s100 per kg.
   Prepare Majok's bill.

2.6 (b) Profit and Loss

Example 1

Roda buys a shirt for £s50 and sells it for £s60. What is her
(i) profit, (ii) percentage profit

Solution

(i) Profit = selling price - buying price

Selling price = £s60
Buying price = £s50
∴ Profit = £s10

(ii) Percentage profit = $\frac{\text{Profit}}{\text{buying price}} \times 100$

Profit = £s10
Buying price = £s50

∴ Percentage profit = $\frac{10}{50} \times 100 = 20\%$

Example 2

Lado bought a bicycle for £s2,000 and two years later he sold it for £s1,500.
Calculate: i) His loss in £s. ii) Percentage loss.

Solution

(i) Loss = buying price - selling price

Buying price = £s2,000
Selling price = £s1,500
∴ Loss = £s 500

(ii) Percentage loss = $\frac{\text{Loss}}{\text{buying price}} \times 100$

Loss = £s500
Buying price = £s2,000

∴ Percentage loss = $\frac{500}{2000} \times 100 = 25\%$

Exercise 23

1. Lugwa buys a chicken for £s200 and sells it for £s250. What is her profit? What is her percentage profit?

2. A woman buys fish at £s50 and sells them for £s80 each. What is her percentage profit?

3. A man bought a bicycle for £s2,500 and later sold it for £s2,000. What was his loss? What was his percent loss?

4. A boy bought a book for £s90 and at the end of one year sold it for £s60. Find his percent loss.

5. Find the missing values in the table below

Cost Price	Selling Price	Profit	Percentage Profit
a) £s200	£s225	___	___
b) ___	£s235	£s35	___
c) £s400	___	£s88	___
d) £s3600	___	£s99	___

6. Fill in the missing values in the table below

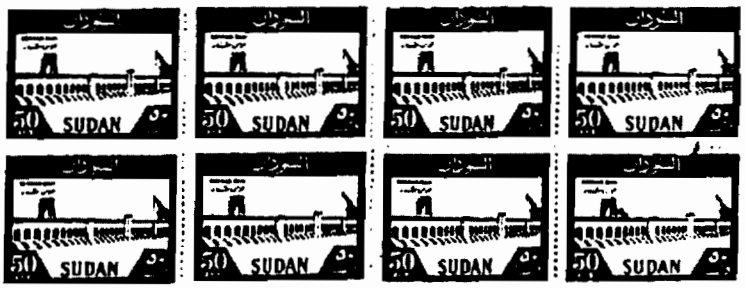
Cost Price	Selling Price	Loss	Percentage Loss
a) £s100	£s80	___	___
b) £s500	£s486	___	___
c) £80	___	£s12	___
d) ___	£s150	£s25	___

Postal Rates

2.6 (c) Reading postal rates

Inland Postage Charges

Types of article	Maximum weight	Cost £s
LETTERS (Weight limit 2kg)	Not over 20g	250
	Not over 50g	625
	Not over 100g	1,250
	Not over 250g	3,125
	Not over 500g	6,250
	Not over 1kg	12,500
	Not over 2kg	25,000
AEROGRAMS		250
POSTCARDS		400



Exercise 23a

A. Use the above table to answer questions 1 - 5

1. In the first week of July 1996, Juma the office messenger for a certain company posted letters which had the following weight:

   18g, 20.1g, 19.95g, 20g, 15g, 32g, 25g, 6g, 40g, 17g, 14g

   List the items which fall under the category "Not over 20g."

2. Study the following list of items.

   22g, 40g, 254g, 350g, 499g, 512g, 1001g, 99.9g, 101g, 25g, 15g, 12g, 125g, 272g, 60g, 150g, 299.5g, 1042g, 2000g, 1000g, 25.1g, 250.1g, 990g, 999.9g

   From the list above, list those items which fall under the category

(i) Not over 50g (ii) Not over 100g
(iii) Not over 20g (iv) Not over 250g
(v) Not over 500g (vi) Not over 1kg
(vii) Not over 2kg

3. What would you pay for a letter weighing
(i) 25g (ii) 480g (iii) 12g (iv) 675g (v) 1450g

4. Chuol posted three letters weighing
a) 32g, b) 67g c)127g

(i) What was the postage charge for each letter?
(ii) Find the total cost for the three letters.

5. Aya posted one aerogram and two postcards. How much did she pay for the three items?

Parcels and Letters

INLAND POSTAL CHARGES	
Small Packets Weight (up to 1kg)	*£s.*
Not over 100g	1,000
Not over 250g	2,500
Not over 500g	5,000
Not over 1kg	10,000

B. The following are parcels that were posted by a certain businessman in Yei, in the month of May.

949g, 750g, 75g, 125g, 50g, 497g, 230g, 249g, 252g, 370g, 192g, 500g, 150g, 400g, 1000g, 887g, 99g

List the items that fall under category.
(i) Not over 100g (ii) Not over 250g
(ii) Not over 500g (iii) Not over 1kg

2. Calculate the cost of sending three parcels each weighing 562g.

3. Deng posted four parcels weighing 80g, 150g, 275g, 420g. How much money did Deng use on postage?

4. Under what categories will the following parcels fall?
(i) 375g (ii) 12g (iii) 499.1g (iv) 100.005g

International Postage Charges - Surface Mail

Types of Articles and Weight Letters (maximum weight 2kg)	£s.
Not over 20g	700
Not over 100g	2,500
Not over 250g	6,500
Not over 500g	10,500
Not over 1kg	20,500
Not over 2kg	35,000
post cards each	800

Exercise 23b

1. Using the table above find the cost of sending letters whose weights are shown below:
   i) 19.5g ii) 100g iii) 1000g iv) 250g

2. Masale posted one letter weighing 240g and 5 postcards to his friend outside Sudan. How much did he spend on postage?

3. Kaku send a letter to a friend within Sudan weighing 19g and another one to a friend outside Sudan weighing 20g.
   a) How much did she use on postage for the letter:
      i) within Sudan?
      ii) outside Sudan?
      iii) What was the difference in cost of postage for the two letters?
      iv) What was her total expenditure on the two letters?

4. How much more does it cost to send a letter weighing 250 grams outside Sudan than to send the same letter within Sudan?

2.6 (d) Telegrams

A telegram is a quick way of sending a message through the post office. The post office changes a certain amount of money for every group of words. For example for the first 10 words the charge may be £s700, and for every word after the first 10, the charge could be £s150. Commas, full stops and abbreviations are counted as words and therefore they should be avoided as much as possible.

Example

Musa sent the following telegraphic message to his friend, Tom.

Tom Box 152 Maridi Birthday Party Invitation
Saturday 11 June 1997 2pm Musa.

i) How may words are used in the telegram?
ii) How much did it cost Musa to send the telegram?

Solution

i) Number of words 14 (Remember that the full stop has been counted)

ii) Cost

First 10 words = £s700
Next 4 words = 150 x 4
Total cost = £s1,300

Exercise 24

1. Deng sent a telegram to his brother Bringi with this message.

JOHN BRINGI BOX 201 YEI MOTHER SICK JUBA HOSPITAL COME HOME QUICKLY DENG

   i) How many words are there in the telegram?
   ii) How much did he pay for the first ten words?
   iii) How much did he pay for the additional words?
   iv) How much did he pay for the telegram?
   v) Shorten the telegram by one or two words.

2. The Primary six class is planning an educational trip. The cost for the trip is £s 1500 per pupil. Ako wants to send a telegram to his father John Chuol of P.O. Box 113 Khartoum, to request him to send her money for the trip.
   i) Write the telegram that Ako will send to his father. (It should not be more than 12 words)
   ii) Calculate the cost of sending the telegram.

3. Lupai wrote the following telegram to his wife Mrs. Lupai.

MRS. LUPAI P.O. BOX 1001 MARIDI. YOUR SON EMMANUEL IS SICK. COME HOME AS SOON AS POSSIBLE, LUPAI

   i) Rewrite the telegram using not more than 10 words.
   ii) Calculate the cost of sending the telegram.

2.6 (e) (i) Money Orders

MONEY ORDER	COMMISSION
Not exceeding (£s)	(£s)
3,000	150
3,900	205
6,900	345
12,900	555
18,900	795
24,900	870
30,900	900
45,900 and over	1,095

To find the total amount payable to the post office when sending money orders, the following formula is used:

Value of order + Commission = Total amount payable to the post office

Example:

Chuol sent £s12,000 to his son Deng in Khartoum by money order.

i) How much commission did he pay for the order?
ii) What is the total amount which he paid to the post office?

Solution

i) Commission is £s 555

ii) Total amount payable to the post office = value of the order + commission
£s12,000 + £s555 = £s12,555

Exercise 25

How much would you pay as commission for the following money orders?

i) £s2,500 ii) £s6,015 iii) £s24,000
vi) £s25,000 v £s21,500 vi) £s150

2. Calculate the total amount payable at the post office for the following money orders:
   i) £s5,360 ii) £s3,265 iii) £s 275
   iv) £s35,805 v) £s55,000 vi) £s35,805

3. Kaku sent a money order worth £3,150 to her daughter in Maridi Senior School.
   i) How much commission did she pay for the order?
   ii) Calculate the total amount paid to the post office.

4. Fill in the blank spaces in the table below

Value of order £s	Commission £s	Total Amount payable £s
i) 3,450	205	___
ii) 12,000	___	12,555
iii) 30,750	___	___
iv) 24,000	___	___
v) 50,000	___	___

2.6 (e) (ii) Postal Orders

Postal Orders	
Available denomination £s	**Commission charges £s**
150	30
300	45
450	75
600	90
1,200	105
1,800	120
2,400	135
3,000	150
6,000	165

Example

Juma wants to send £s3,900 by postal orders to his Uncle in Yei.

i) Which postal orders did he buy at the least commission?

ii) What was the total amount paid to the post office?

Solution

i) Postal orders bought: £s3,000; £s600; £s300

ii) Total amount payable to the post office = value of orders + commission

For

£s3,000 commission charged	150
£s 600 commission charged	90
£s 300 commission charged	45
	£s285

∴ Total amount payable to the post office
=£s3,900 + £s285 = £s4,185

Exercise 25b

1. John sent £s10,050 to his wife.
   i) What postal orders did he buy of the least commission
   ii) Calculate the total commission charged.
   iii) How much money did John spend altogether

2. Fill in the blank spaces in the following table.

Value Of Postal Order £s	Denominations Bought £s	Total Commission Charged £s
i) 2,850	2,400; 300; 150	
ii) 8,550	6,000; 2,400; 150	
iii) 1,050	600; 450	
iv) 750	600; 150	
v) 12,000	6,000; 6,000	

3. From the following amounts which one can we buy exact postal orders?
   £s900 £s1,600 £s1,750 £s455 £s10,050 £s165

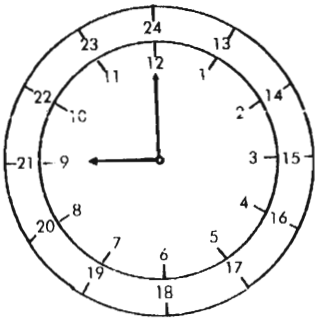
4. What is the least chargeable commission for the following amounts:
   (i) £s750 (ii) £s1,350 (iii)£s6,750 (iv) £s2,700

5. Which denominations can you buy for the following amounts in order to pay the lowest commission?
   (i)£s7,800 (ii) £s900 (iii) £s4,950

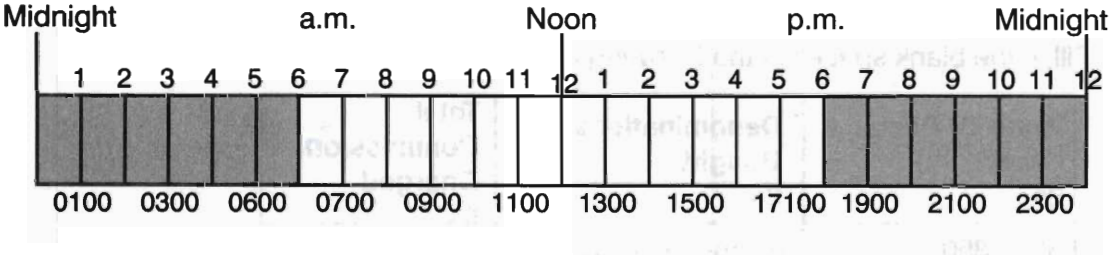
   (iv) £s10,200 (v) £s2,750

2.7 (a) Telling Time

24 Hour clock face



24 Hour chart



Exercise 26

1. What would be the time in the 12 hours system?
   (i) 6 hours after midnight
   (ii) 3 hours after midday
   (iii) 12 hours from noon
   (iv) 4 hours after midnight
   (v) 10 hrs after noon

2. How many hours are there from midnight to:

   (i) 7am (ii) midday (iii) 11pm (iv) 5pm (v) 2am

Example 3

Write the following times in the 24 hour clock system.

(i) 2 hours after midnight = 0200 hours
(ii) 3 hours 15 minutes after noon = 1515hours
(iii) 13 hours 5 minutes after midnight = 1305 hours

NOTE: In the 24hr clock system we use 4 digit numbers

3. Write the following times in 24 hour clock system:

   (i) 1 hour 30 minutes after midnight.
   (ii) 11 hours after midday
   (iii) 4 hours after midday
   (iv) 5 hours 45 minutes after midnight
   (v) 15 minutes after noon.

2.7 (c) Converting the 12 hour clock system into the 24 hour clock system

Example 2

1.	3.00 am	0300 h	three hours
2.	11.00 am	1100 h	eleven hours
3.	4.00 pm	1600 h	sixteen hours
4.	7.15 am	0715 h	seven fifteen hours
5.	5.00 pm	1700 h	seventeen hours

NOTE: To convert p.m. time to th 24 hour clock system we add 12 to the given p.m.
e.g. 4 p.m. = 4 +12 = 1600 h

4. Convert the following 12 hour clock time (a.m./p.m.) into 24 hour clock time.

(i)6 a.m. (ii) 6 p.m. iii) 11 a.m (iv) 11 p.m.

(v) 2 a.m. (vi) 2 p.m. (vii) 1.30 a.m (viii) 1.30 p.m.

(ix) midday (x) midnight

Converting 24 hour time into 12 hour time (a.m./p.m.)

Example

24 hr time system	12 hr time system	Read as
i) 0200h	2 a.m.	Two in the morning
ii) 0200h	1.15 p.m.	Quarter past one in the afternoon
iii) 0400h	4 a.m.	Four in the morning
iv) 1600h	4 p.m.	Four in the afternoon

5. Convert the following 24 hour system time into 12 hour system times (a.m./p.m.)

(i) 0500h (ii) 2100h iii) 1000h (iv) 0100h

(v) 0730h (vi) 1815h (vii) 0830h (viii) 1515h

(ix) 2400h (x) 1200h

2.7 (d) Reading Air, train and bus timetables

Example

A bus travelling from Kapoeta to Torit took 4 hours and 50 minutes. If it reached Torit at 1800h what time did the bus start its journey?

(i) in the 24 hour clock system

(ii) in the 12 hour clock system

Solution

Time of arrival (1800h) = 6.00 p.m.
Time taken to travel = 4.50 hours/minutes

(i) Time of Departure = 1.10 p.m.
In the 24 hour clock system 1.10p.m+ 12.00p.m = 1310h

(ii) Time of departure in 12 hour clock system = 1.10 p.m

Exercise 27a

1. An aircraft from Tarit to Juba takes 1 hour 20 minutes. If it arrives in Juba airport at 1900h, what was its time of departure from Torit?
   (i) in the 24 hour clock system?
   (ii) in the 12 hour clock system (a.m./p.m.)?

2. In Bor county, the examination for Primary Six ended at 1645h. If the exam took 2 hours 15 min, what time did it start?
   (i) in the 24 hour clock system?
   (ii) in the 12 hour clock system?

3. Complete the following travelling timetable for some buses in South Sudan from one town to another:

Towns	Departure	Time taken	Arrival
a) Maridi to Bar	0500 hr	4 hrs 30 min	_____
b) Torit to Kapoeta	_____	6 hrs 15 min	12 hrs
c) Tonj to Rumbek	0700 hr	_____	1300 hrs

Example

A bus traveling from Yei to Logo took 3 hours 15 minutes. If the time of departure was 1030 hrs, what time did it reach Logo?

Solution

Departure (1030hrs) = 10:30 a.m

Time taken traveling = 3.15 hours/minutes

Arrival time = 13:45

I. Arrival time in 24 hour clock system = 1345 hrs

ii. Arrival time in 12 hours system = 1345 - 1200 = 1.45 p.m.

Exercise 27b

1. A truck traveling from Tonj to Juba took 8 hours and 40 minutes. If its departure time from Tonj was 1030 hrs. What time did it reach Juba?

   i. In the 24 hour system clock?
   ii. In the 12 hour system clock?

2. A plane from Yirol to Rumbek started at 0630 hrs. If it took 1 hr 45 minutes to arrive at Rumbek. What time did it arrive in:

   i. The 24 hour system clock?
   ii. The 12 hour system clock?

3. Deng traveled from Wau to Gogrial by bus. The bus started its journey at 1145 hours. If the bus took 3 hours and 10 minutes. What time did it arrive at Gogrial?

   i. In 24 hour system clock?
   ii. In 12 hour system clock?

4. A football match between two teams in Torit County started at 2.00 p.m. and took 1½ hours. What time did the match end?

   Give your answer in 24 hour clock system.

Exercise 27c

1. A bus from Rumbek to Yirol took 6 hours for the trip. If it left Rumbek at 0800 hours, what time did it arrive in Yirol?

   i. 24 hour clock system?
   ii. 12 hour clock system?

2. A plane arrived at the Tambura air strip at 1500 hrs. It took 45 minutes from Yambio to Tambura. What time did it depart from Yambi?

   i. 24 hour clock system?
   ii. 12 hour clock system?

3. Kenyi on his way to the Khartoum arrived at Juba airport 2 hours before departure. If the departure time was 0900 hours, what time did he arrive at the airport?

   i. 24 hour clock system?
   ii. 12 hour clock system?

4. The tirnetable below shows departure and arrival times of a bus traveling from Tonj to Yirol.

Tonj		**Aguka**		**Rumbek**		**Palon**		**Akot**		**Yirol**	
Arr	Dept	arr	Dept	Arr	Dept	Arr	Dept	Arr	Dept	Arr	Dept
	0730	0845	0900	1000	1030	1200	1300	1415	1430	1600	

   i) What time did the bus leave Tonj?
   ii) What time did the bus arrive at Rumbek?
   iii) What was the time of departure from Palon?
   iv) At what time did it arrive at Yirol?
   v) How long did the bus take from Rumbek to Akot?
   vi) For how long did the bus stop at Aguka?

5. Following is a timetable for an aeroplane flying from Juba through several towns to Tambura.

STATION		TIME
Juba	Departure	1000h
Yei	Arrival Departure	1100 h 1215 h
Maridi	Arrival Departure	1345 h 1430 h
Yambio	Arrival Departure	1545 h 1715 h
Tambura	Arrival	1845 h

Use the timetable above to answer the following questions in a.m./p.m. hour clock system.

i) What was the time of departure from Yei?
ii) What time did the plane arrive at Yambio?
iii) How long did the plane stop at Yambio?
iv) How long did the plane stop at Yei?
v) How long did the whole journey take from Juba to Tambura (including the resting time)?
vi) At what station did the plane have the longest stopover?

Exercise 27d

1. Kenyi leaves home at 6.15 a.m. to go to school. If he takes 2 hours 45 minutes to walk to school, what time does he arrive?

2. The school assembly starts at 8.05 a.m and ends at 8.15 a.m. How long is the school assembly?

3. A group of soldiers started their training exercises at 11 a.m and finished at 5.30 p.m. How long were the exercises?

4. In a certain county, school lasts from 8.15 a.m to 5.00 p.m. How long do the children stay in school?

5. Aya worked in her garden for 5 hours and 30 minutes. If she started working at 0900 h, what time in 24 hour clock system did she stop?

2.8 (a) Speed

Example 1

From Buga's home to school is 24 kilometers. If Bugo takes 4 hours to walk to school, what is his average speed?

Solution

$$\text{Speed} = \frac{\text{Distance covered}}{\text{Time taken}}$$

Distance covered = 24 km,
Time taken = 4 hrs

$$= \frac{24}{4} = 6\text{km/h}$$

Example 2

A cyclist covered a distance of 20 kilometers in half an hour. What was his average speed in kilometres per hour?

Solution

Distance = 20 km, time = 30min

$$= 20 \div \frac{\cancel{30}}{\cancel{60}} = 20 \times \frac{\cancel{60}^{2}}{\cancel{30}_{1}} = 40\text{km/h}$$

Example 3

Lado left home at 8.30 a.m and walked to his uncle's house 36 kilometers away. If he arrived at 11.30 a.m what was his average speed?

Solution

$$\text{Speed} = \frac{\text{Distance covered}}{\text{Time taken}}$$

Distance covered = 36 km
Time taken = (11.30 - 8.30) = 3hrs

$$\therefore \text{Average speed} = \frac{36}{3} = 12\text{km/h}$$

Exercise 28a

1. A lorry travelled 540 kilometres in 9 hours. Calculate its average speed.

2. Majok started his journey at 7.30 a.m. He arrived at the air strip at 10.30 a.m. If he covered a distance of 21 kilometres. What was his average speed?

3. An athlete covered a distance of 400 metres in 20 seconds. Calculate his average speed in metres per second (m/sec).

4. Bringi left his home at 6.30a.m to walk to school 32 kilometres away. If it took him 4 hours to reach school:
   i) What time did he arrive at school?
   ii) Calculate his average speed.

5. A bus left Maridi at 9.00 a.m and reached Yambio at 3.00 p.m. If it covered a distance of 180 kilometres.
   i) How long did the bus take from Maridi to Yambio?
   ii) What was its average speed in kilometres per hour?

Example 1

From Juma's home to school is 28 kilometres. If he walks at an average speed of 7 km/h, how long does he take to reach school?

Solution

$$\text{Speed} = \frac{\text{Distance covered}}{\text{Time taken}}$$

Distance = 28km; speed = 7km/h

$$\therefore \text{Time} = \frac{\cancel{28}^{4}}{\cancel{7}_{1}} = 4\text{hrs}$$

Example 2

In an 800 metres race, Makano finished at a speed of 100m/ min. How long didit take Makano to finish the race?

Solution

$$\text{Time} = \frac{\text{Distance covered}}{\text{Time taken}}$$

Distance = 800m Speed = 100m/min

$$\therefore \text{Tirne} = \frac{800}{100} = 8\text{min}$$

Exercise 28b

1. A bus travelled a distance of 320 kilometres at an average speed of 80 km/h. How long did the bus take to cover the whole journey?

2. Kadanya walked for 36 kilometres at a speed of 8 km/h. He rested for 45 minutes then he walked for another 20 kilometres at 8 km/h.

   a) Find the time taken;
      (i) for the first part of the journey;
      (Ii) for the second part of the journey.

   b) What was his average speed for the whole journey?

3. A man cycled at a speed of 5m/min. If he covered a distance of 1200 metres how long did he take?

4. A lorry travelling at a speed of 70km/h covered 420km. Calculate the time taken to cover this distance.

5. John Riaka travelled a distance of 560 kilometres at an average speed of 40 km/h. How long did the journey take him?

Distance = Time x Speed

Example 1

Bringi walked for 6 hours at an average speed of 8km/h. What distance did he cover?

Solution:

Time = 6 hours Speed = 8 km/h
Distance = 6 x 8 =48km

Exercise 28c

1. A bus travelling from town A started at 8.30 a.m and reached town B at 11.30 a.m. It was travelling at a speed of 60km/h. Calculate the distance between A and B.

2. A lorry travelling at an average speed of 50 km/h took 3½ hours to complete its journey. How long was the journey?

3. Ako left her home at 6.30 a.m to go to school. She arrived at 8.00 a.m. She walked at an average speed of 4km/h. Calculate the distance between her home and school.

4. In a certain race a man ran at an average speed of 8m/sec. If it took him 16 sec to finish the race, what distance did he cover?

5. A bus started its journey at 0945h from station A and arrived at station B at 1530 h. If it travelled at an average speed of 60 km/h, how far is station A from station B.

2.8 (b) (i) Converting m/s into km/h

Example 1

Express 20m/s as km/h.

Solution

1000m = 1km
3600s = 1hr

In 1 sec distance covered = 20m

In 3600 sec distance covered = 3600 x 20m

in km/h $= \frac{3600 \times 20}{1000} = 72$ km/h

Example 2

An athlete ran at a speed of 9m/s. Calculate his speed in km/h.

Solution

In 1 sec the athlete covered 9m.

In 3600 sec = 3600 x 9m

in km/h $= \frac{3600 \times 9}{1000} = 32\frac{2}{3}$ km/h or 32.4 km/h

2.8 (b) (ii) Converting km/h into m/s

Example 1

Express 60 km/h in m/s.

Solution

1km = 1000m 60km = 60,000m
1h = 60 min = (60 x60)s = 360s

The speed of 60km/h $= \frac{60km}{1h}$

$= \frac{60,000m}{3600s} = 16\frac{2}{3}$ m/s

Example 2

A man walked at an average speed of 8km/h. Find his speed in m/s.

Solution

1km = 1000m 8km = 8 x 1000 = 8000mm
1h = 60 min = (60 x60)s = 3600s

The average speed 8km/h $= \frac{8km}{1h}$

$= \frac{\overset{20}{\cancel{8,000}}m}{\underset{9}{\cancel{3600}}s} = 2\frac{2}{9}$ m/s

Exercise 29

1. Convert the following speeds in metres per second (m/s) into kilometres per hour.
   i) 4 m/s ii) 30m/s iii) 2.7m/s (Answer to nearest 10)
   iv) 50m/s v)18m/s vi) 12m/s

2. An aeroplane flew at an average speed of 240m/s. Express this speed in kilometres per hour (km/h).

3. A lorry covered a distance of 800m in 40sec. What was his speed in:
   i) metres per second? ii) Express this speed in km/h.

4. Express the following speeds in kilometres per hour into metres per second.
   i) 20km/h ii) 120km/h iii) 36km/h iv)90 km/h

5. A bus was travelling at a speed of 7km/h. What is this speed in metres per second?

6. Deng cycled to his school 36km/h away from home. If he took 4 hours to reach school, what was his speed in:
   i) km/h ii) m/s

7. Fill in the blank spaces in the table below

Speed	Time	Distance
i) 60km/h	5 hours	____
ii) ____	4 hours	120km
iii) 5m/s	____	3000m
iv) ____	8 min	180m
v) 3km/h	4hrs	____

8. In the table below fill in the spaces.

k/hr	m/s
i) ____	50m/s
ii) 72km/h	____ m/s
iii) ____	30m/s
iv) 108km/h	____ m/s

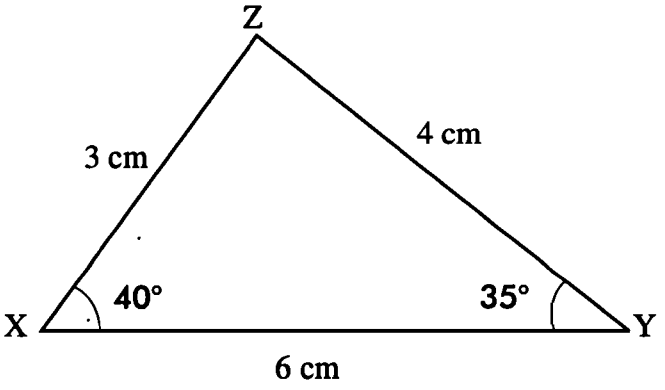
UNIT 3 Geometry

Triangles

A three (3) sided figure is called a triangle.

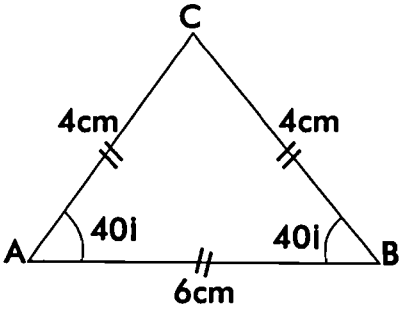
Types of Triangles

a) Scalene Triangles
Draw a triangle XYZ in which XY = 6 cm angle xyz = 35°, YZ = 4 cm, angle YXZ = 40°



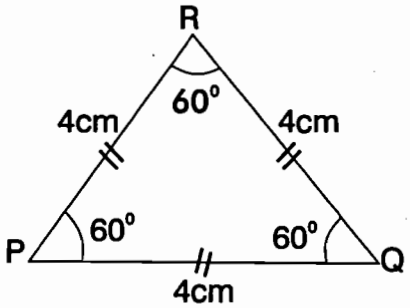
Scalene triangle has all the sides are of different lengths. All the angles are different (angles not equal).

b) Isosceles Triangle
Draw a triangle ABC, in which AB = 6 cm, angle BAC = 40°, ABC = 40°, AC = 4 cm and BC = 4 cm.



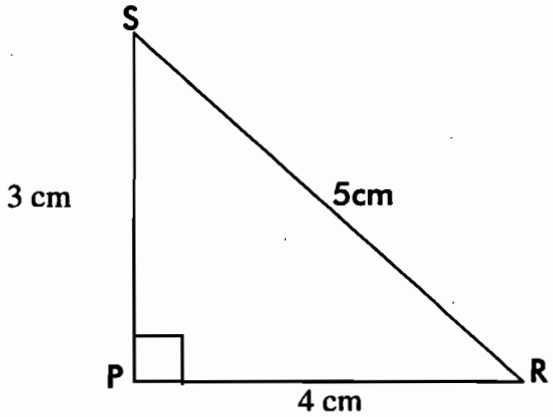
This type of a triangle is called an Isosceles triangle. It has the following properties:
Two of its sides are equal.
Two of its base angles are equal.

c) Equilateral Triangle
Draw a triangle PQR, in which PQ = PR = 4 cm and angle PQR = QPR =PRQ = 60°.



This type of triangle is called an equilateral triangle. It has the following properties:
All sides are equal
All angles are equal to 60°

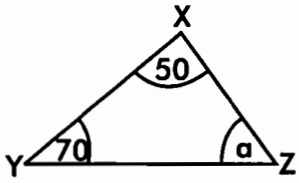
d) Draw a triangle PRS in which PR = 4 cm, angle RPS = 90° and PS = 3 cm, as shown.



This type of triangle is called a right angle triangle. One of its angles is a right angle (90°).

Example 1

The total sum of all angles in a triangle is 180°.
Find the value of a

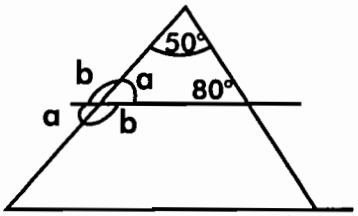


a + 70° + 50° = 180°
a + 120° = 180°
a +120° - 120° = 180° - 120°
<u>a = 60°</u>

The total sum of supplementary angles = 180°
Find the value of b

b + 70° = 180°
b + 70° - 70 = 180° - 70°
<u>b = 110°</u>

Vertically opposite angles are equal
Angle a = a
b = b

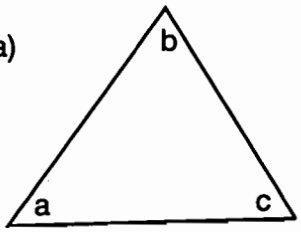


a + 130° - 130° = 180° - 130°
<u>a = 50°</u>

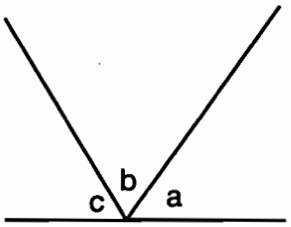
a + b = 180°
b + 50° - 50° = 180° - 50°
b = 130°

3.1 (c) Sum of the angles in a triangle

(a)

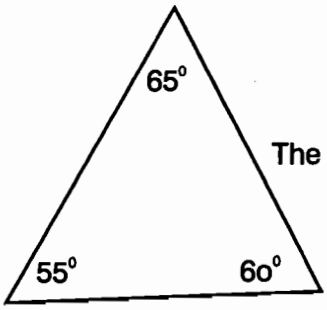


(c)



Copy figure (a) onto a piece of paper. Cut angles a, b, and c and arrange them as shown in figure (b) above.

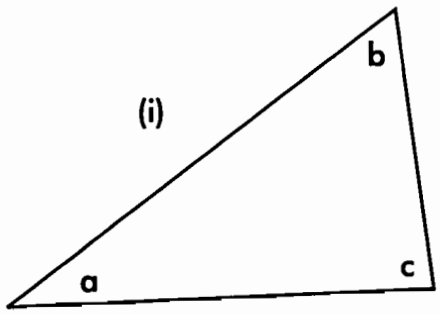
Measure angles a, b, and c. What do you find?

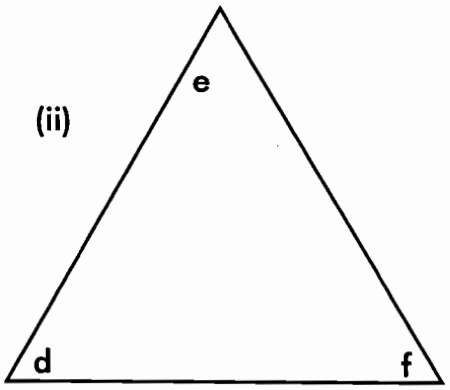


The sum of the angles in a triangle is 180°

Exercise 1

1. Measure all the angles in the two triangles below and find the sum of the angles in each triangle.





2. The table below shows the sizes of the angles of different triangles A,B,C,D, and E. calculate the sizes of the angles marked q, r, s, t, and y.

Triangle	1st Angle	2nd Angle	3rd Angle
A	105^0	105^0	q^0
B	90^0	90^0	45^0
C	s^0	s^0	60^0
D	60^0	60^0	60^0
E	40^0	40^0	y^0

Exercise 2

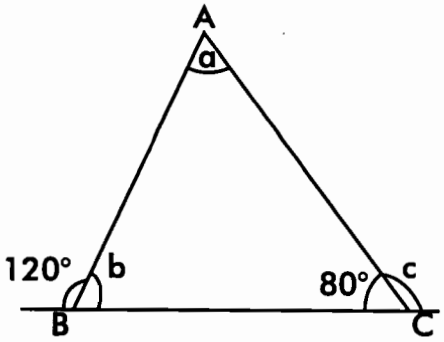
1. Use a protractor to draw the following angles:

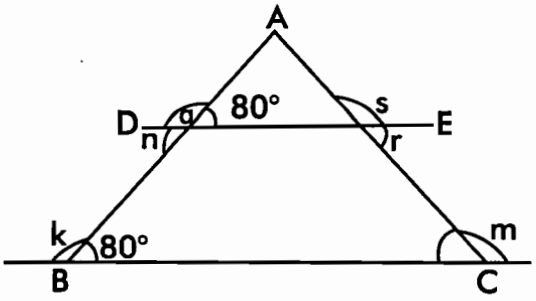
a) 30° b) 45° c) 75° d) 90°

e) 120° f) 127° g) 60° h) 15°

i) 105° j) 127° k) 140° l) 115°

2. Find (i) a (ii) b (iii) c





3. Find the measure of all the angles marked with letters

k = q = s = m = r = n =

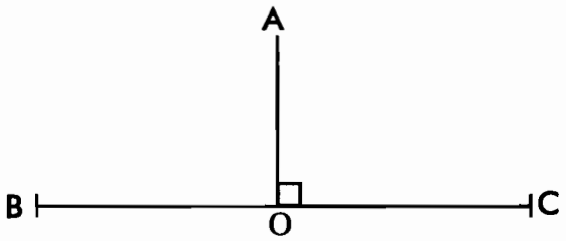
3.2 (a) Drawing a right angle

1. Construction of a right angle using a protractor and a ruler.
   a) Draw a line BC

   b) Mark point O on line BC. Place the centre of the protractor at the point O in such a way that the zero degree mark lies on OC

   c) Mark point A against the 90° mark

Rernove the protractor and join points A and O. Angle AOC is a right angle.



i) Using the inner scale, read from zero along line BC to line AB. The number of degrees the angle ABC has made with the line BC is 50°.

Exercise 3

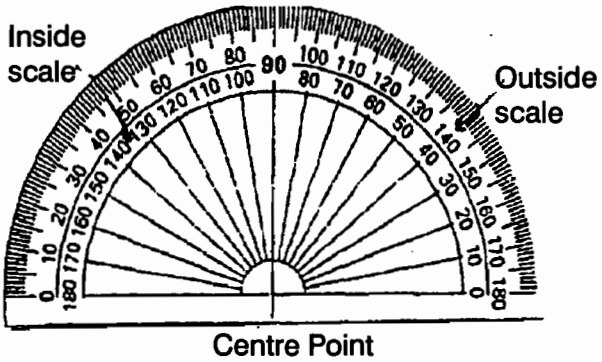
a) Draw a right angled triangle ABC. Use a protractor and a ruler angle ABC = 90°, BC = 4cm and AB = 3 cm.

b) Draw a right angled triangle DEF in which DE 8cm,EF = 6cm and angle DEF = 90°

c) Draw the following right angled triangles:
   i. Triangle XYZ, where XY = 7cm = YZ = 4 cm and angle XYZ = 90°
   ii. Triangle ABC where angle CAB is a right angle CA = 6cm and AB = 6cm
   iii. Triangle PQR in which PQ = 5cm, QR = 3 cm and PQR = 90°
   iv. Triangle CDE in which CD = 3.5 cm, DE = 4.5cm angle CDE = 90°

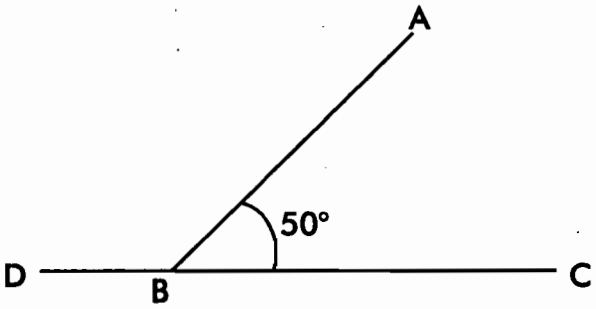
3.2 (c) Measuring Angles

A protractor is a geometrical instrument used for measuring angles in degrees. It has an inner scale marked and read counter clockwise and an outer scale marked and read clockwise. Each scale is marked from 0° to 180°. When measuring an angle, we use the scale which has the point 0° on one of the lines forming the angle. To measure the angle, we always start reading from 0° up to the scale mark where the line transects the protractor.



Measuring angles using a protractor

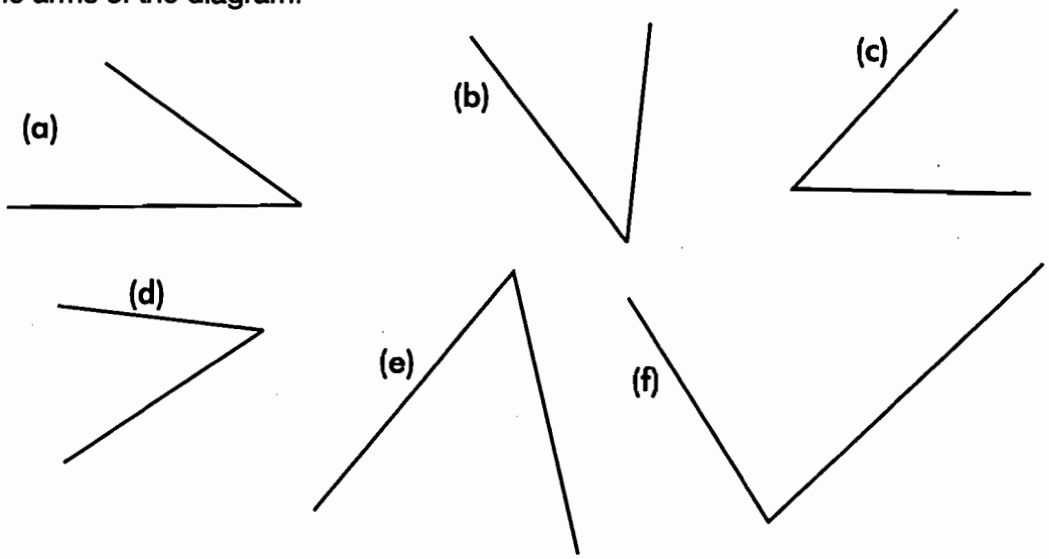
To measure angle ABC, place the protractor on line DC with its zero point at the point where the line AB meets the line DC meet at B.



i) Using the inner scale, read from zero along line BC to line AB. The number of degrees the angle ABC has made with the line BC is 50°.

1. Draw angles of different sizes on the chalkboard. The learners copy and measure the angles to the nearest degree.

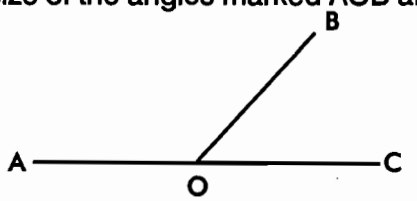
2. Use a protractor to measure the size of the following angles. Remember to place the centre of the protractor at the joining point and the straight edge along one of the arms of the diagram.



3. Use a protractor to draw the following angles:

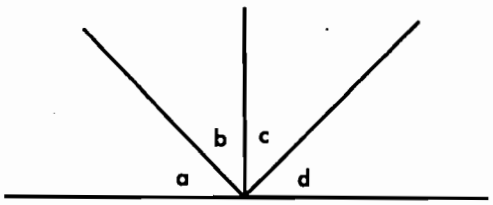
(a) 30°	(b) 45°	(c) 75°	(d) 90°
(e) 120°	(f) 127°	(g) 60°	(h) 15°
(i) 105°	(j) 127°	(k) 140°	(l) 115°

4. Find the size of the angles marked AOB and BOC.



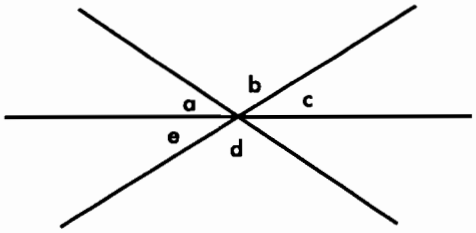
5. (i) Find the sizes of the angles marked a, b, c and d.

   (ii) Find a + b + c + d.



6. (i) find the measure of the angles marked a, b, c, d and e.

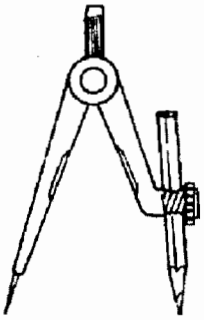
(ii) find a + b + c + d + e



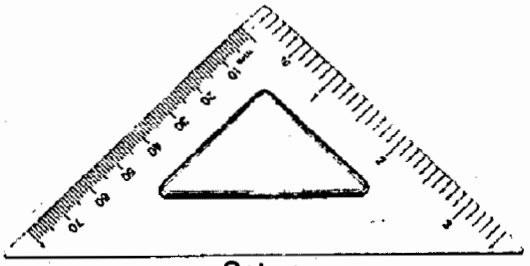
3.2 (d) Construction of geometrical shapes

You should already know how to do the following constructions using a ruler and a pair of compasses only. When constructing, be sure to show all your construction lines and curves or cuttings. Make certain that these lines are not so faint as to be almost invisible.

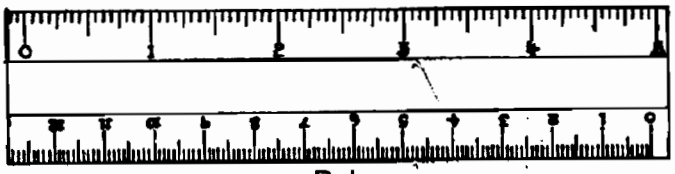
The following geometrical instruments are used in drawing figures. Study them carefully.



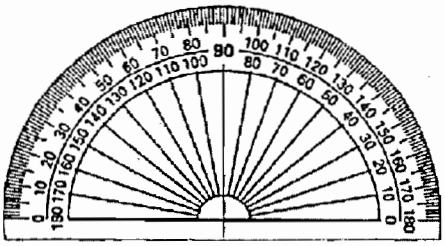
A pair of compasses



Set square



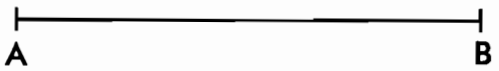
Ruler



Protractor

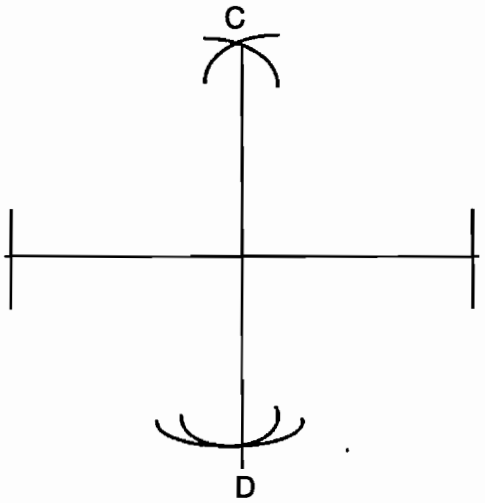
Name of instrument	Used for
A pair of compasses	Draw circles, arcs and make patterns
A 45° set square	Draw angle of 45° and 90°
A protractor	Draw and measure angles
A ruler	Draw and measure lines

1. How to bisect a given straight line AB.



Step 1
Put your pair of compasses at point A and open it to a radius of more than half the line AB. Swing your compasses in order to make arcs above and below line AB.

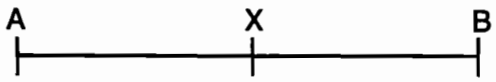
Step 2



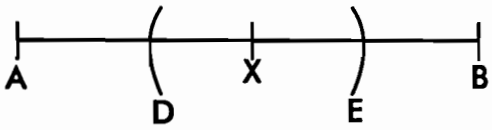
Lift the pair of compasses. Do the same from point B, using the same radius. Name the point of intersection of the arcs above the line AB as C and that below a D. Join the points C and D. The line CD bisects the line AB.

2. How to construct a perpendicular line from a given point on a line.

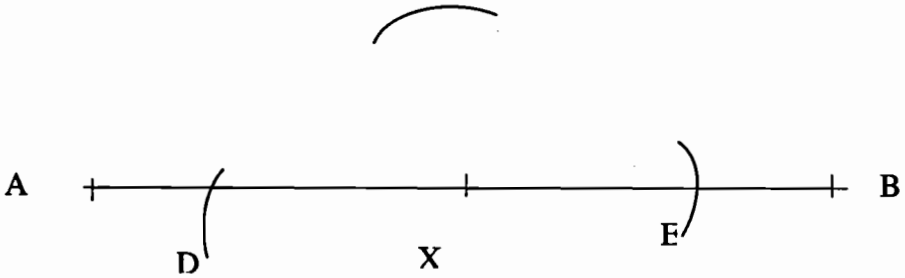
Given a line AB with a point X on it



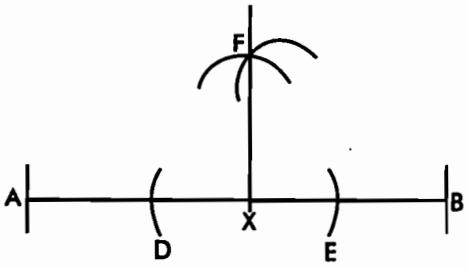
Step 1
Put your compass at X. Open it to a reasonable radius less than AX and keep it fixed. Mark two arcs on either side of the point (call them E and D.



Step 2
With E as centre open your compass to a reasonable radius and mark an arc above AB.



Step 3
With the radius D as centre draw arc to cut the arc you made in step II. Call the point where they intersect, F. Join the points X and F.



Measure angles AXF. What do you find?

We will find that the angles AXF and BXF are right angles. The line FX is a perpendicular line.

Exercise 5

1. Bisect the following lines using a ruler and a pair of compasses.

i) A B

(ii) Z Y

(iii) Q M

2. Construct perpendicular lines from the given lines below.

(i) X

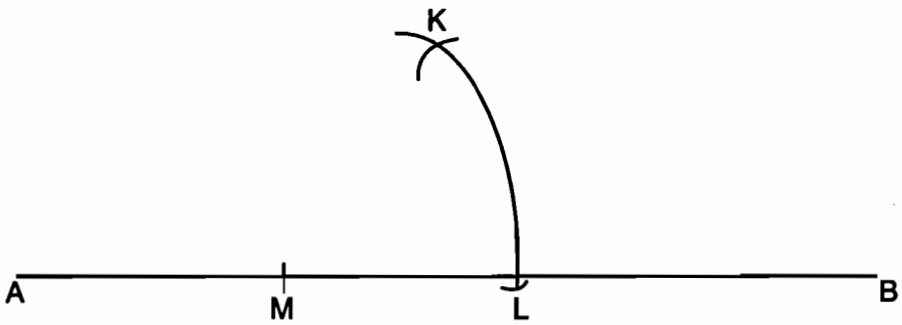
(ii) R

3.2 (e) Constructing an angle of 60°

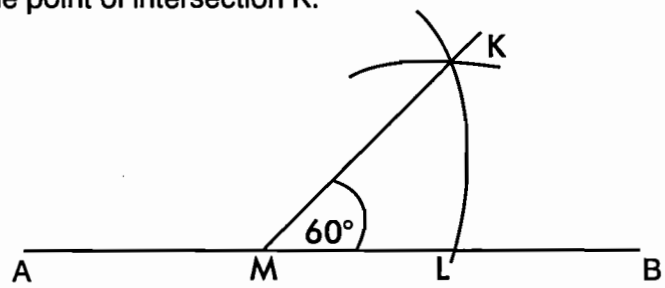
1. Draw a line AB. Mark point M between A and B

(i) A M B

2. From point M, and at any radius, make an arc to intersect the line AMB at L.



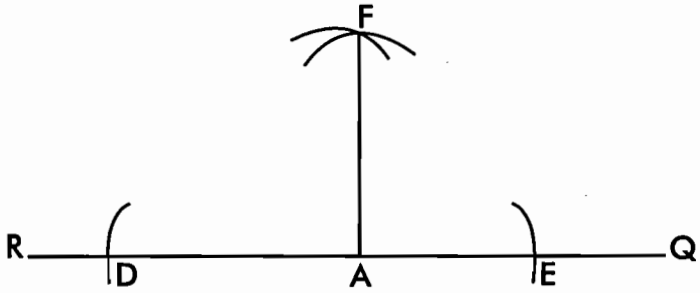
3. With the same radius and at point L mark another arc to intersect the first one. Mark the point of intersection K.



4. Join K and M. Angle KML is 60°.

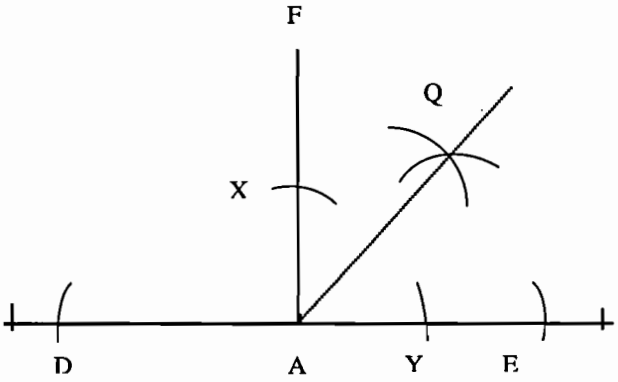
3.2 (f) Constructing an angle of 45°

1. Draw a line and mark a point A between R and Q. Construct a perpendicular line at point A.



The angle formed above is 90°

To construct an angle of 45°, follow the steps below. At point A, make two arcs, to cut the line AF at X and line AE at Y.



Put your compass point at x and make an arc. Similarly, at Y make another arc to cut the other arc and where the two arcs meet label it Q. Join AQ. The angle QAE is 45°.

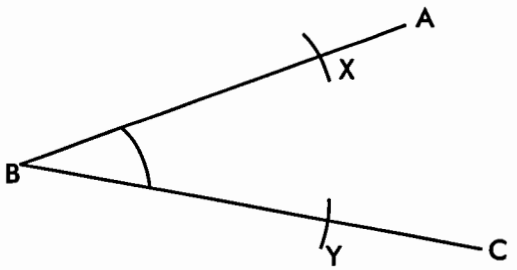
3.2 (g) Constructing the angles: 30°, 120°, 75°.

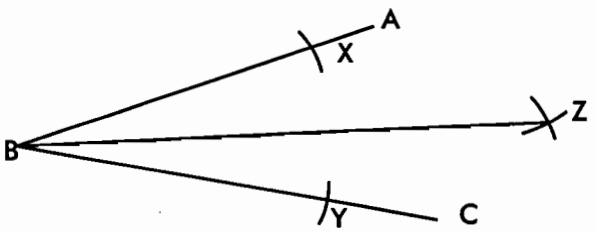
a) How to construct an angle of 30°. Construct an angle 60° then bisect it to get an angle of 30°.
b) How to construct an angle of 120°. Construct an angle of 60°. Since the sum of angles at a point on a straight line add up to 180°, the obtuse angle is 120°.
c) How to construct the angle 75°. Construct an angle of 60°. Bisect one of the angle of 60° to get 30°. Again bisect 30° to get 15°, hence 60° + 15° = 75°.

3.2 (h) Measuring and bisecting angles

With a pair of compasses, at point B and using a reasonable radius, mark an arc on the line AB at X, and the line BC at Y.
At X and with a reasonable radius, draw an arc between A and C, then again at Y, with the same radius. Draw another arc cutting the first one at Z. Join BZ with a straight line.

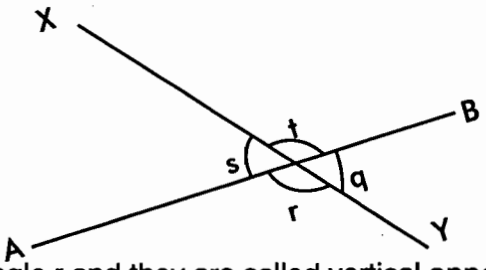
Measure angles ABZ and CBZ. They are equal. Therefore BZ bisects the angle ABC.





3.2 (i) Identifying Vertical, Opposite and Supplementary angles

Vertically opposite angles



Angle t is opposite to angle r and they are called vertical opposite angles. Vertical opposite angles are equal.
Therefore angle t = angle r.

If t = 120° then angle r = 120°.

Can you find angle s and t?

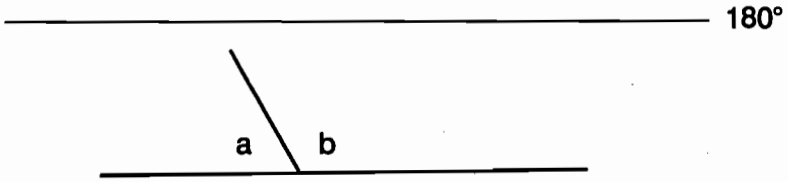
Angle t and angle s are supplementary angles. Supplementary angles add up to 180°.

Therefore:
s + t = 180°
s + 120° = 180°
s + 120° 120° = 180° - 120°
S = 60°

Find angle q.

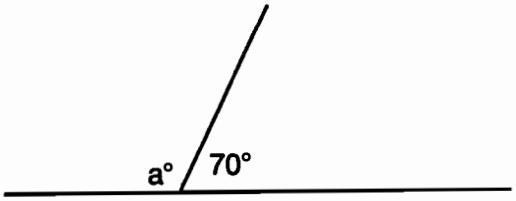
Supplementary angles

The total sum of angles in a straight line is 180°.



What is the total sum of the two supplementary angles above?

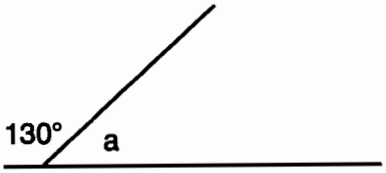
Find a
a° + 70° = 180°
a° + 70° = 180° - 70°
a = 110°



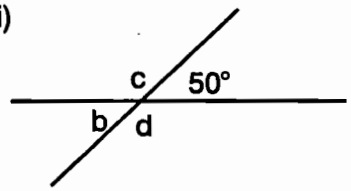
Exercise 5

Find the measure of the angle marked by letter in the diagram below.

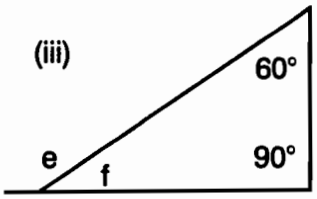
(i)



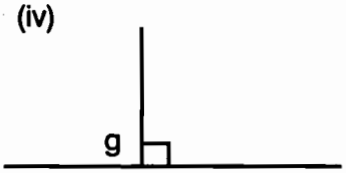
(ii)



(iii)

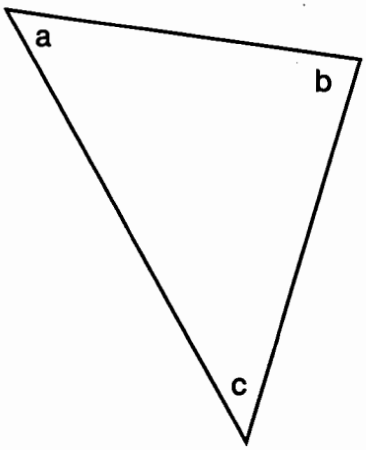


(iv)

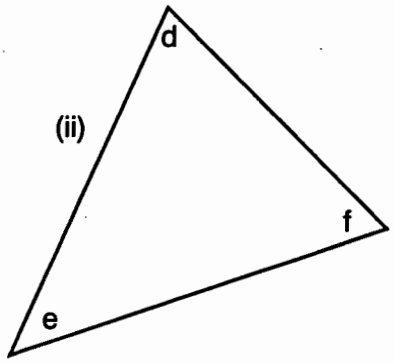


2. Measure the angles in the triangles and then find their sum

(i)

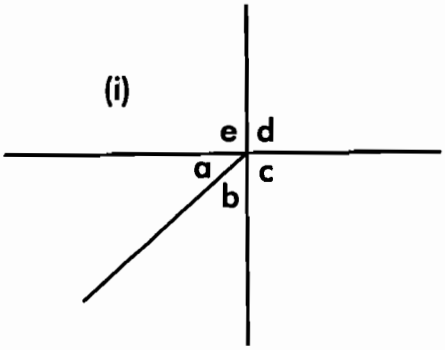


(ii)

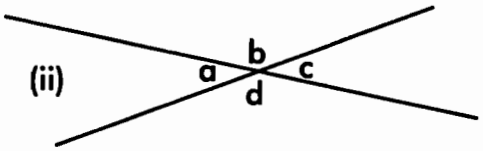


3. Find the measurement of the following angles

(i)



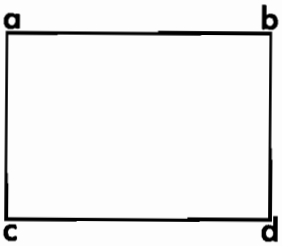
(ii)



3.2 (j) Construction of rectangles, squares and parallelograms

a) Rectangles

- Opposite sides are equal
- All angles are right angles
- Opposite sides are parallel

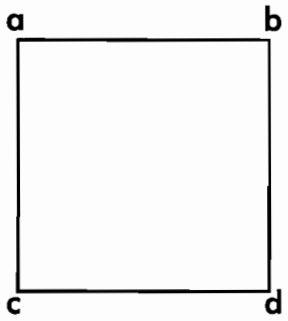


Draw a rectangle ABCD. Use your protractor to measure the angles named a, b, c, d. what is the sum of the angles?

The sum of the angles of a rectangle is .....

b) Squares

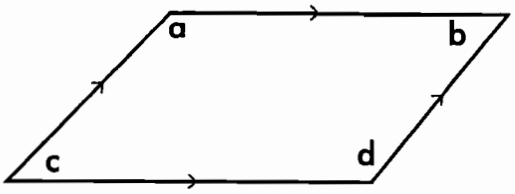
- All sides are equal
- All angles are right angles
- Opposite sides are parallel



Draw a square ABCD. Measure the angle as you did for the rectangle. What do you find?

c) Parallelograms

- Opposite sides are equal
- Opposite sides are parallel
- Opposite angles are equal



Draw a parallelogram ABCD. Use a protractor to measure angles, a, b, c and d. What is the sum of these angles?

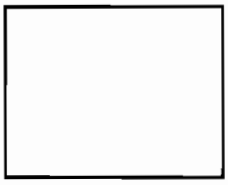
The angle sum of a parallelogram is .....

Exercise 7

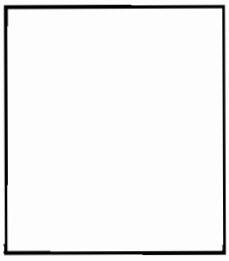
1. Which of the diagrams given below are rectangles, squares or parallelograms?

a)

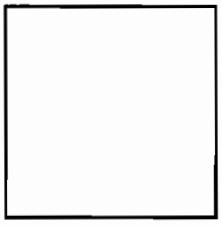
b)



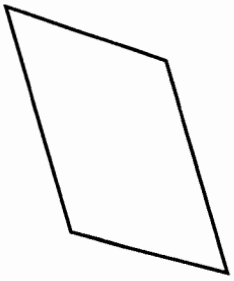
c)



d)

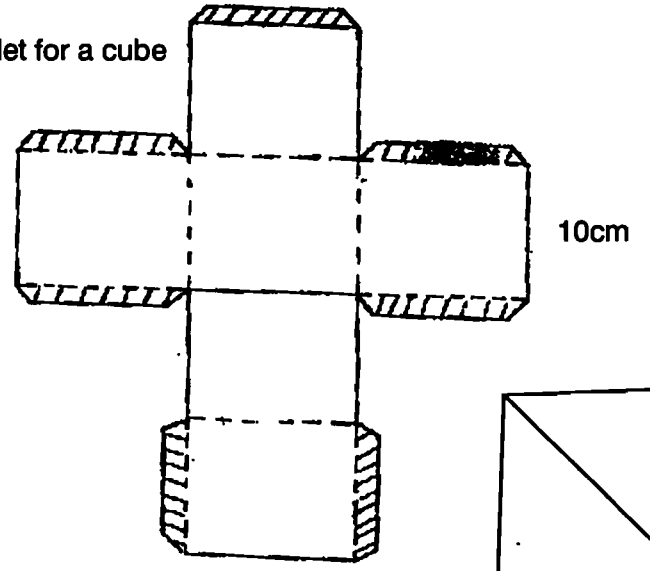


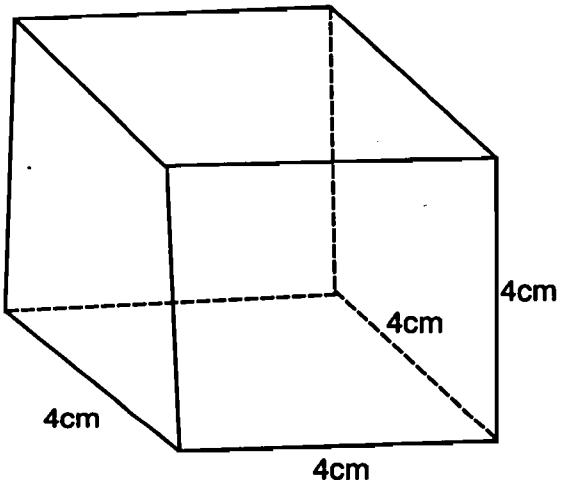
e)



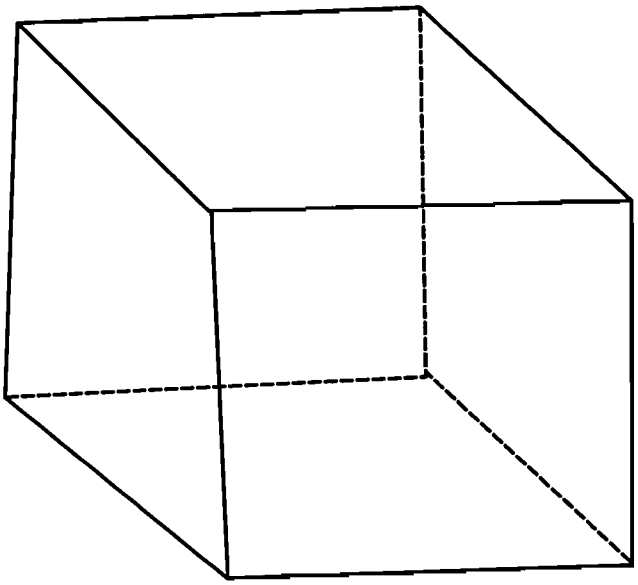
3.2 (k) Making Cubes and Cuboids

Net for a cube





Draw a cuboid as shown below.



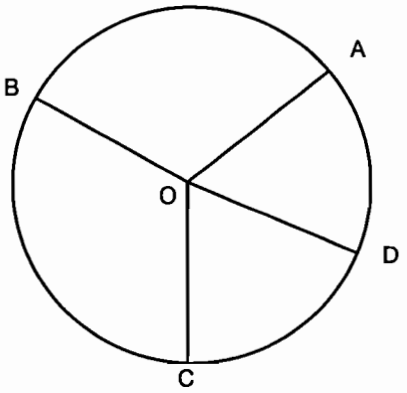
Count the number of;

a) faces b) edges c) corners

3.2 (i) Sum of the Angles within a Circle

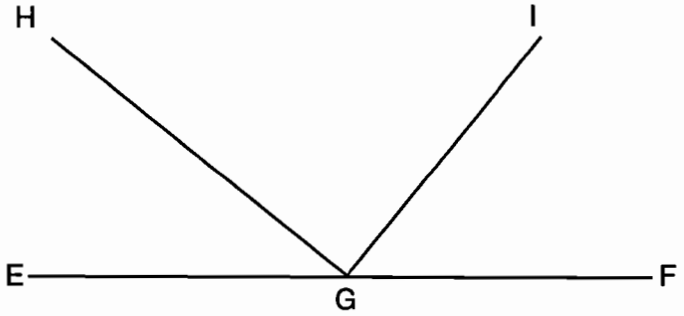
Draw a Circle with centre 0 as shown below. Mark points A,B,C,D.
BOC +COD + DOA + AOB =360°.

(i)



Therefore the sum of angles at a point adds up to 360°.

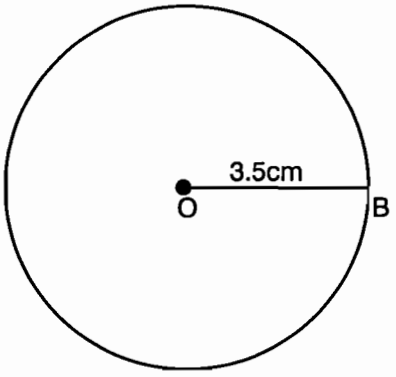
(ii)



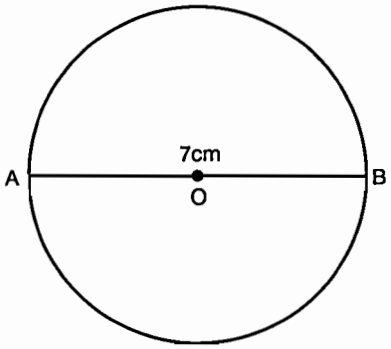
In figure ii) angle EGH + angle HGI + angle IGF = 180°.

3.2 (m) Drawing and Construction of a circle using a given radius and a pair of compasses indicating centre and diameter

Using a pencil, ruler and a pair of compasses, draw a circle of radius 3.5 cm.



The line OB is called radius.



The line AOB is called the diameter. The diameter divides a circle into two equal parts.

Exercise

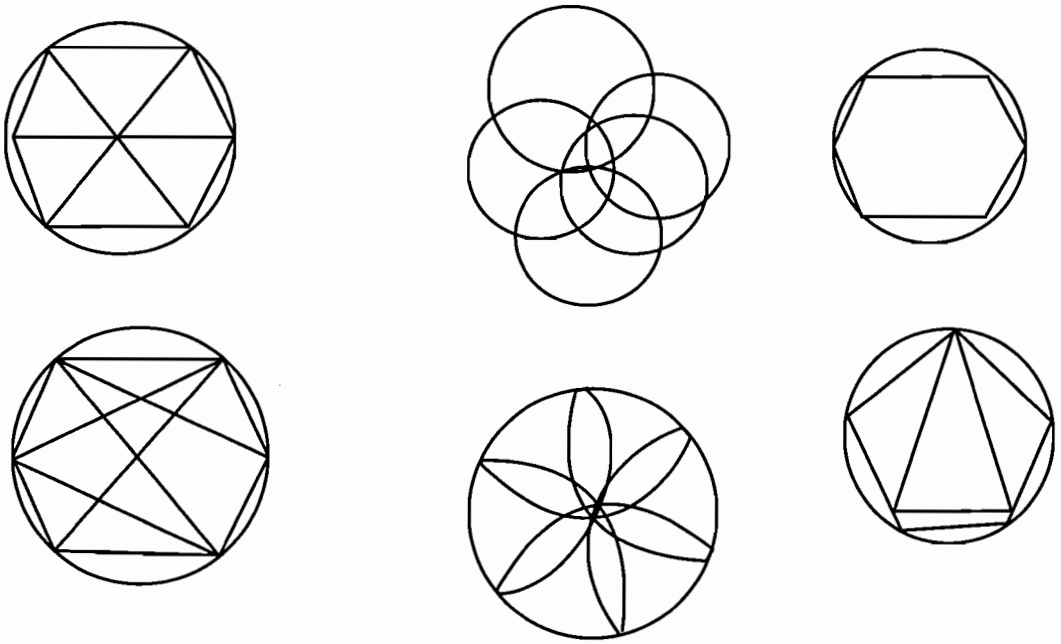
Using rulers, pencils and a pair of compasses draw circles of:

a) Radii i) 4.5 cm ii) 2.5 cm

b) Diameters: i) 8 cm ii) 7 cm

3.2 (n) Making patterns with circles

Try using your instruments to make these patterns.



UNIT 4 Algebra

4 (a) Simplification of Algebraic Expressions

Algebraic Statements

In algebra, letters are used to represent numbers. These letters are referred to as unknown numbers. Statements in words can be written in symbols.

For example:

STATEMENTS IN WORDS	STATEMENTS IN SYMBOLS
i) A number plus nine	Let the number be x. $\therefore$ $x + 9$ or $9 + x$
ii) A number minus nine	Let the number be y. $\therefore$ $y - 9$
iii) 2 times a number	Let the number be b. $\therefore$ $2 \times b$ or $2b$
iv) A number divided by 5	Let the number be r. $\therefore$ $r \div 5$ or $\frac{r}{5}$
v) A half of a number	Let the number be t. $\therefore$ $\frac{1}{2}$ of t, or $\frac{1}{2} \times t$ or $\frac{t}{2}$

Exercise 1

Indicate which choices are correct algebraic statements. There may be more than one correct answer for each problem.

1. Seven added to a number;
   a) $7 + 7$ b) $7 + y$ c) $7y$

2. Four times a number;
   a) $4n$ b) $4 + n$ c) $4 \times n$ d) $n \times$

3. One third of a number

(a) $\frac{1}{3} + x$ (b) $\frac{1}{3} \div x$ (c) $\frac{1}{3} x$ (d) $\frac{x}{3}$

4. A number minus eleven

(a) $4 - a$ (b) $a - 11$ (c) $a + 14 \times n$ (d) $a \div 11$

5. Two times a number

(a) $4 - a$ (b) $a - 11$ (c) $2n$ (d) $n \times n$

6. A number divided by 3

(a) $\frac{3}{4}$ (b) $3 \div q$ (c) $\frac{q}{3}$ (d) $\frac{1}{3} q$

7. Twice as much as b

(a) $2 \times b$ (b) $b + 2$ (c) $b \times 2$ (d) $2b$

8. The sum of one half and a number

(a) $\frac{1}{2} x$ (b) $\frac{1}{2} + x$ (c) $x + \frac{1}{2}$ (d) $x \frac{1}{2}$

9. Divide a number by 2

(a) $n + 2$ (b) $n \div 2$ (c) $2 \div n$ (d) $\frac{n}{2}$

10. Three times as much as a number

(a) $3 - d$ (b) $3 \div d$ (c) $3 + d$ (d) $3 \times d$

11. A number decreased by nine

(a) $t - 9$ (b) $t \div 9$ (c) $9 - t$ (d) $9 + t$

12. Four fewer than a number

(a) $4 - y$ (b) $y - 4$ (c) $4 + y$ (d) $y \div 4$

13. Twenty more than a number

(a) $20 + n$ (b) $20 - n$ (c) $20n$ (d) $n \div 20$

14. Half of a number

(a) $\frac{1}{2} + r$ (b) $d - \frac{1}{r} r$ (c) $\frac{1}{2} - r$ (d) $\frac{r}{2}$

Write algebraic statements for

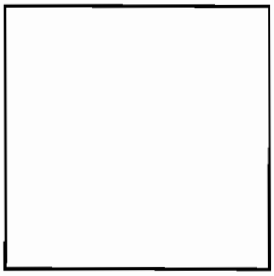
15. A number n minus eight
16. One fourth of a number x
17. Eleven added to a number k
18. Twice as much as p
19. Three subtracted from a number j
20. Four more than h
21. Half of b
22. Five lower than x
23. The product of x and 5
24. A number x multiplied by $\frac{1}{5}$
25. Six less than a number x

Write the algebraic statements in words

26. $x + 5$ 27. $W - 2$ 28. $\frac{y}{6}$ 29. $\frac{6}{y}$ 30. $4n$ 31. $2 - w$

4 (b) Collection of like terms

The length of a square is x cm. What is its perimeter in terms of x?



xcm

The perimeter of the square is $x + x + x + x = 4x$ cm

The x's here are called *like terms.* You may have heard of the proverb "Birds of the same feather flock together". In other words similar thirıgs, anirnals and people very often stay together. Therefore, in algebra, we always try to collect and put similar things together and this is called *collection of like terms.*

Examples

i) $x + x + x = 3x$ (ii) $a + a = 2a$

iii) $x + 2x + y + 3 = 3x + 4y$ iv) $a + b + a = 2a + b$

v) $t + 2t + 3t + 4t = 10t$ vi) $p + q + 2q + 3p = 4p + 3q$

vii) $5x - 2x = 3x$

Exercise 2

A. Collect like terms (or simplify)

1. $a + a$
2. $a + a + a$
3. $x + x + x + x$
4. $y + 2y$
5. $4p + 2p$
6. $7x - 5x$
7. $2p + 3p + 2q$
8. $6k + 3p + 2k$
9. $G + h + 2g + 2h$
10. $100m + 11n + 89$
11. $2u + 3v + 4w$
12. $\frac{1}{2}a + \frac{1}{2}a + a$
13. $\frac{1}{4}s + \frac{1}{4}s + \frac{1}{4}s + \frac{1}{4}s$
14. $15a + 2ab + 15a$
15. $\frac{1}{4}x + \frac{3}{4}x$
16. $\frac{1}{6}p + \frac{1}{6}p$
17. $0.25x + 0.75x$
18. $0.5y + 0.5y$
19. $\frac{1}{3}x + 4x + \frac{2}{3}$
20. $0.2p + 6p + 0.8p$

4 (c) Substitution (replacement)

Substitution means replacing a given symbol by a given value.

Examples

1. What is the value of the expression 4a if a = 2?

Solution

$4a = 4 \times 2 = 8$, so where there is **a** you put 2.

2. Find $x + 3y + z$ if $x = 2$; $y = 3$; $z = 4$

Solution

$x + 3y + z = 2 + 3 \times 3 + 4 = 2 + 9 + 4 = 15$

3. If $a = 2$; $b = \frac{2}{3}$; $c = \frac{1}{4}$; find the value of $a + 6b + 12c$

Solution

$= a + 6b + 12c$

$= a + 6 \times b + 12 \times c$

$= 2 + 6 \times \frac{2}{3} + 12 \times \frac{1}{4}$

$= 2 + 4 + 3 = 9$

Exercise 3

1. (i) If $a = 3$, find the value of $4a$

   (ii) If $x = 2$, find the value of $12x$

   (iii) If $q = 0.25$, find the value of $100q$

   (iv) If $z = \frac{1}{4}$, find the value of $16z$

2. If $x = 5$ and $y = 6$, find the values of the following

(i) $8x$	(ii) $x + 2y$	(iii) $10x + y$
(iv) $2x + 0.1y$	(v) $5x + 6y + x$	(vi) $y + 4x + 5y$
(vii) $0.5x + 0.5y$	(viii) $x + \frac{1}{2}y + \frac{1}{2}y$	(vix) $\frac{1}{2}x + \frac{1}{2}y$

3. Collect like terms and then find the values of the following

(i) $x + y + z + y$, when $x = 1$; $y = \frac{1}{5}$ and $z = \frac{3}{10}$

(ii) $x + y + z$, when $x = 0$; $y = \frac{3}{4}$ and $z = 4$

(iii) $5a - 4a + b$; when $a = 1$ and $b = 3$

(vi) $3u + 8w - 3w - 2u$; when $u = w = 2$

(v) $\frac{1}{2}a + \frac{1}{5}b - \frac{2}{3}c$; when $b = 15$ and $c = 3$; $a = 20$

(vi) $4p + 4q - 3p - 3q$; when $p = 0.5$, $q = 0.5$

(vii) $\frac{2}{3}p - \frac{1}{3}q$; if $p = q$; $q = 6$

(viii) $m + 3n + 4m - 3q$; when $p = 0.5$, $q = 0.5$

(ix) $18c - 3d + 9c$; when $c = \frac{1}{3}$ and $d = 3$

(x) $12x + 6y + y + p + q$; when $x = 1$, $y = 3$, $p = \frac{1}{2}$, $q = \frac{1}{2}$

4. Rick travelled $2p$ km when cycling and p km when walking on his way to a meeting. Find the total number of kilometers he travelled in terms of p?

5. Obure has $20y$ cows, $5z$ goats and $3x$ sheep. Kenyi has y cows, $2z$ goats and $3x$ sheep. Find the total number of animals owned by Obure and Kenyi in terms of y, z, x.

6. Deng has 30y cows. If 15y cows are taken away by cattle thieves, how many cows are left at Deng's cowshed? Express your answer in terms of y.

7. Lado sold p eggs at £2 each and h goats at £2000 each. Find (i) in terms of p and h how much money did Lado earn altogether. (Ii) if p = 50 and h = 2, work out the amount of money earned by Lado.

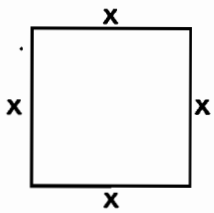
8. Mundri is p km from Juba, Maridi is y km from Mundri and Yambio is z km from Maridi. If p = 150 km, y = 80 km and z = 200 km, how far is Yambio from Juba?

9. A basket of fruit contains 30a mangoes, 20b bananas and 10c oranges. If 3a mangoes, 2b bananas and 5c oranges were bad,
   (i) What is the total number of good fruits in terms of a, b and c?
   (ii) If a = 3; b = 4; and c = 1. What is the number of good fruits?

10. I think of a number; double it and take away five from it, the result is 25.
    (i) Write the statement in algebraic form.
    (ii) Using trial and error find the number I thought of.

4 (d) Solution of Simple Equations

If the perimeter p of a square is equal to 4x,

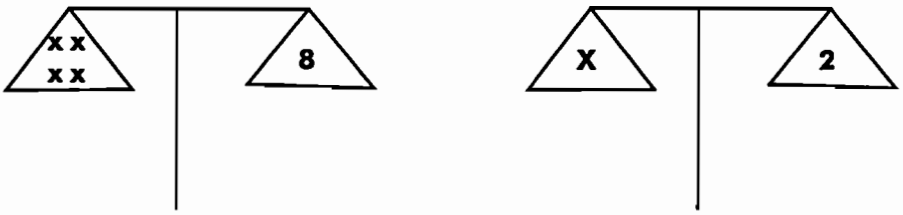


$x + x + x + x = 4x$

It means that p = 4x, if p = 8 then 8 = 4x or written more conveniently 4x = 8

Then (i) 4x = 8 is called an equation
(ii) The letter x is called an unknown
(iii) When we find the value of the unknown we say we have solved the equation.

An equation can be compared to a pair of scales with two pans balanced. To solve the equation 4x = 8, we have:

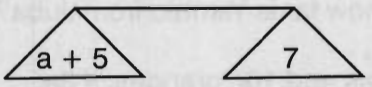


Can you say what has happened to both sides?

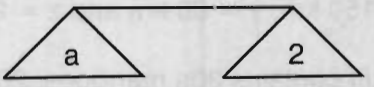
It is clear that if we do the same thing to each side of the scales, the scales will still balance. If we do the same thing to each side of an equation, add, subtract, multiply or divide, the two sides will still be equal.

Example 1

Solve a + 5 = 7



Equation is balanced - a + 5 = 7



Equation still balanced at the end

Step I

To find a, we get rid of five from left side by subtracting 5

$$a + 5 - 5 = 7$$

Now, what you do to one side of an equation must also be done to the other side to keep the balance.

Therefore;

$$a + 5 - 5 = 7 - 5$$

Step II

Simplify the equations.

$$a + 0 = 2 \qquad a = 2$$

Example 2

Solve: $a - 3 = 2$

To get rid of 3 from left side we add 3 to both sides. Why add 3? Because -3 + 3 = 0. Therefore we shall remain only with **a** on the left side which is the unknown.

$$a\ 3 + 3 = 2 + 3$$
$$a + 0 = 5$$
$$a = 5$$

Exercise 4

A. Solve the following equations by subtracting the same number from each side.

1) $a + 2 = 3$ 2) $r + 3 = 11$ 1) $a + 10 = 10$

4) $a + 12 = 17$ 4) $x + 1 + 2 = 10$ 4) $a + x + 4 = 16$

B. Solve the following by adding the same numbers to each side.

1) $b - 8 = 15$ 2) $c - 14 = 0$ 3) $a - 7 = 8$

4) $a - 9 = 12$ 5) $b - 7 = 14$ 6) $-1 + c = 2$

Example 3

Solve: $3a = 12$

To get rid of 3 from the left side, we divide both sides by 3.

$$\frac{{}^{1}\cancel{3}a}{\cancel{3}_{1}} = \frac{\cancel{12}^{4}}{\cancel{3}_{1}} \quad a = 4$$

C. Solve the following equations by dividing each side by the same number.

1) $2a = 2$ 2) $8b = 64$ 3) $4c = 8$

4) $3b = 15$ 5) $11a = 121$ 6) $8c = 4$

Example 4

Solve $\frac{a}{5} = 2$

To get rid of 5 the left side, we multiply both sides of the equation by 5.

$\frac{a}{5} = 2 \quad \frac{a}{5} \times 5 = 2 \times 5 \quad a = 10$

D. Solve the following equations by multiplying each side by the same number.

(Note that $\frac{a}{4}$ and $\frac{1a}{4}$ mean the same thing.)

1. $\frac{a}{2} = 4$
2. $\frac{c}{4} = 4$
3. $\frac{d}{2} = 15$
4. $\frac{c}{10} = 10$
5. $\frac{d}{11} = 11$
6. $\frac{a}{2} = 2.5$

Mixed Exercise 4

A. Solve the following equations:

1. $a + 2 = 3$
2. $r + 3 = 11$
3. $a + 10 = 10$
4. $b + 1 = 25$
5. $s + 9 = 14$
6. $x + 12 = 17$
7. $c + 1 = 1$
8. $t + 3 = 17$
9. $x + 11 = 30$
10. $a + 2 = 5$
11. $p + 8 = 15$
12. $m + 4 = 4$
13. $k + 6 = 20$
14. $a + 12 = 21$
15. $n + 7 = 8$
16. $3 + a = 5$
17. $7 + 1a = 13$
18. $8 + x = 17$
19. $x + 1 + 2 = 10$
20. $3 + x + 4 = 18$

B. Solve the following equations:

1. $x - 1 = 1$
2. $b - 7 = 7$
3. $q - 7 = 13$
4. $x - 2 = 2$
3. $b - 3 = 8$
6. $a - 9 = 12$
7. $a - 2 = 3$
8. $b - 8 = 3$
9. $a - 7 + 14$
10. $x - 2 = 6$
11. $b - 11 = 11$
12. $a - 8 = 15$
13. $b - 5 = 5$
14. $a - 8 = 15$
15. $c - 14 = 0$
16. $c - 0 = 2$
17. $c - 21 = 9$
18. $c - 17 = 14$
19. $p - 15 = 15$
20. $c - 21 = 9$
21. $-1 + p = 2$
22. $2x - 3 - x = 5$

C. Solve the following equations:

1. $2a = 2$
2. $7a = 21$
3. $8b = 64$
4. $2a = 4$
5. $5a = 35$
6. $12b = 72$
7. $3b = 9$
8. $9a = 36$
9. $8b = 80$
10. $3b = 15$
11. $6a = 54$
12. $2c = 0$
13. $4c = 4$
14. $7a = 49$
15. $3c = 1$
16. $4c = 40$
17. $11a = 212$
18. $3x = 1$

D. Solve the following equations:

1. $\frac{a}{2} = 4$
2. $\frac{a}{4} = 4$
3. $\frac{a}{5} = 5$
4. $\frac{a}{4} = 6$
5. $\frac{a}{6} = 4$
6. $\frac{a}{3} = 7$
7. $\frac{c}{4} = 4$
8. $\frac{c}{4} = 7$
9. $\frac{c}{6} = 8$
10. $\frac{c}{8} = 6$
11. $\frac{c}{9} = 7$
12. $\frac{c}{10} = 10$
13. $\frac{d}{2} = 15$
14. $\frac{a}{1} = 1$
15. $\frac{d}{10} = 0.5$
16. $\frac{a}{b} = 1$
17. $\frac{a}{2} = 0$
18. $\frac{d}{8} = \frac{1}{4}$

E. Solve the following equations:

1. $4a = 36$
2. $a + 4 = 36$
3. $a - 4 = 36$
4. $\frac{a}{4} = 36$
5. $x - 7 = 10$
6. $b + 11 = 11$
7. $10b = 1$
8. $\frac{a}{5} = 10$
9. $\frac{a}{6} = 0$
10. $x - 9 = 15$
11. $x + 9 = 15$
12. $\frac{x}{4} = \frac{1}{2}$
13. $10x = 2.5$
14. $x - 0.1 = 1.9$
15. $x + 0.5 = 2.5$
16. $5x = 1.5$
17. $\frac{x}{8} = 0$
18. $\frac{a}{b} = 0$
19. $\frac{b}{9} = 1.2$
20. $a + 2a + 3a = 12$

F. Form an equation from each of the following statements, then solve it.

1. Zindo is x years old and his brother is 5 years younger. If their total ages add up to 15 years, how old is Zindo?

2. I think of a number and subtract 62. The result is 118. What is the number?

3. Nyawarogo had h kg of cooking fat. After using ½ kg of the fat, she was left with 1½ kg. How much cooking fat did she have?

4 (e) Solving problems involving brackets

Example

(i) $2(4a) = 2 \times 4a = 8a$
Here we have multiplied the term in brackets by 2.

ii) $3(2a + b) = 3 \times 2a + 3 \times b = 6a + 3b$
Here we have multiplied by 3.

iii) $4(2c + 2n) = 4 \times 2c + 4 \times 2n$
$= 8c + 8n$

Exercise

Remove brackets from the following

1. a) $2(n + p)$ b) $3(m + 3t + 5)$ c) $5(2a + 3b + 6c)$

   d) $4(3x + 2n + 4c)$ e) $3(6a + 2b)$

2. $3(2h + 3h + h)$ 3. $5(4s + 2s + s + 2s)$ 4. $3(2n + n)$

5. $5(a + b) + 4(2a + b)$ 6. $4(3x + 2y) + 3(3x - 2y)$

Revision

Solve the following:

1) $a + b + a + b =$ 2) $\frac{1}{2}a + \frac{1}{2}a + b$ 3) $0.5y + 0.5y =$

Simplify:

a) $m(3 + p)$ b) $23(p + a) + 3(4p + 7a)$

Solve the equations:

1) a) $2a = 2$ b) $2x - 3x = 5$ c) $b + 6 = 7$ d) $0.1x = 1.9$

2) Peter has t books. Sam has half the number of books that Peter has while Poni has z books. Write down an expression for the total number of books they have.

3) Joyce had y kg of sugar. When she bought another 3½ kg she had 6 kg altogether. What does y stand for?

UNIT 5 Statistics

5.1 (a) Collecting and recording data

Exercise 1 (Revision)

1. Tally the number of pupils in your class.
2. Tally the number of boys and girls in your class.
3. Here is a list of marks for a class test which was marked out of 10.
   8, 7, 1, 9, 6, 7, 3, 9, 6, 2, 7, 5, 3, 5, 10, 4, 7, 9, 8, 7, 6, 8, 5, 6, 7, 9, 5, 6, 7, 8, 9, 1, 2, 8, 6, 10, 5, 4, 7.

   In your own exercise book, tally the number of pupils scoring each mark.

Marks	Tallies
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

4. Tally the number of pupils wearing each shoe size in your class

Shoe Size	Tallies
4	
5	
6	
7	
8	
9	
10	

5. Bringi was grouping his cattle according to their colours. He used the tallying method to do this. His results were as follows:

Colour	Tallies	Total
Brown	卌 卌 卌 II	
Black	卌 卌 卌 IIII	
Spotted	卌 卌 III	
White	III	

If 卌 represented 5 head of cattle,

(a) How many head of cattle were

(i) Black (ii) Spotted (iii) White (iv) Brown

(b) Which was the most common colour in Bringi's cattle?

(c) How many head of cattle did Bringi own altogether?

6. Four doctors from Yei hospital brought the following information from four villages about people suffering from HIV/AIDS.

If 卌 represents 5 patients, use the diagram below to answer

Doctor	Village	Adults	Children
Dr. Chuol	A	卌 卌 卌	II
Dr. Bringi	B	卌 卌 IIII	III
Dr. Aya	C	卌 I	IIII
Dr. Poggo	D	卌 II	I

Answer questions 1 - 8

1. How many children suffered HIV/AIDS in villages A ___, B ___, C___, and D___?
2. How many adults suffered from HIV/AIDS in A ___, B ___, C ___, and D ___?
3. Which doctor had the least number of patients? How many did he/she register?
4. Which doctor had the highest number of HIV/AIDS patients?
5. Which village had the least number of children with HIV/AIDS?
6. Which village had the highest? How many?
7. What was the total number of adults suffering from the four villages?
8. How many children had HIV/AIDS in the four villages?

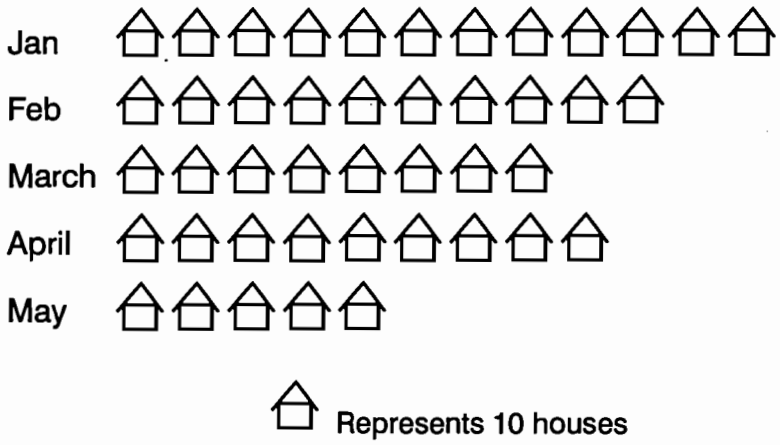
5.2 Pictographs

(i) In a class of boys and girls there are 30 boys and 15 girls. Putting the information on a pictograph we have.

Boys	Girls	
		1 picture represents 5 boys 1 picture represents 5 girls

How many girls are there? How many boys are there?

(ii) Below is a pictograph showing the number of houses built in a city.



(a) Find the number of houses completed in each month.
(b) Find the total number of houses built in the city.

Exercise 2

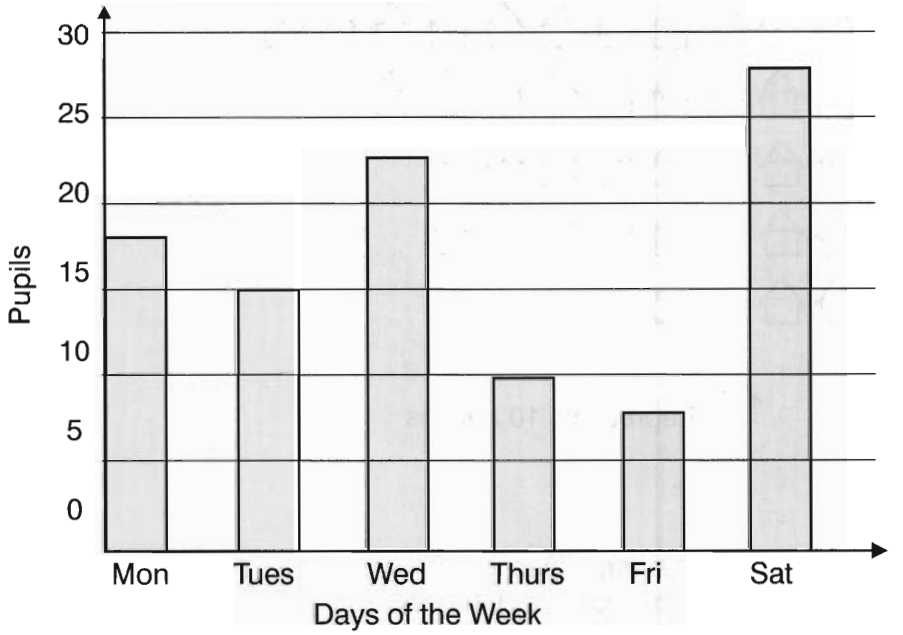
1. Malual has 100 cows, Deng has 250 cows, Chuol has 150 cows, Odu has 200 cows and Kunga has 50.

Use to represent 50 cows represent this information on a pictograph.

2. If in a school, a brick block represents 3 pupils. Represent the following information on a pictograph.
   3 pupils failed math, 12 got 30%, 6 got 90%, 15 got 60% and 9 got 55%.

5.3 Bar Graphs

The following bar graph shows clinic attendance by pupils at a health centre from Monday to Saturday. The scale on the vertical axis is 1cm represents 5 pupils.



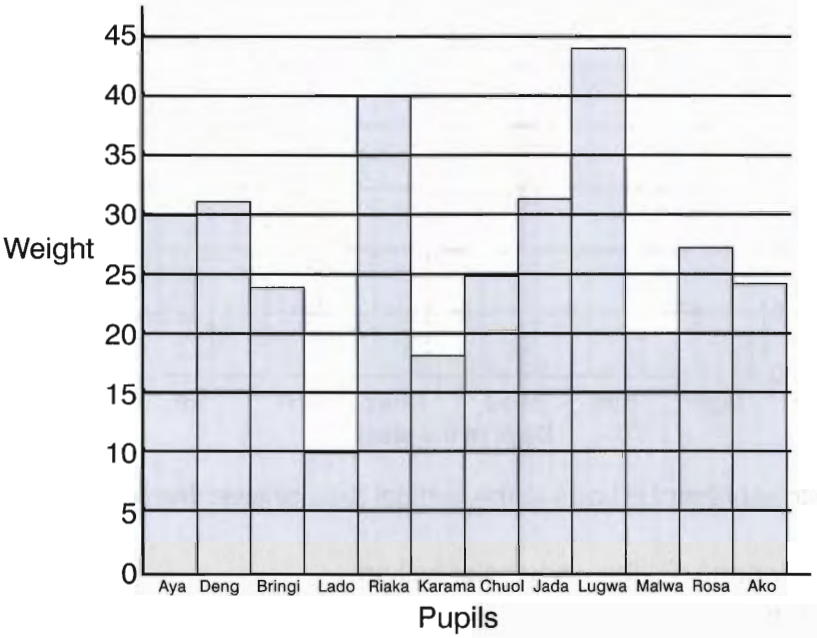
Use the above bar graph to answer the following questions.

1. How many pupils attended clinic on:
   (a) Monday (b) Tuesday (c) Wednesday
   (d) Thursday (e) Friday (f) Saturday

2. What was the total weekly attendance?
3. What was the average attendance for the week?
4. On which day of the week was the attendance lowest?

Exercise 3

1. The following bar graph shows weight in kilogrammes of 12 children in a certain school.



If on the scale on the vertical axis 1cm represents 5 pupils, answer the following questions from the bar graph.

a) Who is the heaviest child? How heavy?

b) How heavy is:
i) Karama ii) Aya iii) Malwa iv) Bringi v) Ako?

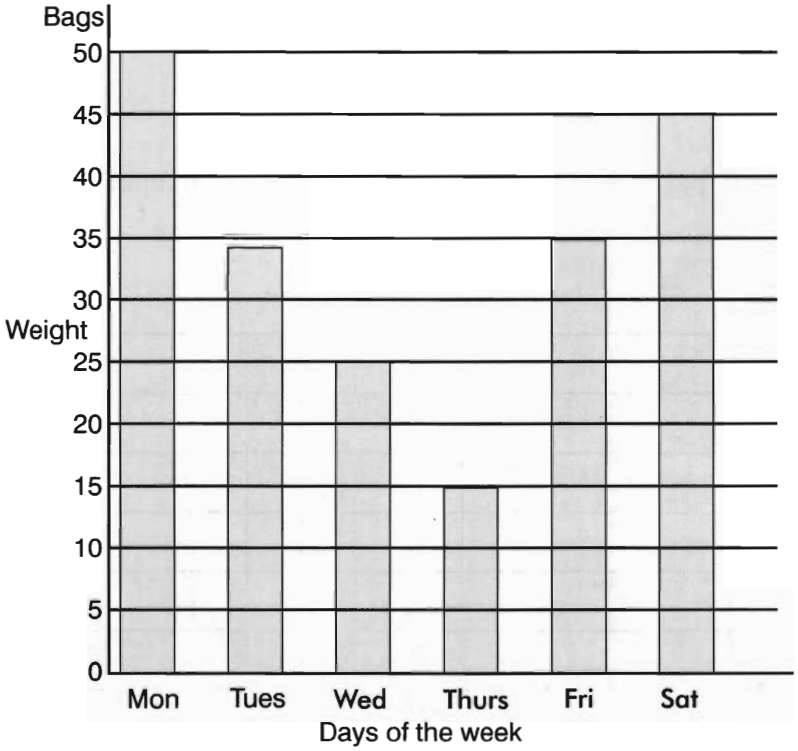
c) Who is the lightest child?

d) What is the difference in kilogrammes between Lugwa and Lado?

e) Find the total weight of the twelve children.

f) Find the average weight.

2. Following is a bar graph showing the number of bags of sugar sold by a wholesaler in one week.



Using 1cm to represent 5 bags in the vertical axis, answer the following questions.

a) How many bags did the wholesaler sell on:
   i) Tuesday
   ii) Wednesday and Thursday
   iii) Monday and Saturday

b) Which day of the week did the wholesaler make the:
   i) highest sales ii) lowest sale?

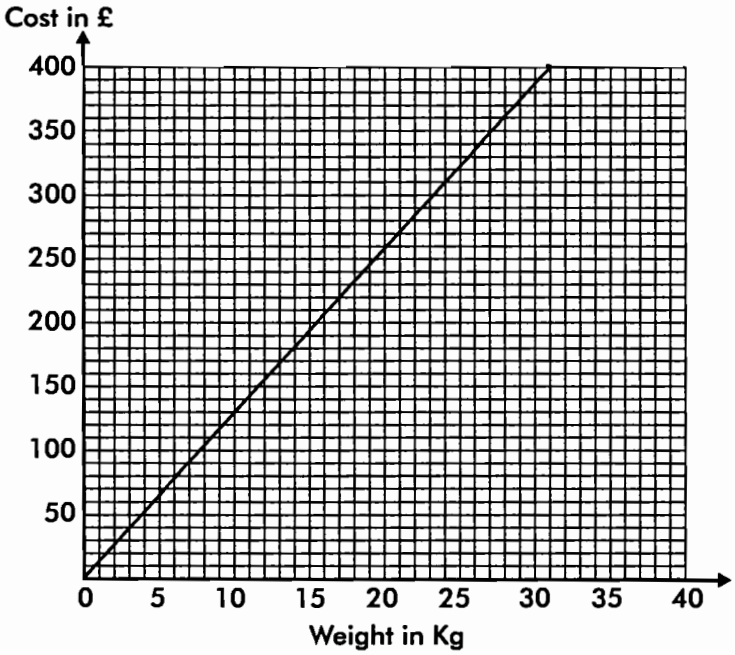
c) Find the total number of bags of sugar sold during the week.

d) What was the mean sale for the week?

5.4 Reading and interpreting line graphs

Line Graphs

On the graph below, the vertical axis represents cost of maize in £ and the horizontal axis represents weight in kilograms.



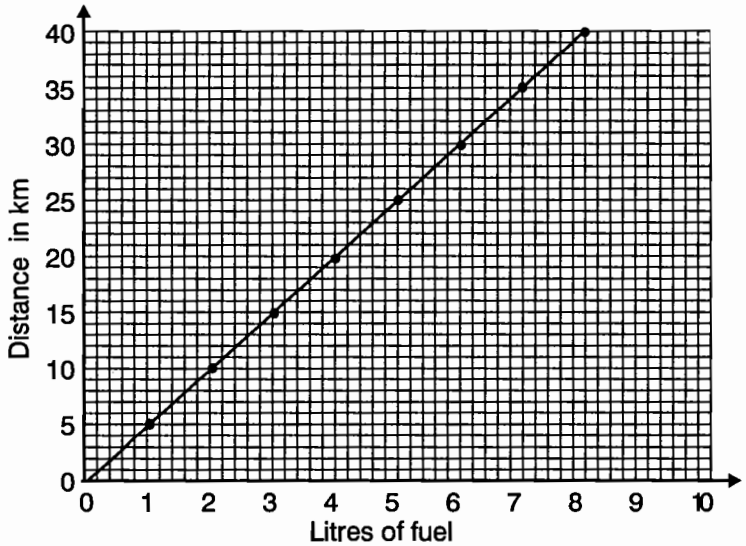
a) The scale on the vertical axis is 1cm represents £50.
The scale on the horizontal axis is 1cm represents 5kg

b) From the graph calculate the:
   i) cost of 10kg = £130
   ii) cost of 30kg = £390
   iii) cost of 4kg = £50

c) i) £150 can buy 12kg
   ii) £300 can buy 23kg
   iii) £50 can buy 4kg

Exercise 4

1. The graph below shows fuel consumption for Bringi's vehicle.



Use the graph above to answer the following questions.

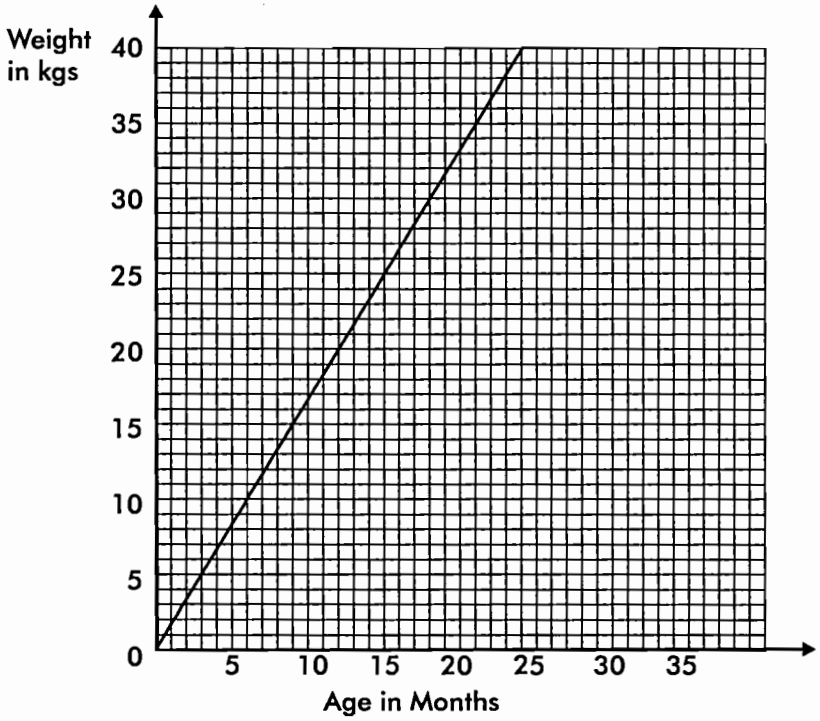
a) What is the scale on the horizontal axis?

b) What is the scale on the vertical axis?

c) What distance in kilometres would Bringi travel with:
   i) 3 litres ii) 4.2 litres iii)7.8 litres

d) How many litres of fuel will Bringi's car use to cover:
   i) 9km ii) 40km iii) 22km

2. On the graph below, the horizontal axis shows the age of a baby in months. The vertical axis shows the weight of a baby in kilograms. Use the graph to answer the questions below.
   Find the scale in the
   (a) vertical axis
   (b) horizontal axis
   (c) How old will the baby be when weighing:
      (i) 8kg
      (ii) 25kg
   (d) What is the weight of the baby at:
      (i) 5 months ii) 10 months iii) 20 months



3. A 100kg sack of potatoes cost £s800. Using the scale 1cm to represent £s100 on the vertical axis and 1cm to represent 10kg on the horizontal axis.

   a) Draw a line graph for the cost of potatoes.
   Use the graph to answer the following questions.

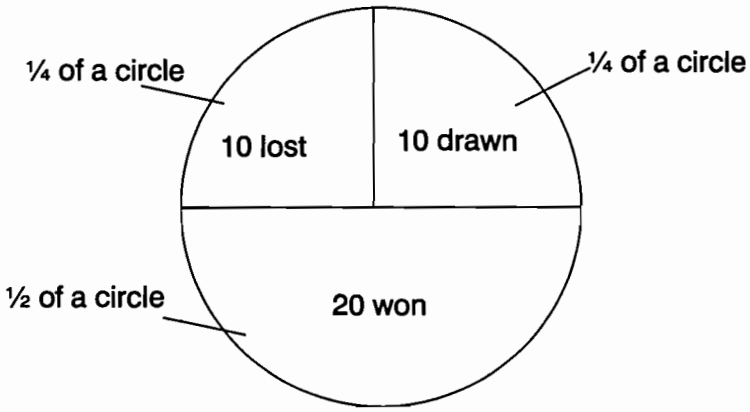
   b) What is the cost of:
   i) 60kg ii) 9kg iii) 74.4kg

   c) How many kilogramms of potatoes can one buy for
   I) £s400 ii) £s 208 iii) £s560

5.5 Identifying and drawing Pie Charts

Pie Charts

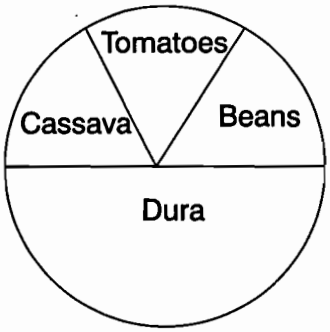
Circular diagrams are sometimes used to show data and are called Pie Charts. Below is a pie chart showing the results of 40 soccer matches played by Merriek football club in a single season.



From the graph you can see that the team won ½ of its matches. Because 40 matches were played, 20 matches were won (½ of 40), ¼ of the matches were drawn (¼ of 40 = 10) and ¼ of the matches were lost (¼ of 40 = 10).

Example 1

A farm has an area of 18 hectares. The circle graph below shows which crops were planted on the land.



Now answer the following questions:

a) State the fraction of the circle used to represent each crop.
b) State the number of hectares under each crop.

Solution

a) Dura $= \frac{1}{2}$ Beans $= \frac{1}{6}$ Tomatoes $= \frac{1}{6}$ and Cassava $= \frac{1}{6}$

b) Dura $= \frac{1}{2} \times 18$ ha $= 9$ ha Beans $= \frac{1}{6} \times 18$ ha $= 3$ ha

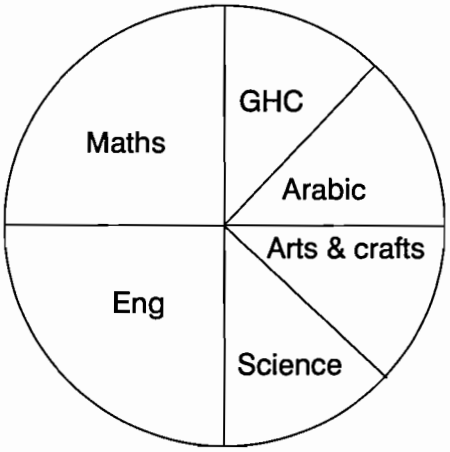
Tomatoes $= \frac{1}{6} \times 18$ha $= 3$ha Cassava $= \frac{1}{6} \times 18$ha $= 3$ha

Example 2

In a school subjects were allocated lessons on the school timetable as follows:

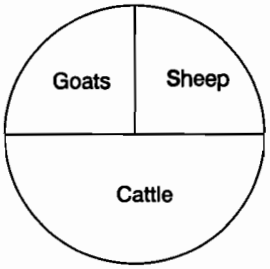
English $\frac{1}{4}$, Mathematics $\frac{1}{4}$, Science $\frac{1}{8}$, Arabic $\frac{1}{8}$, Arts and Crafts $\frac{1}{8}$, G.H.C. $\frac{1}{8}$

Represent this information on a pie chart.



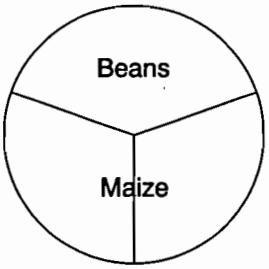
Exercise 5

1. The circle graph represents types of animals found in Deng's cattle camp.



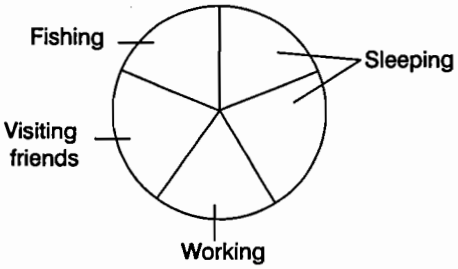
   a) State the fraction represented by each type of animal.
   b) If there were 400 animals in Deng's camp, find the number of each type of animal.

2. A farmer cultivates two types of crops: maize and beans. The circle graph below shows the fraction of the acreage under cultivation of each crop.



   a) State the fraction of acres under maize
   b) If the farmer cultivated a total of 15 acres, how many acres were put under maize?

3. The circle graph below shows a man's activities for a day.



   Use the Pie graph to answer the following questions.

   a) What fraction of his day was spent working?
   b) What fraction of his day was spent sleeping?
   c) How many hours per day were spent visiting with friends?

5.6 The Mathematic Mean (Average)

The arithmetic mean or average is a quantity obtained by adding the total of the quantity and dividing it by the number of the items.

Example

In the following tests Aya obtained the marks out of 10

Maths	English	Geography	Art/Craft	H/Economics	Science
7	5	6	4	3	5

$$\text{Mean} = \frac{7+5+6+4+3+5}{6} = \frac{30}{6} = 5$$

Exercise 6

1. Find the Mean (Average) of the following
   a) 7kg, 8kg, 4kg, 9kg

   b) 45m, 20m, 10m, 5m

   c) 2.7 litre, 3.5 litre, 4.5 litre, 5.5 litre, 0.3 litre

2. If the average marks obtained by 5 pupils in an English test are 50, what is the total number of marks scored by the 5 pupils?

3. In a certain clinic, the weights of 5 new born babies were recorded in kg, as follows.
   2kg, 2.5 kg, 3kg, 3.5kg, 1.5 kg
   Find the average birth weights.

UNIT 6 Scale Drawing

6.1 Determining unit of length to represent a given length

In scale drawing, long distances on the ground are represented by short lengths on paper. For example, 1 cm on the paper may represent 10m on the ground.

1 cm	represents	10 m
1 cm	represents	50 kilometres

Example

In scale drawing, 1 cm represents 10m

(i) What does ½ cm represent?

(ii) What does 1½ cm represent?

(iii) What does 2 cm represent

Solution

We are given that

1 cm represents 10 m,

Then

i) ½ cm represents ½ x 10m = 5m

ii) 1½ cm represents $\frac{3}{2}$ x 10m = 15 m

iii) 2 cm represents 2 x 10 = 20 m

Exercise 1

In a scale drawing, 1 cm represents 5 m of real measurement. What will the following lengths represent?

i) 8 cm	ii) 2 cm	iii) 1 cm	iv)1.3cm
v) 2.7 cm	vi) 10.5 cm	vii) 0.25 cm	viii) 0.5 cm

Example

Complete the table below:

Scale	Measurement	Drawing Measurement
i) 1 cm represents 5m		6cm
ii) 1 cm represents 10m	100m	
iii) 1 cm represents 20 m	200 m	
iv) i cm represents 15 m		5 m
v) 1 cm represents	40m	8 m

Solution

i) 1 cm represents 5 m.
Therefore 6 cm represents 6 x 5 = 30 m

ii) 10 m is represented by 1 cm
Then 1 metre is represented by $\frac{1}{10}$cm

100 m is represented by 100 x $\frac{1}{10}$cm = 10 cm

iii) 20 metres is represented by 1 cm
Then 1 metre is represented by cm

200 m is represented by$\frac{1}{20}$x 200 cm = 10 cm

iv) 1 cm represents 15 m
5 cm represents 15 x 5 = 75 m

v) 8 cm represents 40 m
1 cm represents $\frac{40}{8}$ m = 5 m

Exercise 2

Complete the table below

Scale	Real length	Drawing length
1 cm represents 7 cm	140 m	?
1 cm represents 8 cm	?	30 cm
1 cm represents?	100 m	10 cm
1 cm represents 12 m	40 cm	?
1 cm represents 12 m	?	4 cm

6.2 Drawing lines to a given Scale

Example

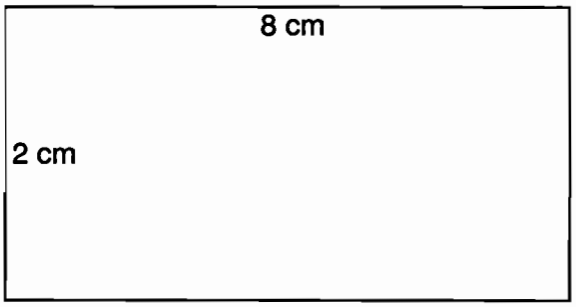
A rectangular plot of land measures 80 metres by 20 metres. Using scale, draw the rectangular plot in cm.

Solution

Choose a reasonable scale such as 1 cm represents 10 m. Therefore the length of 80 m will be represented by 8 c
8 cm = 80 m

The width of 20 metres will be represented by 20 : 10 = 2 cm.

The 8 cm and 2 cm can now be drawn on a piece of paper as shown below.



This is called the scale drawing

Exercise 3

1. 1cm represents 6 m on the ground. Find the measurement on the ground which is represented by:

   (a) 3 cm (b) 5cm (c) 10 cm

   (d) 1¾ cm (e) 1½ cm

2. Using a scale of 1 cm represents 1 m, draw the exact representations of the following lines:

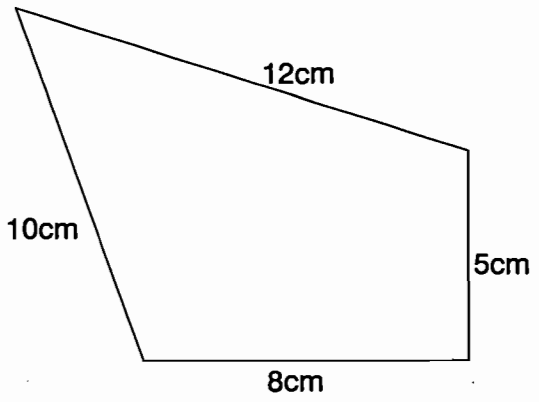
   (a) 10 m (b) 5 m (c) 13 m

   (d) 16 m (e) 25 m

3. A garden measures 100 m by 72 m. Using a scale of 1 cm representing 10 m, make an accurate drawing of the garden.

4. A classroom measures 30 m by 15 m. If 1 cm represents 5 m, make an accurate drawing of the classroom.

5. On a scale drawing 1 cm represents 2 m. Calculate the actual lengths of sides of the figure shown.



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