PRIMARY SIX

THEME: NUMERACY

TOPIC: OPERATION ON WHOLE NUMBERS

The following are the major operations:

B O D M A S

(-) Subtraction

(+)Addition

(x) Multiplication

(÷)Division

of

() Brackets

ADDITION AND SUBTRACTION OF WHOLE NUMBERS

Consider; 4 + 5 = 9

In the above mathematical problem, 4 and 5 are called addends while 9 is the sum.

Consider 20 – 14 = 6

In the above mathematical problem, 20 is the minuend, 14 is the subtrahend while 6 is the difference.

EXAMPLES:

1. Find the sum of 389,754 and 23,657

```
  1  1  1  1  1
  3  8  9  7  5  4
+ 2  3  6  5  7
-----------------
  4  1  3  4  1  1
```

2. There are 58167 pens in a box and 789968 pens in another box. What is the total number of pens in the two boxes?

```
  1  1  1  1  1  1
  5  8  6  1  7  4
+ 7  8  9  9  6  8
-----------------
  1  3  7  6  1  4  2
```

There are 1, 376, 142 pens altogether

3. Find the difference of 5233186 and 1345102

```
   4  11 12 13
   5  2  3  3  1  8  6
 - 3  9  8  8  0  8  4
 ---------------------
```

4. The number of cows in a district was 1,238,960 but 765,874 cows were slaughtered. How many cows remained?

```
   0  11 13     8  15 10
   1  2  3  8  9  6  0
 -    7  6  5  8  7  4
 ---------------------
   0  4  7  3  0  8  6
```

There were 473,086 cows that remained

5. Work out: 345,783 – 472,096 + 432,562

(345,783 + 432,562) – 472,096

```
        1  1
   3  4  5  7  8  3
 + 4  3  2  5  6  2
 ---------------------
   7  7  8  3  4  5
```

```
              2  13 15
   7  7  8  3  4  5
 - 4  7  2  0  9  6
 ---------------------
   0  0  6  2  4  9
```

ACTIVITY

1. Work out: 8975631 + 2867542
2. Find the sum of 231048 and 524628
3. There were 351 272 books in a library and 189 242 more books were donated to the same library. How many books are there altogether?
4. Find the difference of 678231 and 354986
5. What must be added to 237428 to get 885643?
6. Subtract 452 367 from 872 291
7. Decrease 845654 by 518349
8. A dairy processed 5300,450 litres of milk and sold 3450,833 litres. How many litres were left?

MULTIPLICATION OF WHOLE NUMBERS

Consider $8 \times 7 = 56$

In the above mathematical problem, 8 is the multiplier, 7 is the multiplicand while 56 is the product.

Examples

1. Work out: 357 × 9

```
   5 6
   3 5 7
 ×   9
 -------
 3 2 1 3
```

Method II

```
   3 5 7
 ×   9
 -------
```

9 x 7 = 63

9 x 50 = 450

9 x 300 = 2700

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

2. Find the product of 348 and 26

```
   3 4 8
 ×   2 6
 -------
   2 0 8 8
+ 6 9 6
 -------
   9 0 4 8
 -------
```

Method II

```
   3 4 8
 ×   2 6
 -------
```

6 x 8 = 48

6 x 40 = 240

6 x 300 = 1800

20 x 8 = 160

20 x 40 = 800

20 x 300 = 6000

```
   1 1
   6 0 0 0
   1 8 0 0
     8 0 0
     2 4 0
     1 6 0
 +       4 8
 -----------
   9 0 4 8
 -----------
```

3. Find the product of 4520 and 739.

```
     4 5 2 0
   × 7 3 9
   ---------
     4 0 6 8 0
   1 3 5 6 0
+ 3 1 6 4 0
 -----------
   3 3 4 0 2 8 0
 -----------
```

The product of 4520 and 739 is 3,340,280

4. There are 24 bottles of soda in a crate. How many bottles are in 297 crates?

(297 x 24) bottles

```
   2 9 7
 ×   2 4
 -------
   1 1 8 8
+ 5 9 6
 -------
   7 1 4 8
 -------
```

There are 7,148 bottles of soda in 297 crates

5. A carpenter needs 46 screws to fix a bed. How many screws does he need to fix 792 beds?

(792 x 46) screws

$$\begin{array}{r} 7\ 9\ 2 \\ \times\ 4\ 6 \\ \hline 4\ 7\ 5\ 2 \\ +3\ 1\ 6\ 8\ \ \\ \hline 3\ 6\ 4\ 3\ 2 \end{array}$$

He needs 36,432 screws to make 792 beds

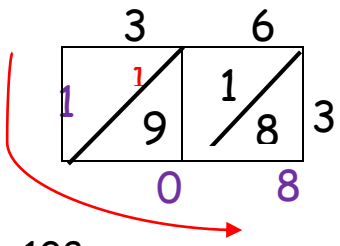
Activity

1. Work out the product of the following numbers
   a) 84 and 32 b) 637 and 18 c) 2508 and 16
2. To plant a garden of bananas on a hectare of land, you need 538 suckers. How many suckers do you need to plant on 63 hectares of land?
3. A bus carries 67 passengers per trip. How many people can be carried by the same bus in 98 trips?
4. A school consumes 3568kg of rice per month. How many kilograms can the same school consume in 47 seven months?

MULTIPLICATION OF WHOLE NUMBERS USING LATTICE METHOD

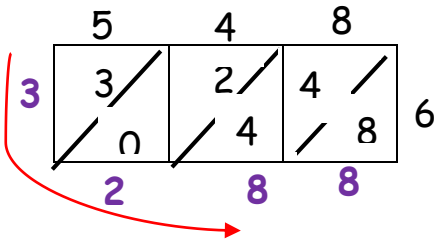
Examples

1. Work out 36 x 3 using lattice method.



34 x 3 = 108

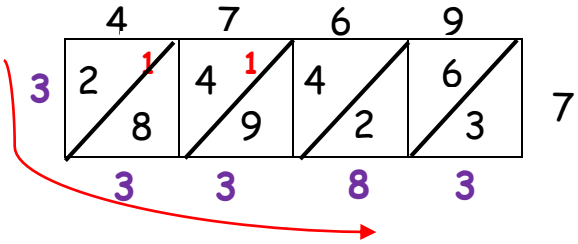
2. Work out 548 x 6 using lattice



548 x 6 = 3,288

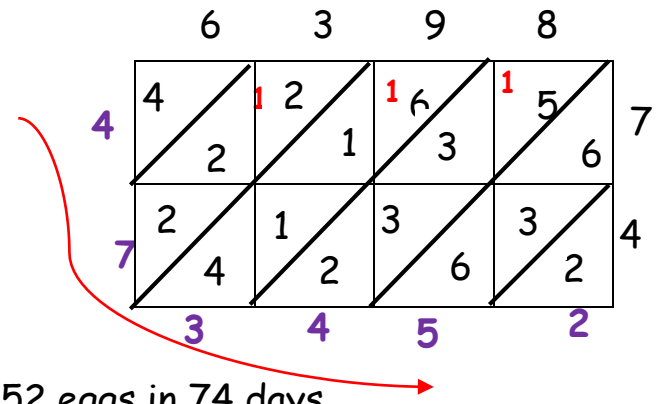
3. A university uses 4769 litres of water daily. How much water does it uses in a week? (Use lattice method)

(4769 x 7) litres



The university uses 33,383 litres of water in a week

4. Kato collects 6398 eggs daily on his farm. How many eggs does he collect in 74 days?



He collected 473,452 eggs in 74 days

ACTIVITY

1. Work out the following using lattice method.

a) 82 x 4 b) 753 x 6 c) 2,3647 x 5 d) 438 x 69

2. There are 94 books in each bookshelf. If there are 75 bookshelves, how many books are there altogether?
3. A maize mill processes 873 bags of flour in a day. How many bags of flour are processed in 69 days?

DIVISION OF WHOLE NUMBERS

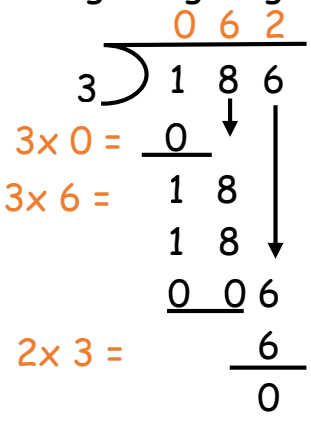
Consider; 30 ÷ 2 = 15

In the above division problem, 30 is the dividend, 2 is the divisor while 15 is the quotient.

Examples:

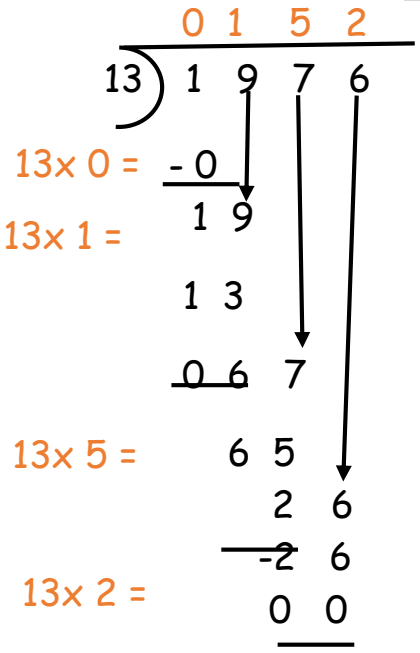
1. Work out the following using long division.

a) 1 8 6 ÷3



186 ÷ 3 =62

b) 1976 ÷ 13

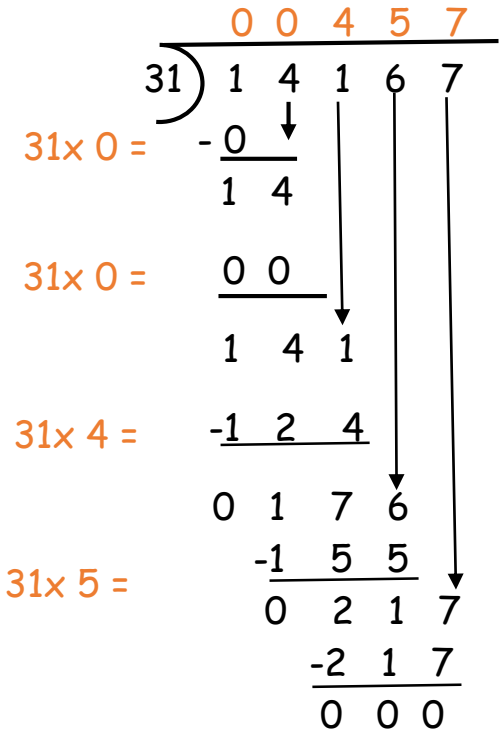


1X13 =13
2X13 =26
3X13 =39
4X13 =52
5X13 =65
6X13 =78

1976 ÷ 13 = 152

2. On a farm, 14,167kg of tomatoes were picked in a month of 31days.What was the average weight of tomatoes picked every day?

(141676 ÷ 31) kg



1X31 =31
2X31 =62
3X31 =93
4X31 =124
5X31 =155
6X31 =188
7x31 =217

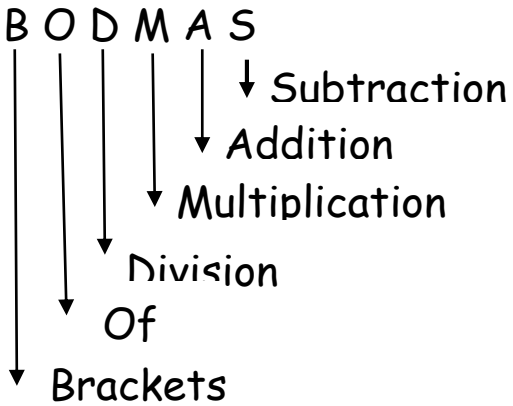
The average weight was 457kg of tomatoes

Activity

1. Work out the following using long division.
   a) 8416 ÷ 4 b) 18372 ÷ 6 c) 7290 ÷ 18 d) 11,776 ÷ 46
2. Share 759 books among 23 pupils.
3. Find the quotient of 5040 and 63.
4. A farmer packed 7500 mangoes in 15 similar cartons. How many mangoes were packed in each carton?
5. The Baby coach carried 34100 passengers in 50 trips. How passengers did it carry per trip?
6. A company makes 375000 books every day. If 250 books are packed in each carton, how many cartons are produced every day?

COMBINED OPERATIONS

In case of more than one operation in a problem, we follow the order of BODMAS.



Examples

1. Work out the following correctly:

a) 28 – 13 + 45

(28 +45) - 13
73- 13
60

b) 8 x 48 ÷ 4

(48÷4) x 8
12 x 8
96

c) 85 + (7 x 10)

(7 x 10) + 85
70 + 85
155

d) $\frac{1}{2}$ of 50 + 39 ÷ 3

$\frac{1}{2}$ of 50 + (39 ÷ 3)

($\frac{1}{2}$ of 50 + 13

$\frac{1}{2} \times 50 + 13$ (25 over 50, 1 over 2)

(1 x 25) + 13

25 + 13

38

e) (48 – 10) – (5 x 2) + (6 x 2)

(48 – 10) – (5 x 2) + (6 x 2)

38 - 10 + 12

(38 + 12) – 10

50 - 10

40

2. Kamu had sh.8000 on her mobile money account. She received sh.3700 more from her mother and later used sh.1700 as airtime. How much was left on her account?

Sh.8000 + sh.3700) – sh.1700

(sh.8000 + sh.3700) – sh.1700

Sh.11700 - sh.1700

Sh.3800

She was left with sh. 10000 on her account

3. Benti had sh.54000 and used $\frac{1}{3}$ of it to pay electricity bills. She then sold her hen at sh.16000. How many money does have now?

$sh.54000 - \frac{1}{3} \times$ sh.54000) + sh.16000

Sh.54000 - ($\frac{1}{3} \times$ sh.54 000) + sh.16000 (18 000 over 54 000, 1 over 3)

Sh.54000 – sh.18000) + sh.16000

She has sh.34,000 now

(sh.54000 + sh.16000) – sh.36000

Sh.70000 – sh.36000

Sh. 34,000

Activity

1. Work out the following correc

a) 48 – 20 + 22

b) 72 ÷ 4 x 3

c) 9 ÷ 9 + 5 – 3

d) 56 ÷ (7 x 8) + 9

e) (8 – 3) – (4 x 2) + (6 x 3)

$f)$ $\frac{3}{10}$ of 60 + $\frac{2}{5}$ of 30

g) 6 x 2 + 14 ÷ 14

h) 30 – 4 x 5

2. Kiku had 24 fruits and have away $\frac{1}{4}$ of them to a friend. Kiku later got 12 fruits more from his daddy. How many fruits did he remain with altogether?
3. Andema had sh.7500 and received sh.4500 more from a friend. He later equally shared the money with his elder brother. How much did each get?

PROPERTIES OF NUMBERS

a) Commutative property
b) Associative property
c) Distributive property

COMMUTATIVE PROPERTY

It states that the order numbers in a multiplication problem (multiplicand & multiplier) does not change the product.

Example

7 x 3 = 21

3 x 7 =21

It also states that the order of numbers in an addition problem (addends) does not affect the sum.

Example

9 + 15 = 24

15 + 9 = 24

NB: Division and subtraction are not commutative.

Examples

a) 20 – 7 = 13

   7 – 20 = -13

b) 36 ÷9 = 4

   9÷36 = $\frac{9}{36}$

ASSOCIATIVE PROPERTY

It states that the sum or product of three or more numbers will not change regardless of what sequence/order.

Examples

a) 3 x 7 x 5

(3 x 7) x 5

21 x 5

105

Or

3 x 7 x 5

3 x (7 x 5)

3 x 35

105

b) 8 + 11 + 9

(8 + 11) + 9

19 + 9

28

Or

8 + (11 + 9)

8 + 20

28

NOTE: subtraction and division are not associative

Examples

a) 8 – 9 – 4

(8-9) – 4

$^{-}1$ – 4

$^{-}5$

Or

8 – (9 – 4)

8 – 5

3

b) 100 ÷ 4 ÷ 5

(100 ÷ 4) ÷ 5

25 ÷ 5

5

Or

100 ÷ (4 ÷ 5)

$100 \div \frac{4}{5}$

$100 \times \frac{5}{4}$

25 x 5

125

DISTRIBUTIVE PROPERTY /DISTRIBUTIVE LAW

It states that multiplying two addends by a number gives the same product as multiplying each addends by the same number

e.g. 2(3+9) = (2 x 3) + (2 x 9)

2 x 12 = 6 +18

24 = 24

It states that multiplying the subtrahend and minuend by the same number gives the same product as multiplying by individual subtrahend and minuend by the same number

e.g. $4(25-10) = (4 \times 25) - (4 \times 10)$

$4 \times 15 = 100 - 40$

$60 = 60$

It states that dividing the sum of two numbers by the same number gives the same quotient as adding the quotient of individual division problems by the same number.

e.g. $(60 + 44) \div 4 = 60 \div 4 + 44 \div 4$

$104 \div 4 = 15 + 11$

$26 = 26$

It states that dividing the difference of two numbers by the same number gives the same quotient as subtracting the quotient of individual division problems by the same number.

$(100 - 40) \div 4 = 100 \div 4 - 40 \div 4$

$60 \div 4 = 25 - 10$

$15 = 15$

Examples

Work out the following using distributive property.

a) $(87 \times 19) + (19 \times 13)$

Common factor

Note: Identify the common factor and then factorize

$19(87 + 13)$

19×100

1900

b) $(52 \times 4) + (4 \times 18)$

$(52 + 18)4$

70×4

280

c) (87 x 25) - (27 x 25)

Common factor

25(87 - 27)

25 x 60

1500

d) (26 x 8) - (11 x 8)

(26 - 11)8

15 x 8

60

e) (59 ÷ 6) + (13 ÷ 6)

Common factor

(59 + 13) ÷6

72 ÷6

12

f) (143 ÷ 10) - (23 ÷ 10)

Common factor

(143 - 23) ÷10

120 ÷10

12

Activity

Work out the following using distributive property.

a) (4 x 17) + (23 x 4)

b) (16 x 100) + (100 x 14)

c) (72 x 15) – (15 x 42)

d) (81 x 7) – (7 x 11)

e) (161 ÷ 8) + (39 ÷ 8)

f) (360 ÷ 9) + (90 ÷ 9)

MORE DISTRIBUTIVE PROPERTY

Example

Work out the following using distributive property:

a) $(54 \times 2.7) + (0.3 \times 54)$

Common factor

$54(2.7 + 0.3)$

54×3.0

162

b) $(100 \times 0.25) + (0.11 \times 100)$

Common factor

$100(0.25 + 0.11)$

100×0.36

$\cancel{100}^{1} \times \frac{36}{\cancel{100}_{1}}$

36

C) $(23 \div 0.25) + (27 \div 0.25)$

Common factor

$(23 + 27) \div 0.25$

$50 \div 0.25$

$50 \div \frac{25}{100}$

$50 \div \frac{25}{100}$

$\cancel{50}^{2} \times \frac{100}{\cancel{25}_{1}}$

2×100

200

d) $(167 \div 0.65) - (37 \div 0.65)$

Common factor

$(165 - 37) \div 0.65$

$130 \div 0.65$

$130 \div \frac{65}{100}$

$130 \div \frac{65}{100}$

$\cancel{130}^{2} \times \frac{100}{\cancel{65}_{1}}$

2×100

200

ACTIVITY

Work out the following using distributive property:

a) $(25 \div 0.4) + (75 \div 0.4)$

b) $(16 \div 0.05) + (34 \div 0.05)$

c) $(56 \div 0.2) - (24 \div 0.2)$

d) $(56 \times 0.2) - (24 \times 0.2)$

e) $(66 \times 0.6) + (54 \times 0.6)$

f) $(280 \times 0.6) + (280 \times 0.2)$

SCIENTIFIC NOTATION/STANDARD FORM

A number in scientific notation takes the form of $a \times m^n$ where a is positive integer from 1.0 to 9.9, m is base ten while n is an exponent/index.

Hints

- If a number is more than ten, divide it until you get a quotient which is between 1 and 10.
- If a number is less than one (1), multiply it by ten (10) until the product is between one (1) and ten (10).

Examples

1. Express 7845 in standard form.

$7\,8\,4\,5 = 7.845 \times 10^3$

Or

7845÷10 =784.5 (1)

784.5÷10 =78.45 (2)

78.45÷10 =7.845 (3)

7.845×10^3

2. Express 39000 in scientific notation.

$3\,9\,0\,0\,02 = 3.9 \times 10^4$

Or

39000÷10 =3900.0 (1)

3900.0÷10 =390.00 (2)

390.00÷10 =39.000 (3)

39.000÷10 =3.900 (4)

3.9×10^4

3. Write 879.643 in scientific notation

$8\,7\,9.6\,4\,3 = 8.796 \times 10^2$

Or

879.643÷10 =87.9643 (1)

87.9643÷10 =8.79643 (2)

8.79643×10^2

4. Express 9.876 in standard form

9.876×10^0

5. Write 0.0985 in scientific notation

$0.0\,9\,8\,5 = 9.85 \times 10^{-2}$

Or

0.0985 x 10 = 0.985 (1)

0.985 x 10 = 9.85 (2)

9.85×10^{-2}

7. Write 0.00306 in standard form.

$0.\,0\,0\,3\,0\,6 = 3.06 \times 10^{-3}$

Or

0.00306 x 10 = 0.0306 (1)

0.0306 x 10 = 0.306 (2)

0.306 x 10 = 3.06 (3)

3.06×10^{-3}

Activity

Express the following in scientific notation/standard form

a) 2463 b) 879400 c) 20098

d) 2.3456 e) 751.98 f) 9001.87

g) 0.0046 h) 0.0009082

FINDING STANDARDIZED NUMBERS

Examples

1. Write 3.789×10^5 in its original form.

$\frac{3789}{1000} \times 10 \times 10 \times 10 \times 10 \times 10$

$\frac{3789}{1000} \times 1\,0\,0,0\,0\,0$

3789×100

378,900

2. What number has been written in standard form give 3.75642×10^2?

$\frac{375642}{100000} \times 10 \times 10$

$\frac{375642}{10\,0\,0\,0\,0\,0} \times 100$

$\frac{375642}{10\,0\,0}$

$3.75642 \times 10^2 = 3756.42$

3. Writ the number whose standard form is 2.109×10^0.

$\frac{2109}{1000} \times 1$

$\frac{2109}{1000}$ $2.109 \times 10^0 = 2.109$

4. What number has been written in standard form to give 8.56×10^{-4}?

$\frac{856}{100} \times \frac{1}{10000}$

$\frac{856}{1000000}$

0.000856

$8.56 \times 10^{-4} = 0.000856$

5. What number has been written in standard form to give 3.6×10^{-2}?

$\frac{36}{10} \times \frac{1}{100}$

$\frac{36}{1000}$

0.036

$3.6 \times 10^{-2} = 0.036$

Activity

What number has been written in standard form to give each of the following?

a) 8.6×10^4

b) 7.00458×10^5

c) 1.2068×10^0

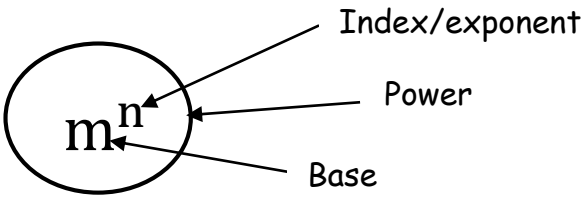
d) 7.24×10^{-2}

e) 3.491×10^{-4}

f) 5.438×10^{-1}

INDICES/EXPONENTS

Consider the illustration below;



EVALUATING POWERS

Examples

Evaluate the following:

i) $2^2 + 2^4$

$(2 \times 2) + (2 \times 2 \times 2 \times 2)$

$4 + (4 \times 4)$

$4 + 16$

20

ii) $(3^2 + 3^1)^0$

$(3 \times 3 + 3)^0$

$(9 + 3)^0$

12^0

1

iii) $y^3 + y^3$

$y^3 + y^3$

$2y^3$

iv) $3y^2 + 5y^2$

$3y^2 + 5y^2$

$8y^2$

v) $5y^4 + y^4$

$5y^4 + y^4$

$6y^4$

Activity

Work out the following:

a) $9^5 + 9^2$ b) $3^1 + 3^7$ c) $4^3 + 4^6$ d) $2a^4 + 6a^2$

e) $3b^6 + b^2$ f) $m^5 + m^7$ g) $2k^3 + 3k$ h) $8^2 + 8$

EVALUATION OF POWERS

Examples

Simplify the following:

a) $3^3 - 2^3$

$(3 \times 3) - (2 \times 2 \times 2)$

$9 - 8$

1

b) $4^3 - 2^3$

$(4 \times 4 \times 4) - (2 \times 2 \times 2)$

$(16 \times 4) - (4 \times 2)$

$64 - 8$

56

c) $3w^4 - w^4$

$3w^4 - w^4$

$2w^4$

d) $5n^4 - n^3$

$5n^4 - n^3$

e) $(4 + 8)^0$

12^0

1

ACTIVITY

Work out the following:

i) $4t^5 - t^3$ ii) $6^2 - 3^3$ iii) $5^2 - 4^2$

iv) $6d^3 - 2d^3$ v) $5h^8 - 3h^8$ vi) $10n^7 - 9n^7$

LAWS OF INDICES

1st law of indices states "the when multiplying powers of the same base, maintain the base and add the indices/exponents".e.g.

$b^3 \times b^5 = b^{3+5}$

2nd law states that when dividing powers of the same base, maintain the base and subtract the exponents.

$b^8 \div b^5 = b^{8-5}$

The above laws are summarized as MA/DS; multiplication we add and division we subtract.

APPLICATION OF LAWS OF INDICES IN MULTIPLICATION

Examples

1. Simplify $4^3 \times 4^2$ using laws of indices

   4^{3+2}

   4^5

   Without laws of indices

   $4^3 \times 4^2$

   $4 \times 4 \times 4 \times 4 \times 4$

   4^5

2. Simplify $m^8 \times m^2$

   m^{8+2}

   m^{10}

   Without laws of indices

   $m^8 \times m^2$

   $m \times m \times m \times m \times m \times m \times m \times m \times m \times m$

   m^{10}

3. Simplify $k^3 \times k \times k^6$

   K^{3+1+6}

   K^{10}

   Without laws of indices

   $K^3 \times k^1 \times k^6$

   $k \times k \times k \times k \times k \times k \times k \times k \times k \times k$

   k^{10}

4. Simplify $10^p \times 10^n$

   10^{p+n}

Activity

Simplify the following:

a) $3^2 \times 3^6$ b) $4^8 \times 4^{12}$ c) $w^2 \times w^6$ d) $p^5 \times p^4$ e) $y^7 \times y^5 \times y3$

f) $c^8 \times c^1 \times c^0$ g) $d^1 \times d^{10} \times d^5$

APPLICATION OF LAWS OF INDICES IN DIVISION

Examples

1. Simplify $3^4 \div 3^2$

3^{4-2}

3^2

3×3

9

Without laws of indices

$3^4 \div 3^2$

$$\frac{3 \times 3 \times \cancel{3} \times \cancel{3}}{\cancel{3} \times \cancel{3}}$$

3×3

3^2

3×3

9

2. Simplify $p^{10} \div p^6$

P^{10-6}

P^4

Without laws of indices

$P^{10} \div P^6$

$$\frac{p \times p \times p \times p \times \cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p}}{\cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p} \times \cancel{p}}$$

$p \times p \times p \times p$

p^4

3. Simplify $36m^8 \div 9m^3$

$36 \div 9 (m^{8-3})$

$4m^5$

Without laws of indices

$36m^8 \div 9m^3$

$$\frac{\cancel{36} \times m \times m \times m \times m \times m \times \cancel{m} \times \cancel{m} \times \cancel{m}}{\cancel{9} \times \cancel{m} \times \cancel{m} \times \cancel{m}}$$

$4m^5$

Activity

Simplify the following;

a) $2^6 \div 2^2$ b) $d^{18} \div d^{11}$ c) $n^9 \div n^7$ d) $n^{24} \div n^{10}$ e) $x^5 \div n^5$

f) $2k^5 \div k^2$ h) $8g^{13} \div g^9$ i) $18b^7 \div 3b^4$ j) $28m^8 \div 7m^3$

APPLICATION OF LAWS OF INDICES IN MULTIPLICTAION

Examples

1. Solve for x: $2^p = 32$

- Express 32 as a power of 2

2	32
2	16
2	8
2	4
2	2
	1

$2^p = 2 \times 2 \times 2 \times 2 \times 2$

$2^p = 2^5$ Since the bases are the same, ignore them and equate the indices

$P = 5$

2. Solve for w: $3^w \times 3^1 = 81$

- Express 81 as a power of 3

3	81
3	27
3	9
3	3
3	3
	1

$3^w \times 3^1 = 3 \times 3 \times 3 \times 3$

$3^w \times 3^1 = 3^4$

Apply a law of indices in multiplication

$3^{w+1} = 3^4$ Since the bases are the same, ignore them and equate the indices

$W + 1 = 4$

$W + 1 - 1 = 4 - 1$

$W = 3$

3. Solve for y: $2^y \times 3^3 = 108$

$2^y \times 3^3 = 2 \times 2 \times 3 \times 3 \times 3$

$2^y \times 3^3 = 2^2 \times 3^3$

$2^y \times 3^3 \div 3^3 = 2^2 \times 3^3 \div 3^3$

$2^y = 2^2$

$y = 2$

2	108
2	54
3	27
3	9
3	3
	1

4. Solve for a: $2^3 \times 5^a = 200$

$2^3 \times 5^a = 2 \times 2 \times 2 \times 5 \times 5$

$5^a \times 2^3 = 2^3 \times 5^2$

$5^a \times 2^3 \div 2^3 = 2^3 \div 2^3 \times 5^2$

$5^a = 5^2$

$a = 2$

2	200
2	100
2	50
5	25
5	5
	1

Activity

Solve the following equations

a) $2^d = 2^6$ b) $2^n = 16$ c) $3^f = 27$ d) $2^k \times 2^2 = 32$

e) $4^1 \times 4y^y = 256$ f) $2^2 \times 5^r = 100$ g) $3^m \times 5^2 = 75$

APPLICATION OF LAWS OF INDICES IN DIVISION

Examples

1. Solve for m: $2^m \div 2^1 = 8$

- Express 8 as a power of 2

2	8
2	4
2	2
	1

1

$2^m \div 2^1 = 2 \times 2 \times 2$

$2^m \div 2^1 = 2^3$

Apply a law of indices in division

$2^{m-1} = 2^3$ Since the bases are the same, ignore them and equate the indices

$m - 1 = 3$

$m - 1 = 3$

$m - 1 + 1 = 3 + 1$

$m = 4$

2. Solve for x: $4^{3x} \div 4^{x} = 256$

4	256
4	64
4	16
4	4
	1

1

$$4^{3x} \div 4^{x} = 256$$
$$4^{3x} \div 4^{x} = 4 \times 4 \times 4 \times 4$$
$$4^{3x} \div 4^{x} = 4^{4}$$
$$4^{3x-x} = 4^{4}$$
$$4^{2x} = 4^{4}$$
$$\frac{2x}{2} = \frac{4}{2}$$
$$X = 2$$

3. Solve for k: $3^{k} \div 3^{2} = 27$

3	27
3	9
3	3
	1

$$3^{k} \div 3^{2} = 3 \times 3 \times 3$$
$$3^{k} \div 3^{2} = 3^{3}$$
$$3^{k-2} = 3^{3}$$
$$K - 2 = 3$$
$$K - 2 + 2 = 3 + 2$$
$$K = 5$$

ACTIVITY

Solve the following equations

i) $2^{r} \div 2^{2} = 4$ ii) $4^{y} \div 4^{2} = 16$ iii) $2^{3y} \div 2^{y} = 16$

iv) $4^{2x} \div 4^{x} = 64$ v) $5^{3p} \div 5^{p} = 625$ v) $3^{2n} \div 3^{n} = 27$

PATTERNS AND SEQUENCES

Divisibility test.

Divisibility test is the quicker way of finding out whether a number is exactly divisible by another number or not.

Divisibility test for two and three.

i) Divisibility test for two.

A number is exactly disable by two when it is even i.e. when its last digit is 0, 2, 4, 6 or 8.

Examples

1. Without dividing, which of the two numbers is exactly divisible by two?

a) 345 and 654

345 is not an even number.

654 is an even number.

Therefore 654 is exactly divisible by two.

b) 1123 and 3112

1123 not even.

3112 is even. Therefore 3112 is exactly divisible by two.

ii) Divisibility test for three.

A number is exactly divisible by 3 when the sum of its digit is a multiple of three.

Example

Which of the following numbers 234 and 632 is exactly divisible by three?

234

Sum off digits = 2 + 3 + 4

= 9

9 is a multiple of three.

234 is exactly divisible by 3.

632

Sum of digits = 6 + 3 + 2

= 11

11 is not a multiple of three.

632 is not exactly divisible by three

Activity

1. Which of the following numbers are exactly divisible by two?

   a) 34 b) 51 c) 690, c) 755, d) 2348

2. Identify all the numbers which are exactly divisible by three in the list below.

   11, 33, 123, 1243, 873 and 4320

3. Without dividing identify the numbers which are exactly divisible by two and three in the list below. 237, 762, 651 and 4560.

Divisibility for 4, 5 and 10

Divisibility test for four.

A number is exactly divisible by four when the number formed by its last three digits is a multiple of 4.

Examples

Without dividing, find out whether the numbers below are exactly divisible by four.

a) 112.

Last two digits form 12

12 is a multiple of 4

112 exactly divisible by 4

b) 7,218

Last two digits form 18

18 is not a multiple of 4

7,218 is not exactly divisible by 4

Divisibility test for 5

The number is exactly divisible by five when its last digit is either **zero** or five.

Examples

Identify all the numbers that are exactly divisible by five from the list below. 24, 76, 55, 675, 3,453, 1,000, and 60,005

55, 675, 1,000 and 60,005 are exactly divisible by five.

Divisibility test for 10.

A number is exactly divisible by ten when its last digit is zero e.g. 10, 100,310, 5700 etc.

Activity.

1. Without dividing show whether the following numbers are exactly divisible by 4.

   a) 404 b) 5,402 c) 4,532, d) 65,911 e) 1,000,040

2. Identify all the numbers that are exactly divisible by five from the list below. 443, 655, 7, 695, 30,003 and 100,010.
3. Circle the numbers that are exactly divisible by ten in the list below. 601, 450, 10,001, 10,000, and 40,401.

Divisibility test for 6 and 9

Divisibility test for 6

A number is exactly divisible by six when it is;

- Even
- Divisible by three

Examples

Without dividing determine whether the following numbers are exactly divisible by six.

a) 2,346

- The number is even.
- Sum of the digits = 2 + 3 + 4 +6
  = 15
- 15 is a multiple of three, therefore 2346 is exactly divisible by six

b) 23,517

- The number is odd, not divisible by six.

c) 14,536

- The number is even

- Sum of the digits (1 + 4 + 5 + 3 + 6) = 19
- 19 is not a multiple of 3, therefore 14,536 is not divisible by six.

Divisibility test for 9

A number is exactly divisible by nine when the sum of its digits is a multiple of nine.

Examples

Without dividing determine whether the following numbers are exactly divisible by six.

a) 234

- Sum of the digits = 2 + 3 + 4
  = 9
- 9 is a multiple of nine, therefore 234 is exactly divisible by 9.

b) 56,328

- Sum of the digits = 5 + 6 + 3 + 2 + 8
  = 24
- 24 is not a multiple of 9, therefore 56,328 is not exactly divisible by nine.

Activity

1. Which of the following numbers are exactly divisible by 2 and 3.
   a) 32,454 b) 32,145 c) 12,134 d) 2,754
2. Without dividing find out the number which numbers are exactly divisible by six from 334, 5133, 4536 and 4,578.

3. Which of the following numbers are exactly divisible by nine?

a) 2709 b) 6,145 c) 45,810 d) 321,456

Types of numbers.

i) Whole numbers

Whole numbers start with zero and keep increasing by 1.

0, 1, 2, 3, 4, 5,…

ii) Counting numbers/ Natural numbers

They start with one and keep on increasing by 1.

1, 2, 3, 4, 5,…

iii) Odd numbers:

These are numbers that give a remainder when divided by 2.

They start with one and keep on increasing by 2.

{1, 3, 5, 7,…}

iv) Even numbers:

These are numbers that are exactly divisible by two.

{0, 2, 4, 6, 8, 10,…}

v) Prime numbers:

These are numbers with only two factors.

The factors are one and the number itself.

{2, 3, 5, 7, 11, 13,…}

vi) Composite numbers:

These are numbers with more than 2 factors

{4, 6, 8, 9, 10, 12,…}

vii) Square numbers:

These are numbers got by multiplying a number by its self.

They can also be got by adding consecutive odd numbers.

{1, 4, 9, 16, 25,…}

viii) Cube numbers:

These are got by multiplying the same number twice.

{1, 8, 27, 64,…}

ix) Triangular numbers:

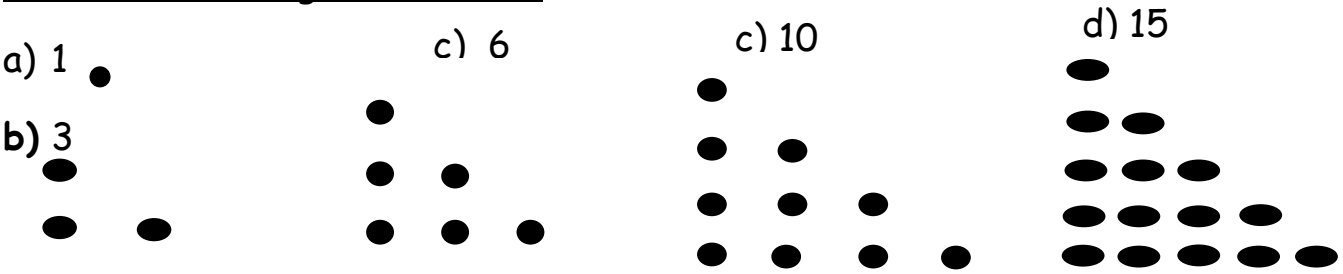
These are numbers got by adding consecutive counting numbers.

Their dot pattern forms a triangle.

{1, 3, 6, 10, 15, 21, …}

+2 +3 +4 +5 +6

Pattern for triangular numbers



Activity

1. Find the next number in the series.

   a) 2, 3, 5, 7, ___.

   b) 1, 3, 5, 7, ___.

   c) 4, 6, 8, 9, 10, ___.

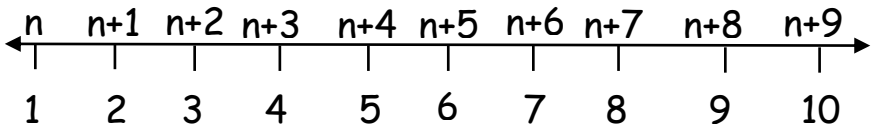
d) 49, 36, 25, 16, ___.

e) 625, 125, 25, ___.

2. What is the product of the 3rd and the 6th triangular numbers?
3. Write the seventh prime number in Roman numerals.
4. What is the difference between the 10th odd number and the 10th even number?
5. Work out the total of the first 8 triangular numbers.

Finding consecutive counting numbers/ natural numbers/ integers.

Consider positive integers on the number line.



- There is one step interval between counting numbers.
- Two step intervals between the 1st and the 3rd counting numbers.
- Three steps between the first and the fourth counting numbers.

Examples

1. Primary six pupils we asked to write a set of 5 consecutive counting numbers whose median is 8. What numbers did they write?

1st	2nd	3rd	4th	5th
8-2	8-1	8	8+1	8+2

The set is {6,7,8,9,10}

2. Three rooms were numbered consecutively using counting numbers. If the last room number was 19, find the numbers for the other rooms

1st no.	2nd no.	3rd no.
19-2	19-1	19

The numbers are 17 and 18

3. The sum of three consecutive counting numbers is 18. Find the numbers.

Let the first number be k

1st no.	2nd no.	3rd no.	Total
k	K+1	K+2	18

K + k + 1 + k + 2 = 18

K + k + k + 1 + 2 = 18

3k + 3 = 18

3k + 3 – 3 = 18 – 3

3k = 15

$\frac{3k}{3} = \frac{15}{3}$

K = 5

The numbers are;
5, 6 and 7

4. The sum of three consecutive counting numbers is 33. Find the numbers if the middle number is n.

1st no.	2nd no.	3rd no.	Total
y-1	y	Y+1	33

Y – 1 + y + y + 1 = 33

Y + y + y + 1 -1 = 33

3y = 33

$\frac{3k}{3} = \frac{33}{3}$

K = 11

The numbers are 10, 11 and 12

5. The sum of four consecutive natural numbers is 86. Work out the range of the numbers if the last number is p.

1st	2nd	3rd	4th	Sum
P - 3	P - 2	P -1	p	86

P – 3 + p – 2 + p – 1 + p = 86

p + p + p + p – 3 – 2 – 1 = 86

4p - 6 = 86

4p - 6 + 6 = 86 + 6

4p = 92

$\frac{4p^{1}}{4_{1}} = \frac{92^{23}}{4_{1}}$

P = 23

The numbers are 20, 21, 22 and 23

Range

23 – 20

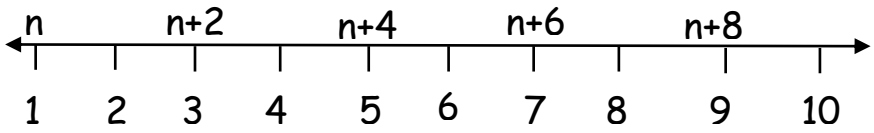
= 3

Activity

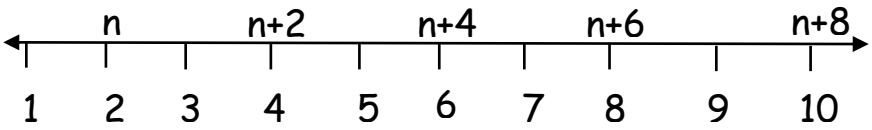
1. Find the three consecutive counting numbers whose median is 14.
2. Find the sum of five consecutive natural numbers whose median is 15
3. The total of three consecutive positive integers is 45.
   a) Find the numbers.
   b) Calculate their average.
4. The sum of three consecutive counting numbers is 138. If the middle number is n;
   a) Find the numbers.
   b) Calculate their range.
5. The sum of four consecutive counting numbers is 54. If the last number is p. find the numbers.

Finding consecutive odd and even numbers

Odd numbers



Even numbers



- There are two step intervals between odd/even numbers.
- Two step intervals between the1st and the 3rd odd/ even numbers.
- Six steps between the first and the fourth odd/ even numbers.

Examples

1. Primary six pupils we asked to write a set of 5 consecutive odd numbers whose median is 7. What numbers did they write?

1st	2nd	3rd	4th	5th
7-4	7-2	7	7+2	7+4

The set is {3,5,7,9,11}

2. Three rooms were numbered consecutively using even numbers. If the last room number was 18, find the numbers for the other rooms

1st no.	2nd no.	3rd no.
18-4	18-2	18

The numbers are 14 and 16.

3. The sum of three consecutive even numbers is 18. Find the numbers.

Let the first number be k

1st no.	2nd no.	3rd no.	Total
k	K+2	K+4	18

K + k + 2 + k + 4 = 18

K + k + k + 2 + 4 = 18

3k + 6 = 18

3k + 6 – 6 = 18 – 6

3k = 12

$\frac{3k}{3} = \frac{12}{3}$

K = 4

The numbers are;
4, 6 and 8

4. The sum of three consecutive odd numbers is 33. Find the numbers if the middle number is n.

1st no.	2nd no.	3rd no.	Total
y-2	y	Y+2	33

Y – 2 + y + y + 2 = 33

Y + y + y + 2 - 2 = 33

3y = 33

$\frac{3k}{3} = \frac{33}{3}$

K = 11

The numbers are 9, 11 and 13

5. The sum of four even numbers is 84. Work out the range of the numbers if the last number is p.

1st	2nd	3rd	4th	Sum
P - 6	P - 4	P -2	p	84

P – 6 + p – 4 + p – 2 + p = 84

p + p + p + p – 6 – 4 – 2 = 84

4p - 12 = 84

4p - 6 + 6 = 84 + 12

4p = 96

$\frac{4p}{4} = \frac{96}{4}$

P = 24

The numbers are
18, 20, 22 and 24

Range
24 – 18
= 6

Activity

1. Find the three consecutive odd numbers whose median is 19.
2. Find the sum of five consecutive even numbers whose median is 16
3. The total of three consecutive positive odd is 45.

   c) Find the numbers.

   d) Calculate their average.
4. The sum of three consecutive even numbers is 78. If the middle number is n;

   c) Find the numbers.

   d) Calculate their range.
5. The sum of four consecutive odd numbers is 88. If the last number is p. find the numbers.

Finding lowest common multiple (LCM)

Example

1. Find the L.C.M of;

a) 6 and 8

M_6 = {6, 12, 18, 24, 30, 36, …}

M_8 = {8, 16, 24, 32, …}

L.C.M = 24

b) Find the LCM of 6 and 8.

M6 = {6, 12, 18, 24, 30, 36, 42, 48,…}

M9 ={9, 18, 27, 36, 45, 54, …}

CM = {18, 36}

LCM = 18

b) 8 and 12.

LCM by prime factorization.

2	8	12
2	4	6
2	2	3
3	1	3
	1	1

LCM = 2 x 2 x 2 x 3
= 4 x 6
= 24

2. What least number of oranges can be shared equally among 6 or 8 pupils without living a remainder?

M6 = {6, 12, 18, 24, 30, 36, 42,…}

M8 = {8, 16, 24, 32, 40, 48,…}

LCM =24

Therefore 24 oranges were shared.

2. Find the least number of sweets when shared among 10 or 15 girls leaves five as a remainder.

M10 = {10, 20, 30, 40, 50, 60, 70, …}

M15 = {15, 30, 45, 60, 75, 90, …}

LCM = 30.

Number of sweets = 30 + 5
= 35 sweets

3. Two bell one for upper primary and one for lower primary at Mbuya parents' school ring at an interval of 30 minutes and 40 minutes respectively. If they first ring together at 8:00 am;

a) After how many minutes will they ring together again?

b) At what time will ring together again?

Solution

a) LCM

2	30	40
2	15	20
2	15	10
3	15	5
5	5	5
	1	1

LCM = 2 x 2 x 2 x 3 x 5
= 4 x 6 x 5
= 24 x 5
= 120 minutes
They will ring together after 120 minutes

b) 60 minutes = 1hour

120 minutes = (120 ÷ 60) hours

= 2

Hours	mins
8	0 0
+ 2	0 0
10 :	0 0 a.m.

Activity

1. Find the LCM of the following.
   a) 12 and 18
   b) 14 and 21
   c) 20 and 30
   d) 30 and 40
2. What number can be divided by 16 and 12 without leaving a remainder?
3. Find the least number that can be divided by 20 and 25 leaving no remainder.
4. What least number of sweets can be shared equally among 7 or 8 children leaving 3 as a remainder?
5. In Mbuya primary school, three bells one for nursery, one for lower primary and the other for upper primary ring at an interval of 20

minutes, 30 minutes and 40 minutes respectively. If they first ring together at 8 : 00 a.m.

a) After how many minutes will they ring together again?

b) At what time will they ring together again?

6. The teacher had a certain number of sweets. When he shared them among 24 pupils or 36 pupils 13 sweets remained. How many sweets did the teacher have?
7. Three containers A, B and C of capacity 40 ml, 50ml and 60 ml respectively are to be used to fill container D. Calculate the minimum amount of water the three containers can pour in the container D without leaving any water in the containers.

Application of LCM and GCF

Examples

1. Find the product of two numbers whose LCM and GCF are 36 and 6 respectively.

   Product of the two numbers = product of LCM and GCF.

   = 36 x 6

   =108

2. Two numbers have a product of 112. Cal calculates the GCF of the two numbers if there LCM is 28.

   Let the GCF be k

   K x 28

   $\frac{\overset{1}{\cancel{28}k}}{\underset{1}{\cancel{28}}} = \frac{\cancel{112}^{4}}{\underset{1}{\cancel{28}}}$

   K = 4

3. The LCM of two numbers is 24 and their GCF is 4. Find the second number if the first number is 8.

Let the second number be y

$Y \times 8 = 24 \times 4$

$8y = 96$

$\frac{\cancel{8}^{1}y}{\cancel{8}_{1}} = \frac{\cancel{96}^{12}}{\cancel{8}_{1}}$

$Y = 12$

$\text{LCM} \times \text{GCF} = \cancel{24}^{3} \times 4$

$1^{st}\ \text{No.} \quad \cancel{8}_{1}$

$= 3 \times 4$

$= 12$

Activity

1. Find the product of k and m if there GCF and LCM is 42 and 3 respectively.
2. The LCM of two numbers is 24 and their GCF is 4. Find the second number if the first number is 8.
3. Given the two numbers 12 and m. find the value of m if their GCF and LCM is 6 and 36 respectively.
4. The product of two numbers whose LCM is 48 is 288. Find their GCF.
5. The LCM of x and y is 120, their GCF is 10. Find the value of y if x is four times the GCF.

Prime factorisation of numbers

Prime factorizing means dividing a number by its prime factors.

We use prime factors when prime factorizing.

Prime factors are prime numbers.

They include 2, 3, 5, 7, 11, 13, …

The answer can be written in set notation, power form or product form

Example I

Prime factorize 18.

Ladder method

2	18
3	9
3	3
	1

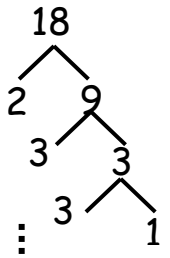
Set notation / subscript form

$F18 = \{2_1, 3_1, 3_2\}$

Power form

$F18 = 2^1 \times 3^2$

Using a factor tree



Product form

$F18 = 2 \times 3 \times 3$

Example II

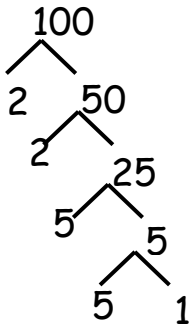
Prime factorize 100.

* Take note of factors of 100 that are prime numbers.

Ladder method

2	100
2	50
5	25
5	5
	1

Factor tree



Set notation

$F100 = \{2_1, 2_2, 5_1, 5_2\}$

Product form

$F100 = 2 \times 2 \times 5 \times 5$

Power form

$F100 = 2^2 \times 5^2$

ACTIVITY

1. Prime factorise the following numbers and write your answer in set notation.

   a) 50

   b) 36

   c) 20

   d) 30

2. Express the following numbers as a product of their prime factors.

   a) 16

   b) 24

   c) 60

   d) 72

3. Prime factorise the following numbers and write the answer in power form.

   a) 15

   b) 34

   c) 48

   d) 105

Finding prime factorised numbers.

Examples

What number has been prime factorised to give;

a) $\{2_1, 2_2, 3_1\}$

= 2 x 2 x 3

= 4 x 3

=12

b) 2 x 3 x 3 x 5

= 6 x 15

= 90

c) $2^2 \times 3^2 \times 5$

= 2 x 2 x 3 x 3 x 5

= 4 x 9 x 5

= 36 x 5

= 180

Activity

1. Find the numbers whose prime factors are shown below.

   a) $\{2_1, 2_2, 2_3, 5_1\}$

   b) $\{3_1, 3_2, 7_1\}$

   c) 2 x 3 x 3 x 5

   d) $3_1, 5_1, 7_1$

   e) $2^3 \times 3 \times 5$

   f) $2^2 \times 3^2 \times 5$

2. Find the value of k.

a) $K = \{3 \times 5 \times 13\}$ b) $k = 3^2 \times 5^2 \times 7$ b) $k = \{2_1, 3_1, 7_1\}$

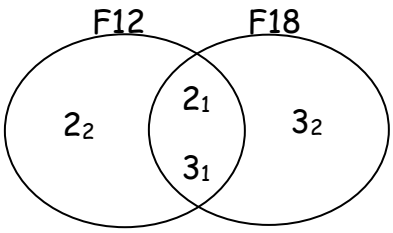
Representing prime factors on Venn diagrams

Example I

1. a) Represent the prime factors of 12 and 18 on a Venn diagram.

2	12
2	6
3	3
	1

2	18
3	9
3	3
	1



a) Find the GCF of 12 and 18.

G.C.F = product of $F_{12} \cap F_{18}$

$F_{12} \cap F_{18} = \{2_1, 3_1\}$

$\therefore G.C.F = 2 \times 3$

$= 6$

b) Work out the LCM of 12 and 18

Product of $F_{12} \cup F_{18}$

$F_{12} \cup F_{18} = \{2_1, 2_2, 3_1, 3_2\}$

$= 2 \times 2 \times 3 \times 3$

$= 4 \times 9$

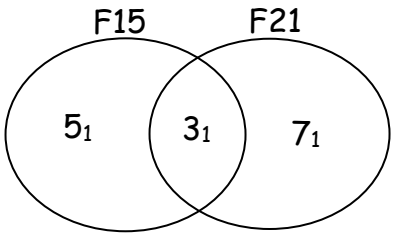
$= 36$

Example 2

2. a) Prime factorise 15 and 21 and show the prime factors on the Venn diagram.

3	15
5	5
	1

3	21
7	7
	1



b) Find the GCF of 15 and 21.

$F_{15} \cap F_{21} = \{3_1\}$

GCF = 3

b) Work out the LCM of 15 and 21

$F_{15} \cup F_{21} = \{3_1, 5_1, 7_1\}$

$= 3 \times 5 \times 7$

$= 15 \times 7$

$= 105$

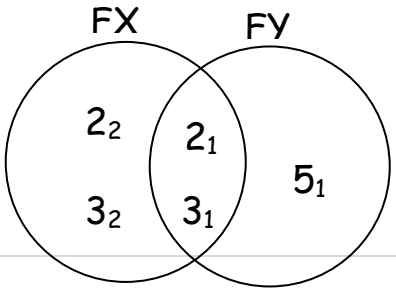
Activity

1. Prime factorise 10 and 20
   a) Show the prime factors of 10 and 20 on a Venn diagram.
   b) Calculate the GCF of 10 and 20
   c) Work out the LCM of 10 and 20.
2. Given the numerals 30 and 40.
   a) Show the prime factors of 30 and 70 on a Venn diagram.
   b) Work out the GCF of 30 and 70
   c) Calculate the LCM of 30 and 70.
3. Prime factorise 60 and 72.
   a) Represent the prime factors of 60 and 72 on a Venn diagram.
   b) Calculate the GCF of 60 and 72.
   c) Find the LCM of 60 and 72.

Finding the unknown number given prime factors on a Venn diagram

Examples

1. Study the Venn diagram below carefully and use it to answer questions that follow.



a) Find the value of x.

$FX = \{2_1, 2_2, 3_1\}$

$X = 2 \times 2 \times 3$

$X = 4 \times 3$

$X = 12$

b) Find the value of y

$Fy = \{2_1, 3_1, 5_1\}$

$Y = 2 \times 3 \times 5$

$y = 6 \times 5$

$y = 30$

c) Find the LCM of X and Y.

$LCM = 2 \times 2 \times 3 \times 5$

$= 4 \times 15$

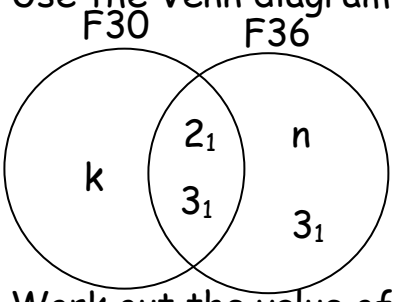
$= 60$

d) Work out the GCF of X and Y

$GCF = 2 \times 3$

$= 6$

2. Use the Venn diagram below to answer the questions that follow



a) Work out the value of n.

$n \times 3 \times 3 \times 2 = 36$

$18n = 36$

$\frac{18n}{18} = \frac{36}{18}$ (2)

(1) (1)

$n = 2$

a) Find the value of k.

$K \times 2 \times 3 = 30$

$6k = 30$

$\frac{6k}{6} = \frac{30}{6}$ (1) (5) (1) (1)

$K = 5$

b) Find the LCM of 30 and 36

$LCM = 2 \times 3 \times 2 \times 3 \times 5$

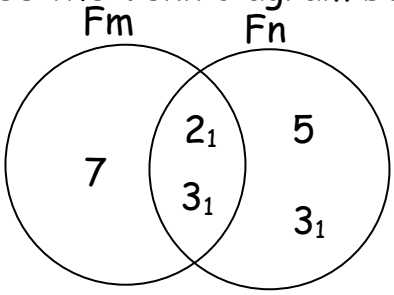
$= 6 \times 6 \times 5$

$= 36 \times 5$

$= 180$

Activity

1. Use the Venn diagram below to answer the questions that follow.



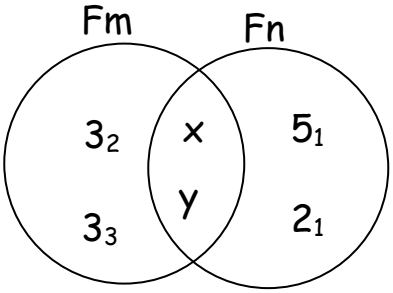
a) Find the value of;

i) m

ii) n

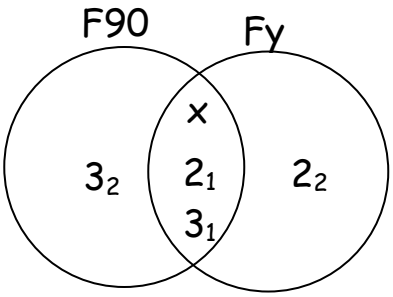
b) Work out the LCM and GCF of m and n.

2. Study the Venn diagram below carefully and use it to answer the questions that follow.



a) Find the value of;
   iii) x
   iv) y
b) Work out the LCM and GCF of m and n.

3. Use the Venn diagram below to answer the questions that follow.



a) Find the value of;
   v) x
   vi) y
b) Work out the LCM and GCF of x and y.

4. The intersection set for two numbers A and B is $\{2_1, 3_1\}$. If A - B $=\{2_2, 3_2\}$ and B-A = $\{5_1\}$.

   a) Find the value of A

   b) Find the value of B

   c) Find the LCM of A and B

   d) Workout the GCF of A and B

Squares and square roots of whole numbers

A square number is got by multiplying a number by its self.

A square root is a number that is multiplied by its self to give a square number.

In 2 x 2 = 4, 2 is the square root of 4 and 4 is the square of 2.

The symbol for square root is √

Example

1. Find the square of:

a) 7
$7^2 = 7 \times 7$
$= 49$

b) 13
$13^2 = 13 \times 13$
$= 169$

b) 18
$182 = 18 \times 18$
$=324$

2. Find the square root of;

a) 36

2	36
2	18
3	9
3	3
	1

$\sqrt{36} = \sqrt{(2x2)x(2x3)}$

$\sqrt{36} = 2 \times 3$
$= 6$

b) 196

2	196
2	98
7	49
7	7
	1

$\sqrt{196} = \sqrt{2 \times 2 \times 7 \times 7}$
$= 2 \times 7$
$= 14$

3. Find the square root of 100

$\sqrt{100} = \sqrt{(2x2)x(5x5)}$

$= 2 \times 5$

$= 10$

2	100
2	50
5	25
5	5
	1

Activity

1. Work out the square of the following

a) 11 b) 15 c) 20 e) 47 f) 114

2. Calculate the square root of the following.

a) 64 b) 121 c) 144 d) 324 e) 625 f) 1600

3. Calculate the area of a square whose side measures ;

a) 14 cm c) 22m e) 41 dm

b) 17 cm d) 21m f) 103 dm

Squares and square roots of fractions.

Examples

1. Find the square of the following numbers.

a) $\frac{2}{3} = \frac{2}{3} \times \frac{2}{3}$

$= \frac{4}{9}$

b) $2\frac{2}{3} = 2\frac{2}{3} \times 2\frac{2}{3}$

$= \frac{8}{3} \times \frac{8}{3}$

$= \frac{64}{9}$

$= 7\frac{1}{9}$

c) $2.5 = (2.5)$

$= \frac{25}{10} \times \frac{25}{10}$

$= \frac{625}{100}$

$= 6.25$

2. Find the square root of the following.

a) $\frac{9}{16} = \sqrt{\frac{9}{14}}$

$= \frac{\sqrt{9}}{\sqrt{16}}$

$= \frac{3}{4}$

b) $\sqrt{12\frac{1}{4}}$

$= \sqrt{\frac{49}{4}}$

$= \frac{\sqrt{49}}{\sqrt{4}}$

$= \frac{7}{2}$

1

c) $2.25 = \sqrt{2.25}$

$= \sqrt{\frac{225}{100}}$

$= \frac{\sqrt{225}}{100}$

$= \frac{15}{10}$

$= 1.5$

Activity

1. Find the square of the following.

a) $\frac{5}{7}$ b) $\frac{14}{17}$ c) $3\frac{4}{9}$ d) $1\frac{23}{27}$ e) 0. 3 f) 0. 36

g) 1.69 h) 0.04 i) 0.0025

Application of square roots

Examples

1. Find the value of p in $p^2 = 36$.

$P^2 = 36$

$\sqrt{P^2} = \sqrt{36}$

$P = 6$

2. The area of a square room is $400m^2$. Calculate the length of its side.

Side x side = area

$S^2 = 400m^2$

$\sqrt{S^2} = \sqrt{400}$

$S = 20m$

Activity

1. Solve for the unknowns;

a) $r^2 = 196$ c) $q^2 = 361$

b) $K^2 = 256$ c) $n^2 = 441$

2. Calculate the length of the side of a square whose area is;

a) $64\ cm^2$ c) $289cm^2$

b) $900m^2$ d) $576dm^2$

3. Given that a = 3 and b= 4. Find the value of c if $c^2 = a^2 + b^2$.

4. Find the value of p if (p x p) = 81

Cube root of numbers

- A cube number is a number multiplied by itself twice.
- A number multiplied by itself twice to give a cube number is called a cube root.
- In 2 x 2 x 2 = 8, two is a cube root of 8 as eight is a cube number.
- The symbol of a cube root is $\sqrt[3]{}$

Examples

1. Find the cube root of 64

$\sqrt[3]{64}$

$=\sqrt[3]{(2x2x2)x(2x2x2)}$

= 2 x 2

= 4

2	64
2	32
2	16
2	8
2	4
2	2
	1

2. Solve for r: $r^3 = 125$

$\sqrt[3]{r^3} = \sqrt[3]{125}$

$r = \sqrt{(5x5x5)}$

r = 5

5	125
5	25
5	5
	1

3. Calculate the length of the side of a cube whose volume is $27cm^3$

S x S x S = V

$S^3 = 27cm^3$

$\sqrt[3]{S^3} = \sqrt[3]{27cc}$

S = 3cm

3	27
3	9
3	3
	1

$= \sqrt[3]{(3x3x3)}$

=3

Activity

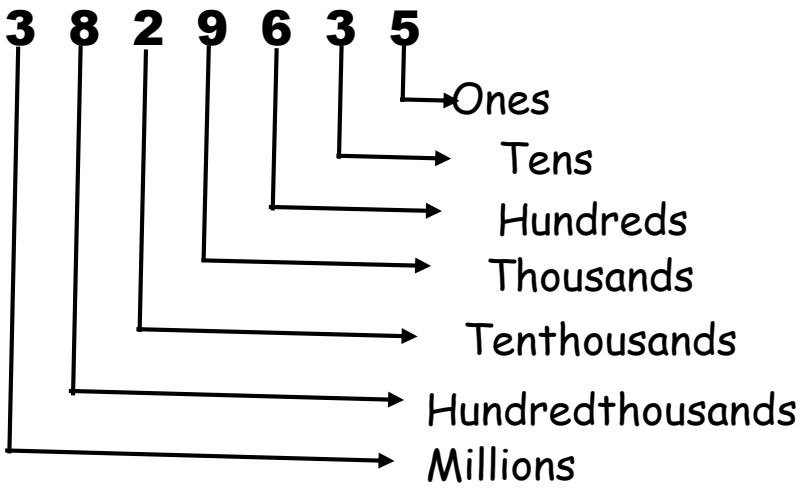
1. Given that $p^3 = 729$. Find the value of p.
2. Work out the cube root of;
   a) 343
   b) 512
3. Calculate the length of the side of a cube whose volume is;
   a) $1000cm^3$
   b) $216m^3$

TOPIC: WHOLE NUMBERS

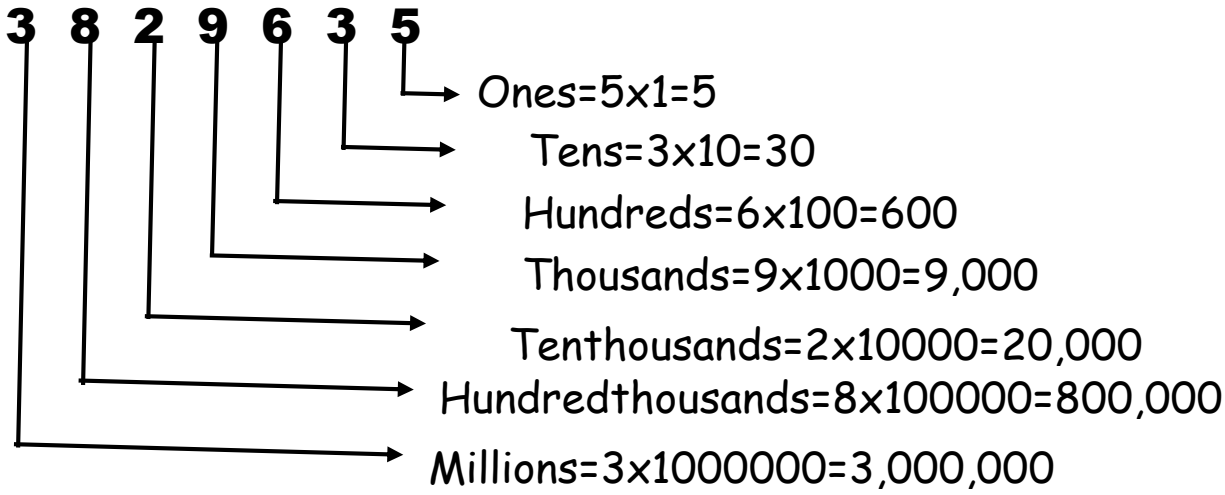
CONTENT: Finding place values and values

Examples

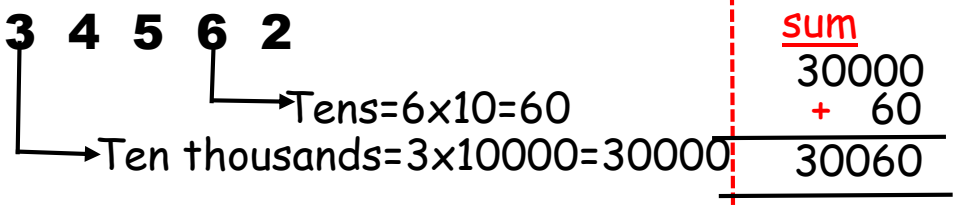
Identify the place value of each digit in the number below



Find the value of each digit in the number below



Find the sum of the values of 3 and 6 in the number 34562



sum

30000

\+ 60

30060

Find the product of the values of 4 and 6 in the number 4062

4 0 6 2

Tens=6x10=60

Thousands=4x10000=40000

Product

=40000 x 60

=240000

Find the product of the value of 8 and the place value of 3 in the number 53862

5 3 8 6 2

Hundreds=8x100=800

Thousands=1000

Product

=800 x 1000

=800000

ACTIVITY

1. Find the place value of each of the digits with a ring in the following numbers.

a) 4(7)6 5 b) (5)6 9 3 8 C) 4 0(6)5 7

2. Find the value of each of the digits with a ring in the following numbers.

a) 3(7)4 b) 4(2)5 8 9 c) (4)6 9 594

3. Find the sum of the values of 4 and 6 in the number 63478.

4. Workout the product of the values of 3 and 5 in the number 3765.

6. Represent the following numbers on an abacus.

a) 4302 b) 3205 c) 2520

TOPIC: WHOLE NUMBERS

CONTENT: Writing whole numbers in words and in figures

Examples

Write the following numbers in words

a) 8 2 9 6 3 5

Thousands	Units
829	635

829,635= Eight hundred twenty nine thousand six hundred thirty five.

b) 99035

Million	Thousands	Units
	99	035

99,035=Ninety nine thousand thirty five.

c) 40215

Million	Thousands	Units
	40	215

40,215=Forty thousand two hundred fifteen.

2.Write the following in figures

a) Forty nine thousand fifteen.

$$\begin{array}{r} 49000 \\ +15 \\ \hline 49015 \end{array}$$

b) Ninety six thousand forty.

$$\begin{array}{r} 96000 \\ +\ 40 \\ \hline 96040 \end{array}$$

Million	Thousands	Units
	3	048

3048=Three thousand forty eight.

ACTIVITY

1. Write the following numbers in words.

a) 4 7 6 5 b) 5 6 9 3 8 C) 40657 d) 55009

2. Write the following in figures.

a) Forty six thousand eighty five.

b) Seventy two thousand two hundred thirteen.

c) Nine hundred four thousand nineteen.

TOPIC: WHOLE NUMBERS

CONTENT: Forming numbers using digits

Examples

1.Given the digits 3,4,6 write down all the 3-digit numbers formed using the digits above.

=346,364,436,463,634,643

2.Given the digits 0,4,1 write down all the 3-digit numbers formed using the digits above.

=104,140,403,430

3. Given the digits 2,4,1 and6

a)Write down the smallest 4-digit number that can be formed using the above digits.

=1246

b)Write down the largest 4-digit number that can be formed using the above digits.

=6421

4. Given the digits 2,0,4 and1

a)Write down the smallest 4-digit number that can be formed using the above digits.

=1024

b)Write down the largest 4-digit number that can be formed using the above digits.

=4210

Activity

1.Given the digits 5,9and 6 write down all the 3-digit numbers formed using the digits above.

2.Given the digits 0,6and 7 write down all the 3-digit numbers formed using the digits above.

3. Given the digits 9,8,1 and2

a)Write down the smallest 4-digit number that can be formed using the above digits.

b)Write down the largest 4-digit number that can be formed using the above digits.

c)Find the sum of the smallest and the largest numbers formed.

4. Given the digits 3,8,0 and2

a) Write down the smallest 4-digit number that can be formed using the above digits.

b) Write down the largest 4-digit number that can be formed using the above digits.

c) Find the sum of the smallest and the largest numbers formed.

TOPIC: WHOLE NUMBERS

CONTENT: Writing whole numbers in expanded form using place values and values

Examples

1. Expand the following using place values

a.) 9812

TH	H	T	0
9	8	1	2

9812=(9x1000) + (8x100) + (1x10) + (2x1)

b) 23012

TTH	TH	H	T	0
2	3	0	1	2

=(2x10000) + (3x100) + (0x10) + (1x10)+ (2x1)

2. Expand the following using values

a) 927

H	T	0
9	2	7

=(9x100) + (2x10) + (7x1)

=900 + 20 + 7

b) 4812

TH	H	T	0
4	8	1	2

=(4x1000) + (8x100) + (1x10) + (2x1)

=4000 + 800 +10 + 2

Activity

1.Expand the following using place values.

a) 234 b) 3427 c) 7924

2.Expand the following using values.

a) 534 b) 7269 c) 68934

TOPIC: WHOLE NUMBERS

CONTENT: Writing whole numbers in expanded form using powers of ten

Examples

1 Expand the following using place values

a) 9812

10^3	10^2	10^1	10^0
9	8	1	2

$9812=(9\times10^3)+(8\times10^2)+(1\times10^1)+(2\times10^0)$

b) 23512

10^4	10^3	10^2	10^1	10^0
2	3	5	1	2

$=(2\times10^4)+(3\times10^3)+(5\times10^2)+(1\times10^1)+(2\times10^0)$

a) 927

10^2	10^1	10^0
9	2	7

$=(9\times10^2)+(2\times10^1)+(7\times10^0)$

Activity

1.Expand the following using powers of ten.

a) 234 b) 3427 c) 7924

c) 534 d) 7269 c) 68934

TOPIC: WHOLE NUMBERS

CONTENT: Rounding off whole numbers

Examples

1.Round 578 off to the nearest tens.

5 7 ~~8~~
+1 0
5 8 0

b) 3 6 4

3 6 ~~4~~
+0 0
3 6 0

2.Round 5378 off to the nearest hundreds

5 3 ~~7~~ ~~8~~
+1 0 0
5 4 0 0

b) 3 6 3 8

3 6 ~~3~~ ~~8~~
+0 0 0
3 6 0 0

3.Round 5378 off to the nearest thousands

2 5 ~~6~~ ~~7~~ ~~8~~
+1 0 0 0
2 6 0 0 0

b) 2 3 ~~9~~ ~~7~~ ~~8~~
+0 0 0 0
2 3 0 0 0

Activity

1.Round off the following to the nearest tens

a) 234 b) 3427 c) 7929

2.Round off the following to the nearest hundreds.

a) 534 b) 7269 c) 68934

3.Round off the following to the nearest thousands.

a) 8421 b) 8269 c) 12934

4.Round off 236578 to the nearest ten thousands.

TOPIC: **WHOLE NUMBERS**

CONTENT: Writing natural numbers in Roman Numerals

Basics of Roman Numerals

1	5	10	50	100	500	1000
L	V	X	L	C	D	M

4 =IV 40 =XL 400 =CD	6=VI 60=LX 600=DC	9=IX 90=XC 900=CM	2=II 20=XX 200=CC 2000=MM	3=III 30=XXX 300=CCC 3000=MMM

1.Convert 96 into Roman numerals

96 = 90 + 6

96= XCVI

2.Convert LIX in Hindu Arabic numerals

LIX = 50 + 9

= 59

Activity

1.Write the following numbers in Roman Numerals

a) 54 b) 49 c) 99 d) 955 e) 415

2.Write the following Roman Numerals into Hindu Arabic Numerals

a) LIX b) XCIX c) LXXXIV d) MDCIV

3.Alex is XLIX years old. Express his years in Hindu Arabic numerals

THEME: INTERPRETATION OF GRAPHS AND DATA.

TOPIC: DATA HANDLING.

Content: Collecting and presenting data in table form.

Example

Given the numbers 8, 2, 6, 4, 2, 1 and 2, represent the numbers on a table.

Number	tallies	Frequency
8	I	1
2	III	3
6	I	1
4	I	1
1	I	1

Evaluation activity

Represent the following numbers on a table;

a) 7, 8, 0, 7, 4, 2, 7, 5, 7 and 6
b) 6, 9, 6, 5, 2, 9, 1, 3, 9 and 6
c) 4, 7, 3, 2, 0, 4, 8, 2, 5 and 4
d) 8, 10, 15, 11, 8, 15, 11, and 15
e) 30, 50, 40, 20, 70, 40, 50 and 40
f) 45%, 50%, 60%, 45%, 50%, 80% and 50%
g) 90%, 60%, 70%, 85%, 90%, 50% and 40%
h) -2, 5, -6, -3, 5, -2, -8, -5 and -3
i) 9, -4, 0, -7, 8, -3, 3, 9, -1 and 7

Lesson 2

Finding range of ungrouped data and range of integers

Range is the difference between the highest and the lowest score.

Example.1. Given the following 2, 4, 6,7,8,3. Find the range.

Range = H – L

Range = 8 – 2

Range = 6

Example 2.Given the following -3, -5, -1, -9, -2 and -10. Find the range.

Range = H – L

Range = -1- (-10)

Range = -1 + 10

Range = 9

Evaluation activity

Find the range of the following numbers;

a) 7, 9, 8, 0, 5, 2 and 1 b) 8, 5, 7, 2, 3, 9, and 5

C) 30%, 90% 25% and 65% d) 6, 3, 8, 4, 9 and 7

e) -4, 9, -3, 8, -2, 0 and 4 f) -1, 3, -7, -3, -5 and 5

g) -5, 9, 0, 3, 5, -4 and 8 h) 60, 10, 80, 20 and 65

i) 70%, 90%, 30%, 65%, 95%, 20%, 40% and 25%

Lesson 3

Solving problems involving range

Example 1.The range of two numbers is 15, the smallest number is 9. Find the biggest number.

Highest – Lowest = Range

h – 9 = 15

h – 9 + 9 = 15 + 9

h = 24

Example 2.The range of two numbers is 5, the smallest number is -3. Find the biggest number.

Highest – Lowest = Range

h – (-3) = 5

h + 3 = 5

h + 3 – 3 = 5 – 3

h = 2

Evaluation activity

1. The range of two numbers is 12, the smallest number is 5. Find the biggest number.
2. The range of two numbers is 6, the smallest number is -2. Find the biggest number.

3. The range of two numbers is 7, the smallest number is -5. Find the biggest number.
4. The range of two numbers is 22, the biggest number is 15. Find the smallest number.
5. The range of two numbers is -2, the biggest number is -5. Find the smallest number.
6. The range of two numbers is -8, the smallest number is -4. Find the biggest number.

Lesson 4

Finding mode and modal frequency

Mode is the number/ figure/ score that appears more than the rest.

Or the number/ score with the highest frequency.

Modal frequency is the number of times the mode has appeared.

Example: Given the numbers 8, 2, 6, 4, 2, 1 and 2. Find;

a) Mode b) modal frequency

Number	tallies	Frequency
8	I	1
2	III	3
6	I	1
4	I	1
1	I	1

Mode = 2

Modal frequency = 3

Evaluation activity

Find the mode and the modal frequency of the following numbers;

a) 7, 9, 8, 0, 7, 2 and 1 b) 8, 5, 7, 2, 3, 9, and 5
C) 30%, 90% 25% and 30% d) 6, 3, 8, 4, 9 and 3
e) -4, 9, -3, 8, -2, 0 and -4 f) -1, 3, -7, -3 and 3
g) -5, 9, 0, 3, 5, -4 and 8 h) 60, 10, 80, 20 and 60
i) 25%, 90%, 30%, 65%, 25%, 20%, 40% and 25%

Lesson 5

Finding the median of ungrouped data and integers

Median is the middle number after arranging the data in ascending or descending order.

Example: 1. Find the median of 4,2,6,7,8,9,3

=②③④,6,⑦⑧⑨

Median = 6

Example: 2. Find the median -3, -9, 7, 4, -1, -4, 5

= -9, -4, -3, -1, ④⑤⑦

Median = -1

Evaluation activity

Find the median of the following numbers;

a) 7, 9, 8, 0, 7, 2 and 1 b) 8, 5, 7, 2, 3, 9, and 5

C) 30%, 90% 25% and 30% d) 6, 3, 8, 4, 9 and 3

e) -4, 9, -3, 8, -2, 0 and -4 f) -1, 3, -7, -3 and 3

g) -5, 9, 0, 3, 5, -4 and 8 h) 60, 10, 80, 20 and 60

i) 25%, 90%, 30%, 65%, 25%, 20%, 40% and 25%

Lesson 6

Finding median of fractions

Example. Find the median of $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$ and $\frac{1}{5}$

$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$

$(\frac{1}{3} + \frac{1}{4}) \div 2$

$(\frac{(4x1)+(3x1)}{3x4}) \times \frac{1}{2}$

$\frac{4+3}{12} \times \frac{1}{2} = \frac{7}{12} \times \frac{1}{2}$

$= \frac{7}{24}$

Evaluation activity

Find the median of the following fractions;

1. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{12}, \frac{1}{5}$
2. $\frac{1}{2}, \frac{1}{5}, \frac{1}{3}, \frac{1}{6}, \frac{1}{7}$

3. $\frac{1}{2}, \frac{1}{6}, \frac{1}{8}, \frac{1}{3}$
4. $\frac{1}{2}, \frac{1}{3}, \frac{1}{5}, \frac{1}{10}$
5. $\frac{1}{2}, \frac{1}{9}, \frac{1}{3}, \frac{1}{4}$

Lesson 7

Solving problems involving median

Example: 1.The median of five consecutive counting numbers is 7. Find the numbers.

The numbers are; n, n+1, n+2, n+3 and n+4

The median = n+2,

n + 2 = 5

n + 2 – 2 = 5 – 2

n = 3

The numbers are; 3, 4, 5, 6 and 7

Example: 2.The median of five consecutive odd numbers is 9. Find the numbers.

The numbers are; n, n+2, n+4, n+6 and n+8

The median = n+4,

n + 4 = 9

n + 4 – 4 = 9 – 4

n = 5

The numbers are; 5, 7, 9, 11 and 13

Evaluation activity

1. The median of five consecutive counting numbers is 15. Find the numbers
2. The median of seven consecutive counting numbers is 19. Find the numbers
3. The median of five consecutive odd numbers is 11. Find the numbers.
4. The median of seven consecutive odd numbers is 17. Find the numbers.
5. The median of five consecutive even numbers is 14. Find the numbers.
6. The median of seven consecutive even numbers is 28. Find the numbers.
7. The median of five consecutive even numbers is 52. Find the numbers.
8. The median of nine consecutive even numbers is 92. Find the numbers.

Lesson 8

Calculating mean of ungrouped data and integers.

Mean is the result you get after dividing the sum of items by the number of items. It is also referred to as average or arithmetic mean.

$$\text{Mean} = \frac{\text{sum of items}}{\text{No.of items}}$$

Example: 1. Find the mean of 2, 4,7,2,8 and 1

$$\text{Mean} = \frac{\text{sum of items}}{\text{No.of items}}$$

$$= \frac{2+4+7+2+8+1}{6}$$

$$= \frac{24}{6}$$

$$= 4$$

Example 2. Find the mean of -3, -2, 9, -5, 7 and 6

$$\text{Mean} = \frac{\text{sum of items}}{\text{No.of items}}$$

$$= \frac{-3+-2+9+-5+7+6}{6}$$

$$= \frac{22-10}{6} = \frac{12}{6}$$

$$= 2$$

Evaluation activity

1. Find the mean of 3, 5, 7, 2 and 4
2. Find the mean of 7, 9, 2, 4, 5, 0 and 3
3. Workout the mean of 30%, 50%, 70%,40% and 30%
4. Find the mean of 30%, 50%, 80%, 30%, 10%and 40%
5. Workout the mean of -4, -6, -1, -6, 4 and -4
6. Find the mean of -3, -5, -1, 0, 8, 9 and 4

7. Workout the mean of -3, 6, -1,0, 7, -3 and 1
8. Workout the mean of 9, 0, 2, 6, 1, 7, 8, and 7
9. Find the mean 0f 9, 0,1, -4, 9, -5, 8 and -3
10. Find the mean of 3, 5, 7, 2, 3, 0 and 3

Lesson 9

Calculating mean of algebraic expressions

Example 1. Find the mean of 6, 4, 2a, 3a, and 5

$$\text{Mean} = \frac{\text{sum of items}}{\text{No.of items}}$$

$$= \frac{6+4+2a+3a+5}{5}$$

$$= \frac{6+4+5+2a+3a}{5}$$

$$\frac{15+5a}{5}$$

$$\frac{15}{5} \frac{+5a}{5}$$

$= 3 + a$ or $a + 3$

Example 2. Find the average of 4x +1, 5x and 14

$$\text{Average} = \frac{\text{sum of items}}{\text{No.of items}}$$

$$= \frac{(4x+1) + 5x + 14}{3}$$

$$= \frac{4x+ 5x+ 1+ 14}{3}$$

$$= \frac{9x + 15}{3}$$

$$= \frac{9x}{3} + \frac{15}{3}$$

$$= 3x + 5$$

Evaluation activity

1. Find the average of 3k +2, 7k and 13
2. Find the average of 8y +1 6y,2y and 14
3. Find the average of 4m +1, 5m and 14
4. Find the average of 3p +2, 2p + 3 and 10
5. Find the average of 2r, 7r, 0, r, 5 and 15

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Fountain pri. MTC. Bk 6, pg

Lesson 10

PROBLEMS ON AVERAGE.

Examples

1. The average of 3 numbers is 12. What is the sum of the three numbers?

$$\text{Average} = \frac{\text{sum of items}}{\text{No.of items}}$$

$$\frac{12}{1} = \frac{\text{sum of items}}{3}$$

$$12 \times 3 = \text{sum of items}$$

36 = sum of items.

2. The average of 3, 0, 7 and x is 4 what is the value of x.

$$\text{Average} = \frac{\text{sum of items}}{\text{No of items}}$$

$$\frac{3+0+7+x}{4} = \frac{4}{1}$$

$$\frac{10+x}{4} = \frac{4}{1}$$

$$10 + x = 16$$

$$10 - 10 + x = 16 - 10$$

$$X = 6$$

Evaluation activity

1. The average age of 3 people is 18 years. The average age of 2 of them is 15 years, how old is the third person?

2. The average height of 4 people is 3m. When the height of the 5^{th} is added, their average height becomes 4m.Find the height of the fifth person.

3. The average weight of 3 pupils is 12kg. When one pupil joins the group, the average becomes 15kg.Find the total weight of all the pupils.

4. The average age of 5 children is 25years. When 2 children leaves the group, the average becomes 15years. Find the total age of the remaining pupils.

5. The average weight of four pupils 7kg and the average weight of six other pupils is 12kg. Find the average weight of all the pupils.

6. The average weight of 9 pupils 15kg and the average weight of six other pupils is 13kg. Find the average weight of all the pupils.

Lesson 11

Finding mean, median, mode, modal frequency and range.

Example: The table below shows the age of children

Age in years	9	11	12	13	8
Number of children	2	1	4	1	1

a) How many children were recorded in the table?

= 2+1+4+1+1

= 9 children.

b) Find the modal age

Modal age is 12

c) Find the range

Range = H – L

= 18 – 9

= 9

d) Find the mean

Mean = $\frac{sum\ of\ items}{\text{no.of items}}$

= $\frac{(9\times2)+(11\times1)+(12\times4)+(13\times1)+(18\times1)}{2+1+4+1+1}$

= $\frac{18+11+48+13+18}{9}$

= $\frac{108}{9}$

= 12

e) Median 9,9,11,12,12,12,12,13,18

Median = 12

Evaluation activity

1. The table below shows the marks scored by P.6 pupils in a test. Use it to answer the questions about it.

Marks	60	90	80	70	70
Number of pupils	2	2	3	1	2

Find;

a) The number of pupils who did the test
b) The mode
c) The modal frequency
d) The median
e) The mean

2. The table below shows the marks scored by P.6 pupils in a test. Use it to answer the questions about it.

Marks	70	50	90	40	80
Number of pupils	2	1	1	2	4

Find;

a) The number of pupils who did the test
b) The mode
c) The modal frequency
d) The median
e) The mean

3. The table below shows the marks scored by P.6 pupils in a test. Use it to answer the questions about it.

Marks	90	80	80	40	50
Number of pupils	1	2	1	4	2

Find;

a) The number of pupils who did the test
b) The mode
c) The modal frequency
d) The median
e) The mean

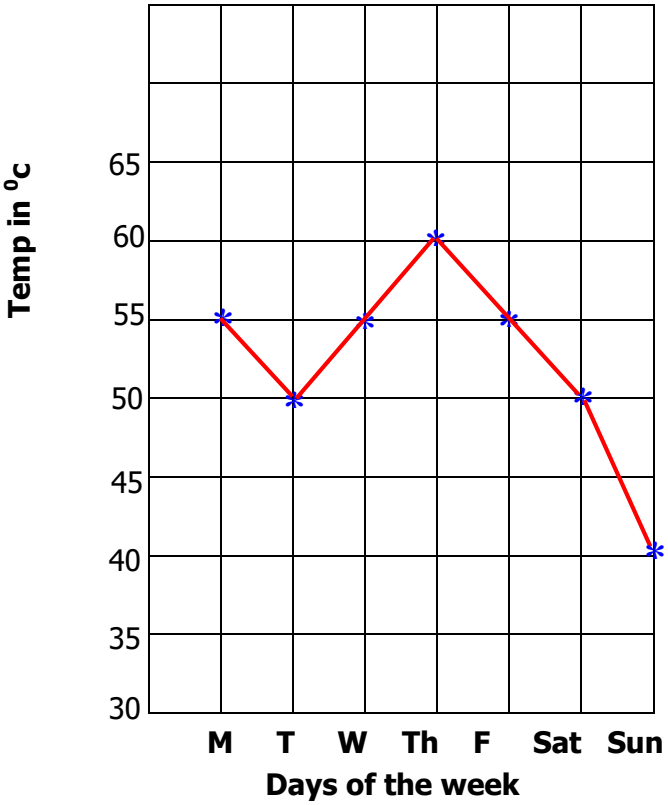
Lesson 12

Presenting and interpreting data using line graphs

A line graph is where the information plotted on a graph is marked and the required point is indicated with a star, thereafter joined by a thick line.

Line graphs display information or data that change continuously over time.

Example The graph below shows the midnight temperatures for the days of the last week.



QUESTIONS

i) Which day had the lowest midnight temperature?

= Sunday

ii) Give three days which had the same midnight temperatures.

= Monday, Wednesday and Friday

iii) What was the midnight temperature of Thursday?

= 60^0c

iv) Which day had the highest midnight temperature?

= Thursday

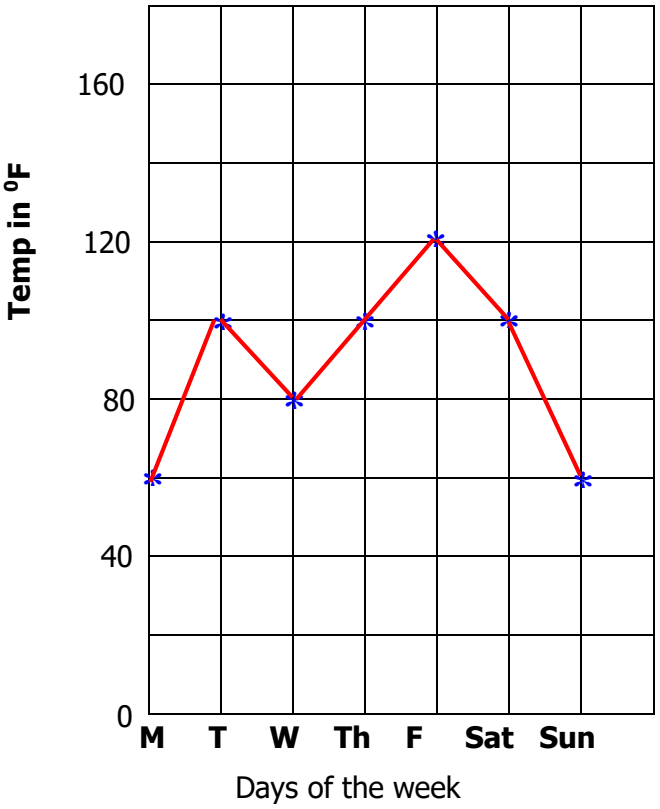
v) Find the range of the temperatures.

Range = H- L

Range = 60^0c – 40^0c Range = 20^0c

Evaluation activity

1. The graph below shows the temperatures for the days of the last week.



QUESTIONS

i) Which day had the lowest temperature?

ii) Give three days which had the same temperatures.

iii) What was the temperature of Thursday?

iv) Which day had the highest temperature?

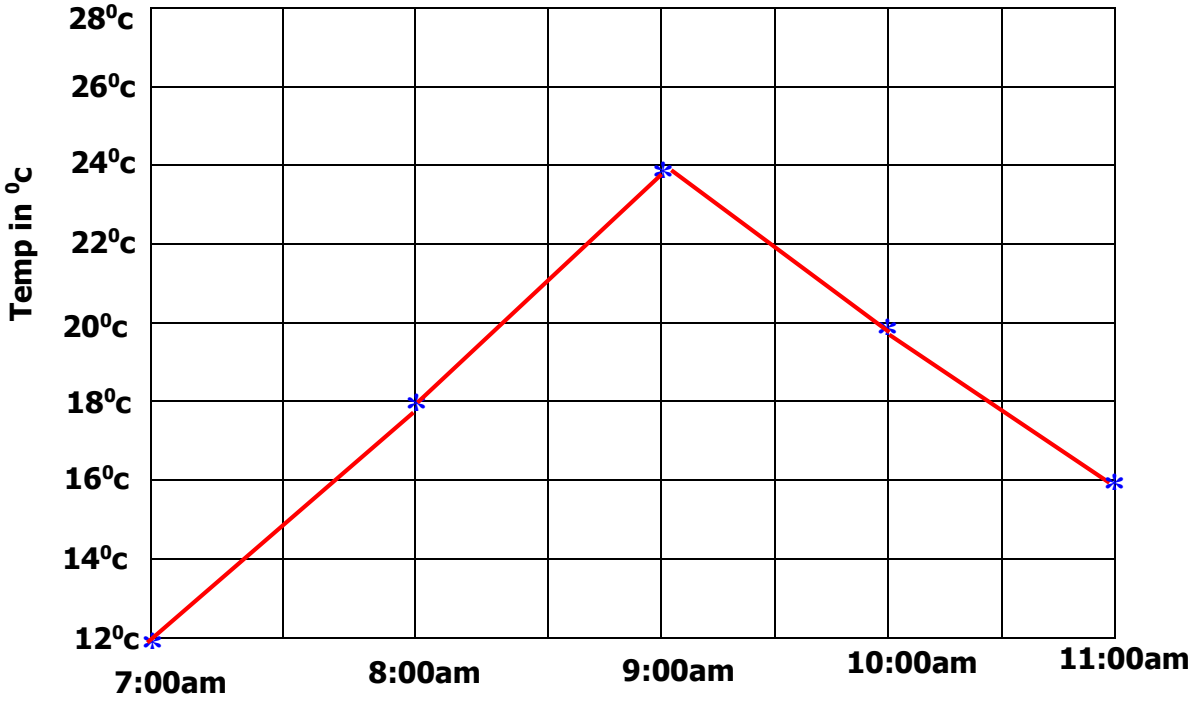
v) Find the range of the temperatures.

vi) Find the median temperature.

vii) Workout the mean of temperature.

viii) Find the mode

2. Use the graph below to answer the questions about it.



Questions

a) Which day had the lowest temperature?

b) What was the temperature at 10:00am?

c) Which day had the highest temperature?

d) Find the range of the temperatures.

e) Find the median temperature.

f) Workout the mean of temperature.

g) Find the mode

Lesson 13: PIE- CHARTS

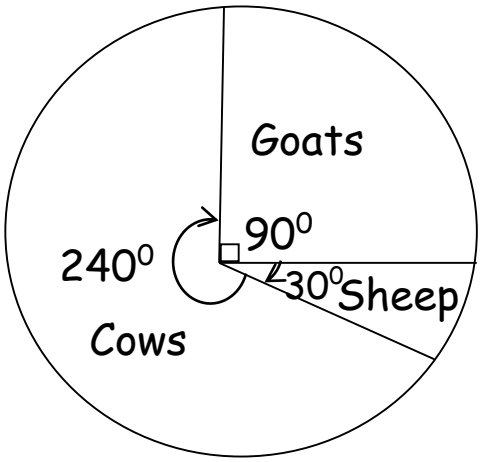
Drawing data on pie charts

A Pie- chart is also known as a circle graph.

It represents one complete whole in terms of fractions, 360^0 in terms of angles and 100% in terms of percentages.

Example: 1. On a farm $\frac{2}{3}$ of the animals are cows , $\frac{1}{4}$ are goats and $\frac{1}{12}$ of them are sheep. Construct a pie chart to show the above information

Cows = $\frac{2}{3}$ × 360° = 2 x 120^0 = 240^0 Goats = $\frac{1}{4}$ ×360° = 90^0	Sheep = $\frac{1}{12}$ ×360° = 30^0



2. The table below shows the number of books in the school library.

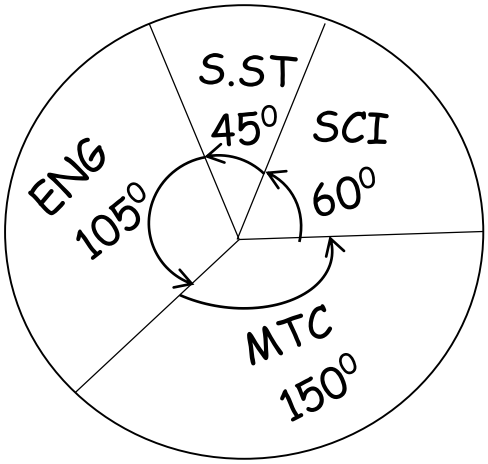
Subject	MTC	ENG	SCI	S.ST
No. of books	50	35	20	15

Represent the above information on the pie chart

Total no. of books 50 + 35 + 20 + 15

= 120

MTC = $\frac{50}{120}$ × 360° = 5 x 30^0 = 150^0	SCI = $\frac{20}{120}$ ×360° = 60^0
ENG = $\frac{35}{120}$ ×360° = 105^0	S.ST = $\frac{15}{120}$ × 360° = 45^0



3. The table below represents how Mr. Mirundi spends his salary.

Items	Car expense	School fees	Others	Saving
Percentages	15%	20%	x	15%

a) Find the value of x

X +15%+ 20%+ 10% +15% = 100%

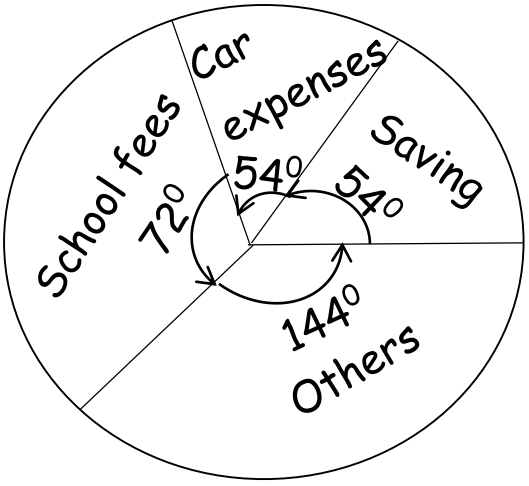
X +60% = 100%

X+ 60% - 60% = 100% - 60%

X = 40%

b) Draw a pie chart to represent the information above.

Car expense = $\frac{15}{100}$ × 360° = 3 x 18^0 = 54^0	others = $\frac{40}{100}$ ×360° = 144^0
School fees. = $\frac{20}{100}$ ×360° = 72^0	Saving = $\frac{15}{100}$ × 360° = 54^0



Evaluation activity

1. On a farm $\frac{1}{4}$ of the animals are sheep , $\frac{1}{8}$ are goats and $\frac{5}{8}$ of them are cows. Construct a pie chart to show the above information (use radius 4.5cm)

2. The table below shows the number of books in the school library.

Subject	MTC	ENG	SCI	S.ST
No. of books	60	30	50	40

Represent the above information on the pie chart (use Radius 5cm)

3. The table below represents how Mr. Mirundi spends his salary.

Items	Rent	School fees	Others	Saving
Percentages	35%	10%	k	25%

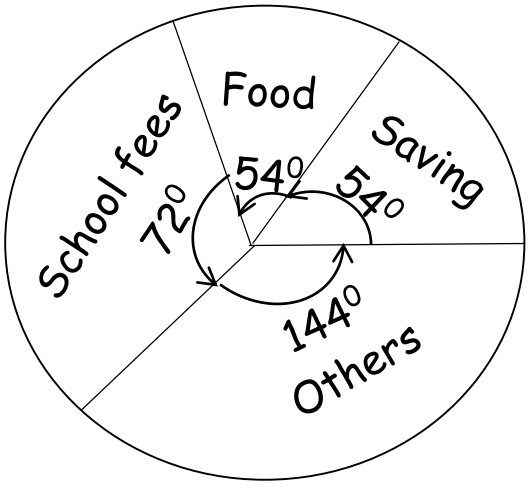
a). Find the value of k

b). Draw a pie chart to represent the information above.

Lesson 14

Interpreting data presented on pie charts

Example. The pie- chart shows how a man spends sh. 24000.



a) How much money is spent on each item?

School fees = $\frac{72}{360}$ × sh.24, 000 = 2 x sh. 2,400 = sh. 4,800	Food = $\frac{54}{360}$ × sh. 24, 000 = 6 x sh.600 = sh. 3,600
Saving. = $\frac{54}{360}$ × sh.24, 000 = 6 x sh. 600 = sh. 3,600	Others = $\frac{144}{300}$ x sh.24, 000 = 48 x sh.200 = sh. 9,600

b) Find the fraction for school fees.

$= \frac{72}{360}$

$= \frac{1}{5}$

c) What percentage of the total represents food?

$= \frac{54}{360} \times 100\%$

$= 15\%$

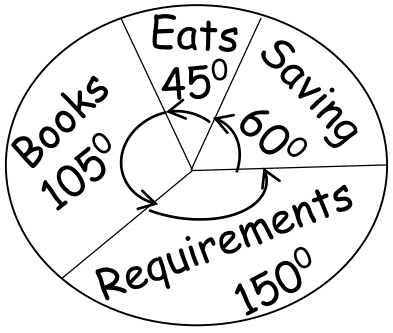
d) .How much more is spent on others than on saving?

= sh. 9,600 - sh. 3,600

= sh. 6,000 more

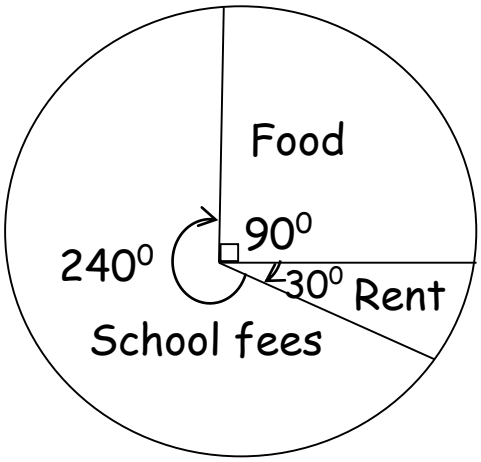
Evaluation activity

1. The pie- chart shows how a pupil spends his pocket money of sh. 36,000.



a) How much money does he spend on each item?
b) What fraction does he spend on eats?
c) What percentage represents saving?
d) How much more is spent on requirements than on books?

2. The pie- chart shows how a nurse spends her monthly of sh. 360,000

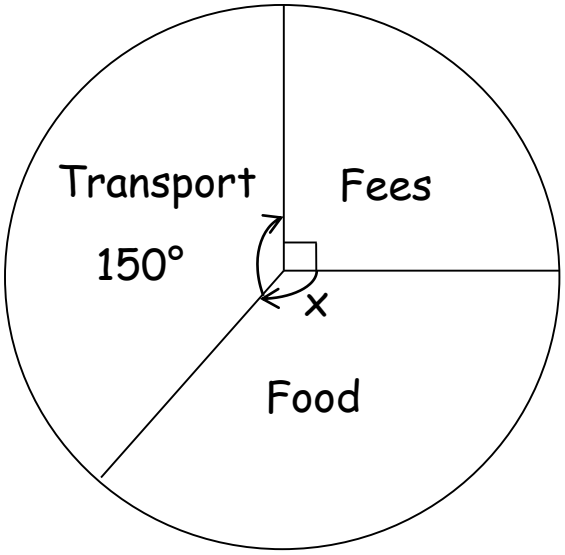


a) How much money does she spend on each item?
b) What fraction does she spend on rent?
c) What percentage represents food?
d) How much more is spent on school fees than on rent?

Lesson 15

Solving real life situations using pie charts

Example.1 The pie chart below shows Mugisha's monthly expenditure if he earns sh. 72000. Study it carefully and use it to answer the questions about it



a) Find the value of x

$x + 90° + 150° = 360°$

$x + 240° = 360°$

$x + 240° - 240° = 360° - 240°$

$x = 120°$

b) How much does he spend on transport?

$= \frac{90°}{360°} \times 72000$

$= 90 \times 200$

= Sh. 18000

or

360° 72000

1° rep..... $\frac{72000}{360°}$

sh 200

90° .....90 × sh. 200

Sh. 18000

c) How much is spent on fees than food?

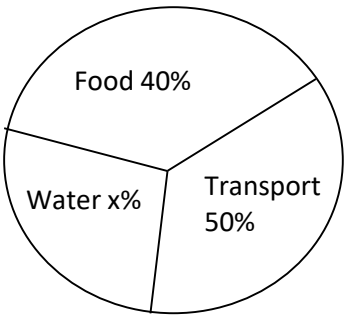
150° – 120° = 30°

$= \frac{30°}{360°}$ x sh 7200

= 30 x sh 200

= sh 6000

Example 2. The pie chart below shows how John spends sh 12000 in a day



a) Find the value of x

x + 40% + 50% = 100%

x + 90% = 100%

x + 90% - 90% = 100%-90%

x = 10%

b) Find how much spent food is:

Food; 40% of 1200

$\frac{40}{100}$ × 1200

= sh. 480.

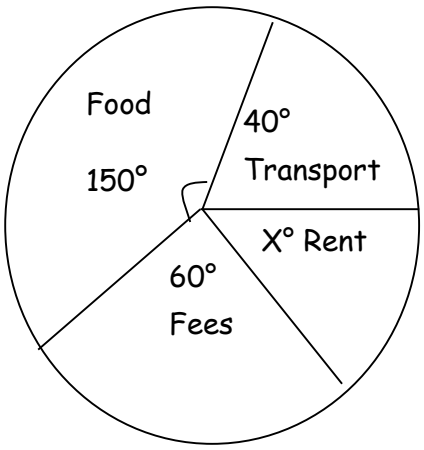
c) Find the angle sector transport.

50% = $\frac{50}{100}$ × 360°

= 180°

APPLICATION OF PIE CHART.

1. The pie chart below shows how a family spends its income.



a) Find the value of x

$X + 60° + 40° + 150° = 360°$

$X + 100° + 150° = 360°$

$X + 250° = 360°$

$X + 250° - 250° = 360° - 250°$

$X = 110°$

b) If the family spends 24000 on fees, find the family's total income

Method 1

Let the total of income be y

$\frac{60}{360} \times y = 24000$

$36 \times \frac{6y}{36} = 24000 \times 36$

$\frac{6y}{6} = \frac{24000 \times 36}{6}$

$Y = 24000 \times 6$

$Y = sh\ 144000$

Method 2

Angle sector for fees = 60°

60° rep sh 24000

1° rep $\frac{sh\ 24000}{60}$

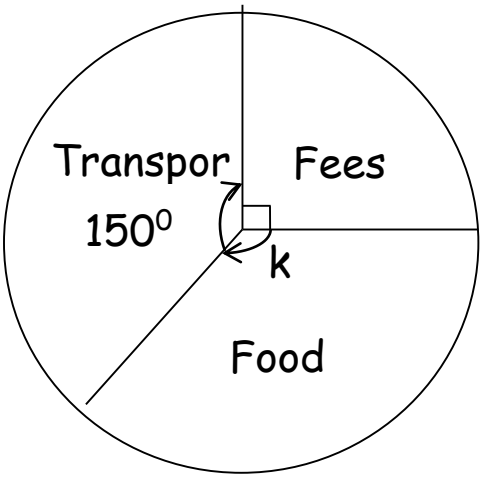
360° rep $\frac{sh24000}{60} \times 360$

$= 24000 \times 6$

= Sh. 144000

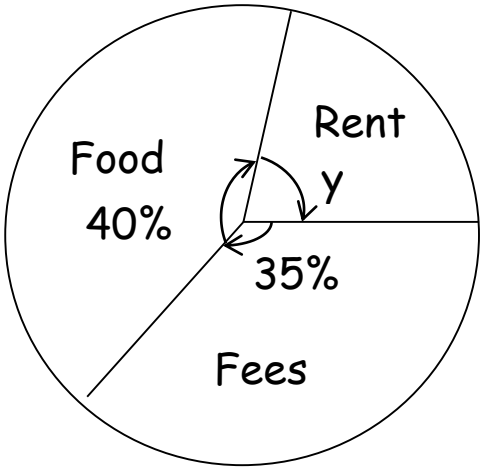
Evaluation activity

1. The pie chart below shows how a family spends its income.



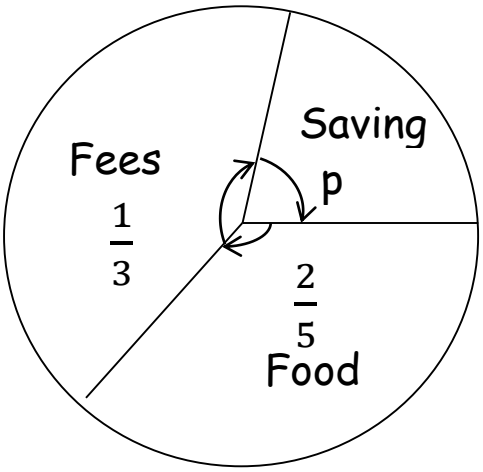
a) Find the value of k
b) If the family spends 24000 on fees, find the family's total income
c) Find the percentage for transport.

2. The pie chart below shows how Musa spends its income.



a) Find the value of y
b) If the family spends 240,000 on fees, find the family's total income
c) Find the fraction for fees.

3. The pie chart below shows how Doreen spends its income.



a) Find the fraction for P
b) If the family spends 180,000 on fees, find the family's total income
c) What percentage represents food?
d) How much more is spent on fees than on saving?

Lesson 16

Interpreting coordinate graphs

INTRODUCTION

Identifying lines of a coordinate graph

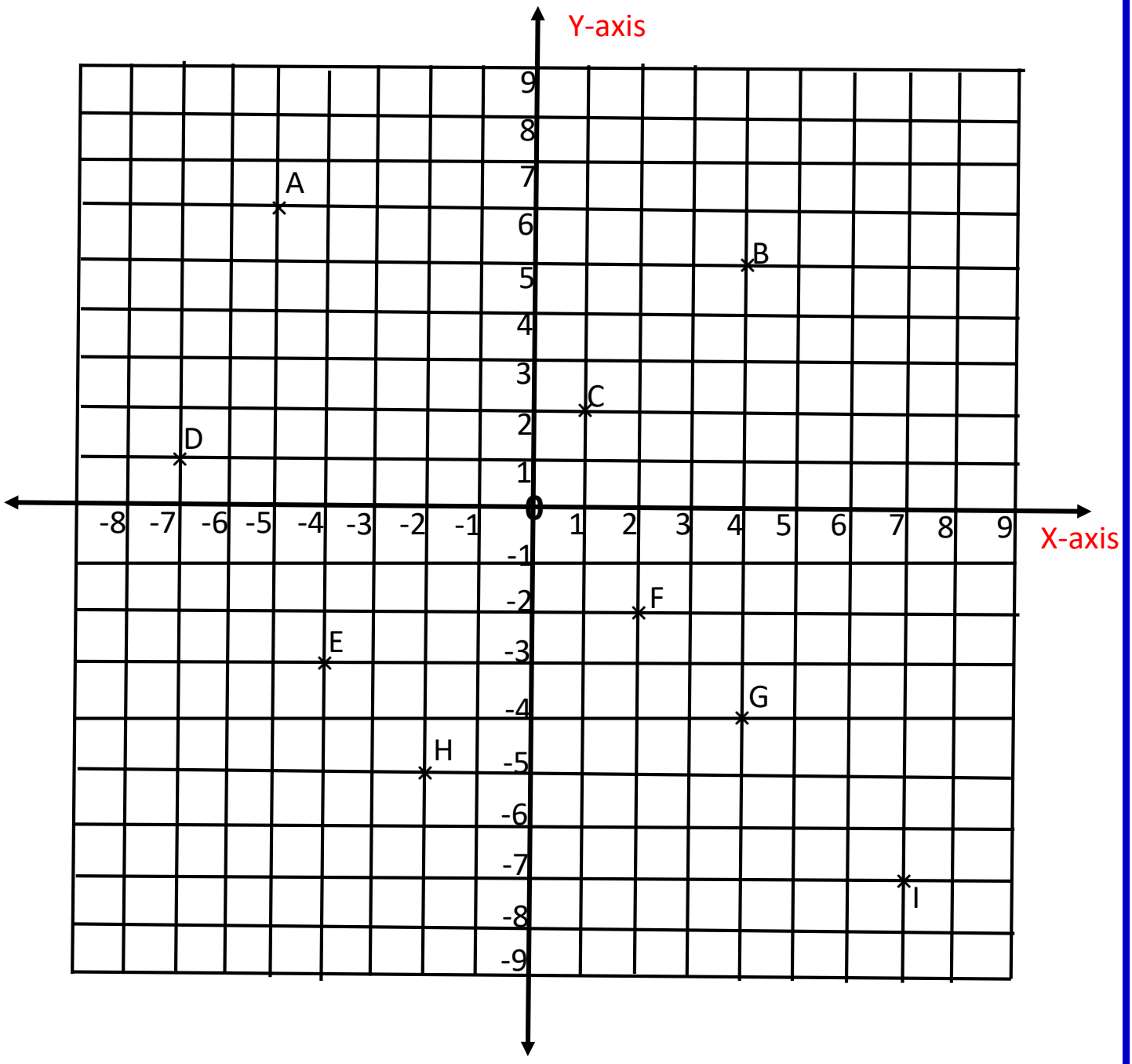
Note: -The horizontal axis is called x-axis and Vertical axis is called the y-axis

- We read from x-axis to y-axis
- Only ordinary brackets are used with no equal signs

Examples

Identify all possible lines on the grid below;

Write the coordinates of points A, B, C, D, E, F, G, H and I.



A (-5, 6), B (4, 5), C (1, 2), D (-7, 1)

Write the coordinates of the remaining points

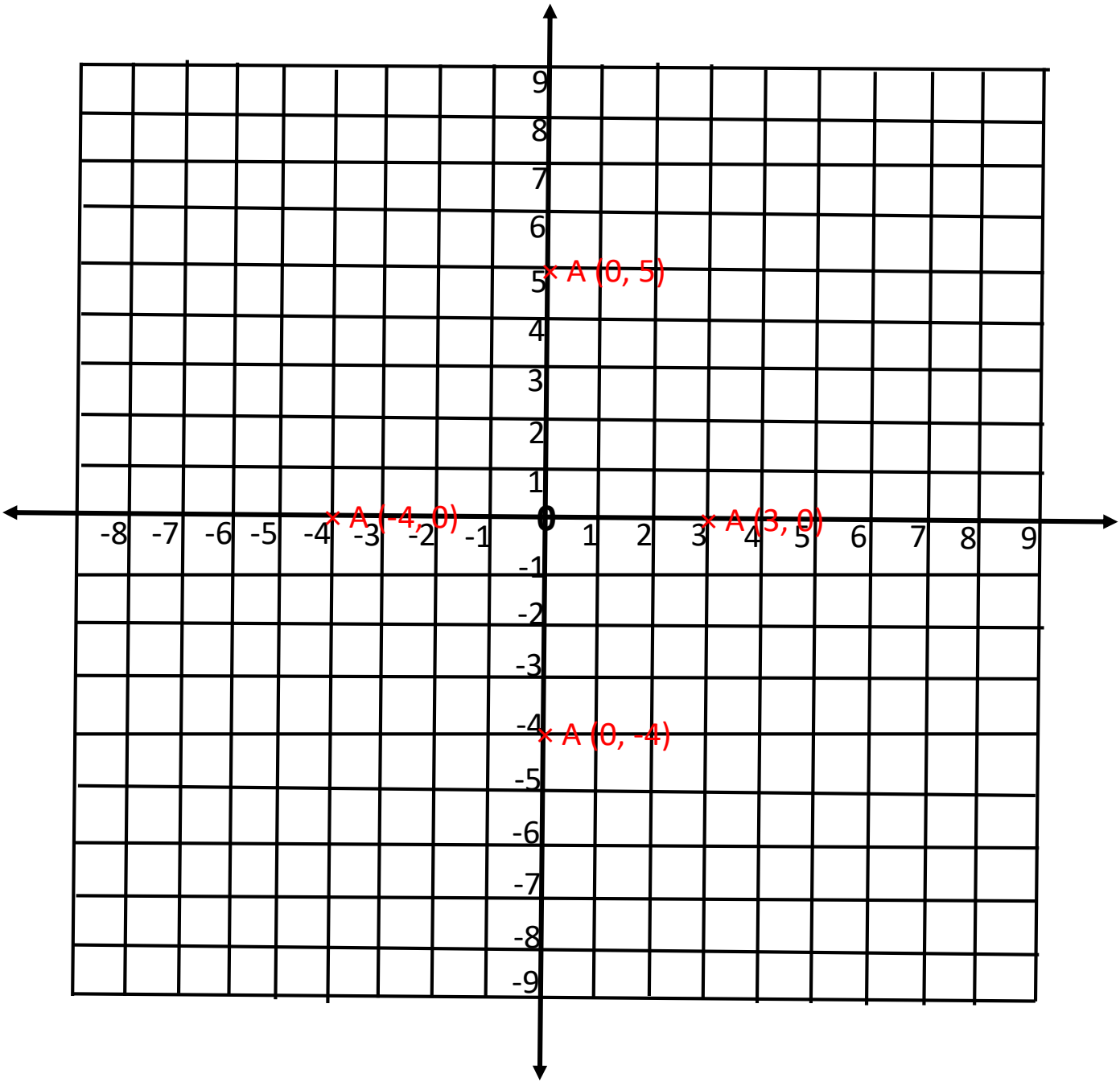
Lesson 17

Plotting coordinates on the grid ×

Plot the following point on a grid

A (0,5), B (0,-4) C(3,0), D (-4,0) E (-2,-2) F (-3,-5)

G (+2,-4), H (-5, +1), I (6, -4), J (5,-5), K (4,-2), L (-1,7)



Plot the remaining point on the coordinate graph.

REFERENCES

Fountain primary Maths Book 7 pages 177 to 198

MK Book 7 pages 164 to 188

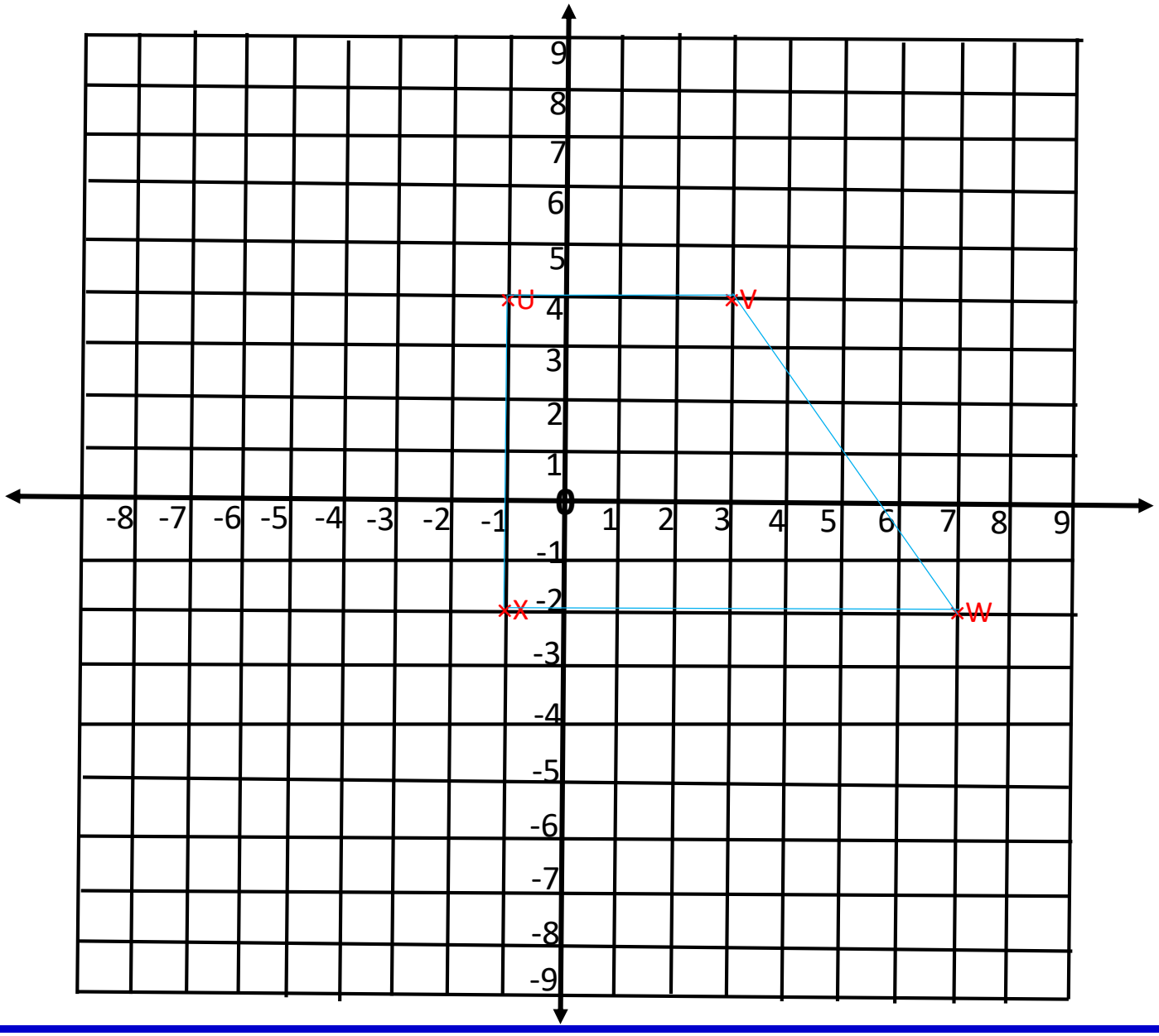
Understanding math Book 7 pages 153 to 189

Lesson 18

Forming figures on the grid and finding their area.

Example: On the grid below plot the following points

U (-1, 4), V (3, 4), W (7,-2) and X (-1,-2)



Join point U, to V, V to W, W to X and X to U and name the figure formed.

A trapezium

Find its area.

Area = $\frac{1}{2}$ h (a + b)

$\frac{1}{2}$ x 6units (4units + 8units)

3units x 12units

= 36square units

If each small square represents a cm, work out the area of the above figure

Area =$\frac{1}{2}$ h (a + b)

= 1 x6cm (4cm + 8cm)

= 3cm x 12cm

= 36cm^2

REFERENCES

Fountain primary Maths Book 7 pages 177 to 198

MK Book 7 pages 164 to 188

Understanding math Book 7 pages 153 to 189

Macmillan Book 7 pages 112 to 138

Evaluation activity

In each of the following questions;

a) Plot the coordinates
b) Join the points and form polygons
c) Name the polygon
d) Find the area of each of the polygons formed.

1. A(-3, 4), B(3, 4), C(3, -2), D(-3, -2)
2. P(7, 6), Q(1, 6), R(4, 1)
3. M(0, 5), N(-3, 3), O(3, 3), P(0, -8)
4. J(-1, 3), K(3, 3), L(-1, -1)

END OF DATA HANDLING

TOPIC: TIME (Primary six)

SUBTOPIC **THE 12 HOUR CLOCK SYSTEM**

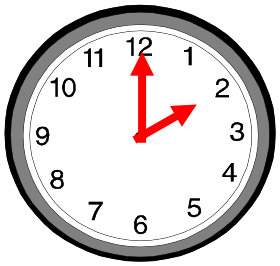
In this system, we use a.m and p.m to tell the time. We use a.m to tell the time after midnight and in the morning, then p.m. in the afternoon and evening.

Note.A new day begins at midnight

Telling time using a.m. and p.m.

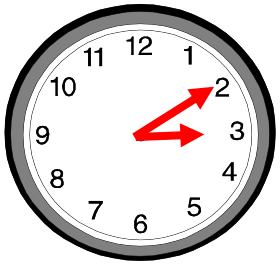
Examples.

1.What morning time is shown on the clock face below?.



It is 2 o'clock in the morning or It is 2:00 a.m.

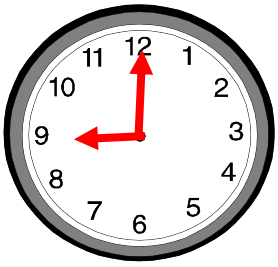
2.What afternoon time is shown on the clock face below?.

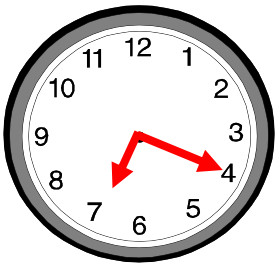


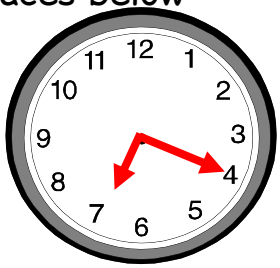
It is 3:10p.m. or it is 10minutes past 3 in the afternoon

Activity

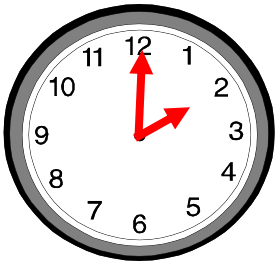
1.Write the morning time shown on the clock faces below

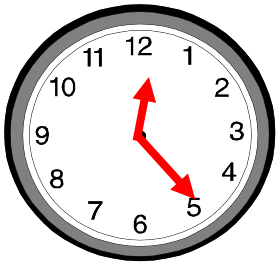


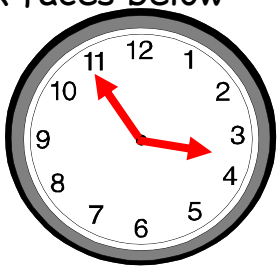




2.Write the afternoon time shown on the clock faces below







Ref.Mk. Book 5 pg 251, and Macmillan Primary maths pg. 165 – 166

3.Write the time below in words.

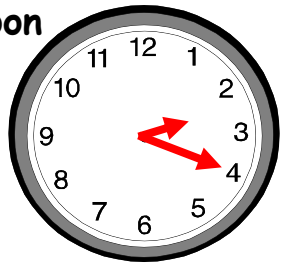
a) 8:10am – Ten minutes past eight in the morning.

b) 6:00 am

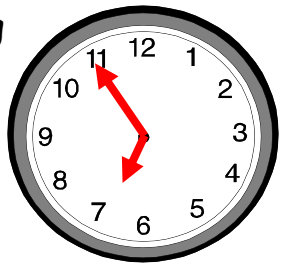
c) 3:52 pm

d) 9:35 pm

e) Afternoon



f) Morning



THE 24 HOUR CLOCK SYSTEM

In this system of telling time, we don't separate the time into am and pm. All the 24 hours of the day are written continuously using four digits ending with the word hours.

12 hour clock	24 hour clock
12:00 midnight	0000hrs
1:00 a.m	01 00 hrs
2:00 a.m	02 00 hrs
3:00 a.m	03 00 hrs
4:00 a.m	04 00 hrs
5:00 a.m	05 00 hrs
6:00 a.m	06 00 hrs
7:00 a.m	07 00 hrs

8:00 a.m	08 00hrs
9:00 a.m	09 00hrs
10:00 a.m	10 00hrs
11:00 a.m	11 00hrs
12:00 noon	12 00hrs
1:00pm	13 00hrs
2:oopm	14 00hrs
3:00pm	15 00hrs
4:00pm	16 00hrs
5:00pm	17 00hrs
6:00pm	18 00hrs
7:00pm	19 00hrs
8:00pm	20 00hrs
9:00pm	21 00hrs
10:00pm	22 00hrs
11:59pm	23 59hrs
12:00midnight	0000hrs

Changing morning time 12 hr clock to 24 hr clock

Examples

Note: When the 12 hr clock time is am the hours in the 24 clock system do not change a part from the morning of midnight Eg.
(1:00am = 0100hours) and (10:00am = 10 00 hours), implying that we just add 0000hours but (12:00am=0000hours), (12:45am=0045hours)

(a)Change 9:40am to 24 hour clock.

9:40am
+0000
0940hours

b) Change 11:35am to 24 hours clock system

11:35am
+0000
11 35hours

c) Change 12:35am to 24 hours clock system

12:35am
-12 00
00 35hours

Activity

1.Change the following into 24hour clock

a) 4:32am b) 6:55am c) 10:30am d) 11:48am

2.Change the following into 24hour clock

a) 12:32am b) 12:55am c) 12:30am d) 12:48am

Changing afternoon time 12 hr clock to 24 hr clock

Note: When changing afternoon time from 12hr clock to 24hr clock, we add 1200hrs apart from 12:00pm which remains as 1200hrs.

Examples

(a)Change 1:30pm to 24 hour clock .

1:30pm
+12 00
13 30hrs

b) Change 11:49pm to 24 hour clock .

11:49
+12 00
23 49hrs

c)Change 12:38pm to 24hr clock

12 38pm
+00 00
12 38hrs

d)Change 12:45pm to 24hr clock

12 45pm
+00 00
12 45hrs

Activity

1.Express the following into 24 hours clock system

(a)3:00pm b) 9:30pm c) 2:34pm d) 4:10pm e) 11:45pm

2.Express the following into 24 hours clock system

(a)3:00pm b) 9:30pm c) 2:34pm d) 4:10pm e) 11:45pm

Changing morning time from 24 clock system to 12 hour clock.

Note: For any time below 12 hours(before midday), we subtract 0000hrs when changing to 12hrs clock system, this time then becomes am but for midnight, we add 1200 hours and still the result will be in am.

Examples

1.Change 0243hrs to 12hr clock system.

02 43hrs
-00 00
2: 43am

2. Change 1145hrs to 12hr clock

11 45hrs
-00 00
11 45am

3.Change 0043hrs to 12hr clock system.

00 43hrs
+12 00
12: 43am

2. Change 0030hrs to 12hr clock

00 30hrs
+12 00
12 30am

Activity

1.Express the following into 12 hours clock system

(a)0300hrs b) 0930hrs c) 0234hrs d) 1010hrs e) 1145hrs

2.Express the following into 24 hours clock system

a) 0050hrs b) 0035hrs c) 0010hrs d) 0008hrs e) 0045hrs

Changing afternoon time from 24 clock system to 12 hour clock.

We subtract 12hours from any time above 1200hrs to change to 12 hour clock and the result will be in pm but the pm of midday does not change(subtract 0000hrs)

Examples

a)Change 1500hrs to 12 clock time.

1500hrs
-1200hrs
3:00pm

C) Change 1245hrs to 12hr clock system

1245hrs
-0000hrs
12:45pm

b)Write 2310 hours to a 12hrs clock.

2310hrs
-1200hrs
11:10pm

d) Change 1205hrs to 12hr clock

1205hrs
-0000hrs
12:05pm

Activity

1.Express the following into 12 hours clock system

1330hrs b) 1933hrs c) 2234hrs d) 1810hrs e) 2145hrs

2.Express the following into 24 hours clock system

b) 1250hrs b) 1235hrs c) 1210hrs d) 1208hrs e) 1245hrs

DURATION OF TIME

Duration means amount of time taken between different intervals.

Finding duration, starting time and ending time

Points to note:

>Duration= Ending time -Starting time

>Ending time= Starting time + Duration

>Starting time= Ending time - Duration

Examples

1. Luyiga started walking from her house at 7:15am and reached the town at 9:15am. How long did it take walking?

Duration= Ending time -Starting time

9: 15am
-7: 15am
2: 00hrs

She walked for 2hours

2.A fifty-minute lesson started at 9:40am. At what time did it end?

ET=ST + D

1
9:40am
+0:50
10:30am

40min + 50min=90min

90min=1hr30min

2.A forty five minutes lesson ended at 9: 20am.At what time did it start

(60+20)-45min

8 60
~~9~~:20am
-0:45
8:35am

80-45=35min

---

3. A meeting started at 10:40am and ended at 12noon.How long did it take?

(60-40) =20min

11 60
~~12~~:00
-10:40
1:20

1hour20min

Activity

1.Aforty-minute lesson started at 11:15am. At what time did it end?

2.A mathematics lesson started at 9:10am and ended at 9:50am.How long did it take?

3.A football which took 1hr and 30 min, started at 4:20pm. When did it end?

4.A birth day party started at 4:30pm and lasted $2\frac{1}{4}$ hours. At what time did end?

5.The first half of a football match ended at 5:25pm after being played for 45minutes.At what time did the match start?

6.A meeting started at 9:30am and lasted 50minutes. At what time did it end?

7.A party started at 5:15pm and lasted 100 minutes. At what time did it end?

8.A mathematics examination which took 2hours and 30 minutes, ended at 11: 00am.At what time did it start?

9.It started raining at 9:25am and it stopped at 2:00pm. For how long did it rain?

10.Musa went to sleep at 1930hours and did not wake up until 0830hours the following day. For how long did he sleep?

11.Alorry left Kampala at 11:15pm and reached Kasese at 5: 45am. How long did the journey take?

12.It started raining at 12:45pm and it stopped at 3:05pm. For how long did it rain?

Reference: MK Book 5 pg 252, Macmillan PR MATHS BK 5 pg. 166,

FINDING DISTANCE, SPEED AND TIME

Points to note

1. Distance=Speed x Time
2. Speed = $\frac{Distance}{Time}$
3. Time = $\frac{Distance}{Speed}$

Finding distance when given speed and time

Examples

1. John took 4hours to cover a certain distance at a speed of 30km/hr. What distance did he cover?

   Distance=Speed x Time

   $\frac{30km}{\cancel{hr}}$ x $4\cancel{hr}$

   = (30 x 4)km

   =120km

2.A bus travelling at a speed of 60km per hour, covered a distance from town X to town Y in $1\frac{1}{2}$hours. Calculate the distance between two towns.

Distance=Speed x Time

$= \frac{60km}{hr} \times 1\frac{1}{2}hr$

$=(\frac{30}{60} \times \frac{3}{2_1})km$

=(30 x 3)km

=90km

3.Acyclist travelled for 45minutes at a speed of 60km/hr. What distance did he cover?

Distance= Speed x Time

$\text{Distance}=\frac{1\ 60km}{hr} \times \frac{45}{60_1} hr$

Distance=(1x45) km

Distance=45km

Activity

1.A cyclist took 2hours to cover a certain distance at a speed of 50km/hr. What distance did he cover?

2.A bus travelling at a speed of 80km per hour, covered a distance from town A to town B in $2\frac{1}{2}$hours. Calculate the distance between two towns

3.Acyclist travelled for 45minutes at a speed of 120km/hr. What distance did he cover?

4.A motorist travelled for 40minutes at a speed of 90km per hour. What distance did he cover?

5.A taxi left town A for B at10:30am driving at a speed of 80km per hour. The driver reached town B at 2:00pm.

a) Calculate the time taken by the driver to reach town B.

b) Find the distance between town A and town B.

Finding time when given distance and speed

Examples

1.Calculate the time taken by a lorry to travel a distance of 120km at a speed of 60km/hr.

$$\text{Time} = \frac{\textit{Distance}}{\textit{Speed}}$$

$$\text{Time} = \left(\frac{\cancel{120}^{2}}{\cancel{60}_{1}}\right)\text{hrs}$$

Time = 2hours

2.How long can a bus travelling at a speed of 80km per hour take to cover a distance of 240km?

$$\text{.Time} = \frac{\textit{Distance}}{\textit{Speed}}$$

$$\text{Time} = \left(\frac{\cancel{240}^{3}}{\cancel{80}_{1}}\right)\text{hrs}$$

Time = 3hours

3.A lorry covered a distance of 90km at a speed of 60km/hr. Calculate the time the lorry took to cover that journey.

$$\text{Time} = \frac{\textit{Distance}}{\textit{Speed}}$$

$$\text{Time} = \left(\frac{\cancel{90}^{3}}{\cancel{60}_{2}}\right)\text{hrs}$$

$$\text{Time} = \frac{3}{2}\text{hrs}$$

$$\text{Time} = 1\frac{1}{2}\text{hrs}$$

Activity

1.Calculate the time taken by a lorry to travel a distance of 240km at a speed of 60km/hr.

2.How long can a bus travelling at a speed of 60km per hour take to cover a distance of 300km?

3.A lorry covered a distance of 150km at a speed of 60km/hr. Calculate the time the lorry took to cover that journey.

4.How long will a car take to cover a distance of 120km at a speed of 40km/hr

5.A motorist covered a distance of 90km at a speed of 120km/hr. How long did he take to cover that journey?

Finding speed when given time and speed

$$\text{Speed} = \frac{\textit{Distance}}{\textit{Time}}$$

Examples

1.Godon took 2hours to cover a distance of 36km on his bicycle. At what speed was he riding?

$$\text{Speed} = \frac{\textit{Distance}}{\textit{Time}}$$

$$\text{Speed} = \left(\frac{36}{2}\right)\text{km/hr}$$

$$\text{Speed} = 18\text{km/hr}$$

2.A bus covered a distance of 80km in 40minutes. Calculate its speed in km/hr.

$$\text{Speed} = D \div T$$

$$\text{Speed} = 80\text{km} \div \frac{40}{60}\text{hr}$$

$$\text{Speed} = \left(\cancel{80}^{2} \times \frac{60}{\cancel{40}_{1}}\right)\text{ km/hr}$$

$$\text{Speed} = (2 \times 60)\text{km/hr.}$$

$$\text{Speed} = 120\text{km/hr.}$$

3.A motorist covered a distance of 150km in $2\frac{1}{2}$hours. Calculate his speed.

$$\text{Speed} = D \div T$$

$$\text{Speed} = 150\text{km} \div \frac{5}{2}\text{hr}$$

$$\text{Speed} = \left(\cancel{150}^{30} \times \frac{2}{\cancel{5}_{1}}\right)\text{ km/hr}$$

$$\text{Speed} = (30 \times 2)\text{km/hr}$$

$$\text{Speed} = 60\text{km/hr}$$

Activity

1.A cyclist took 3hours to cover a distance of 150km . At what speed was he travelling?

2.Anita took 6 hours on a journey of 180km Calculate her speed.

3.A car covered a distance of 210 km in $1\frac{1}{2}$hours. Calculate its speed in km/hr

4.Peter started a journey of 120km at 8:30am and ended at 10:00am.Find his speed in km/hr.

5.A taxi left town at 9:30am and reached town B at 12:30pm.The distance between A and B is 150km

a) Calculate the time taken by the driver to reach town B.

b) Workout the speed used by the taxi.

Converting speed from km per hour to metres per second

Points to note

- 1KM=1000m
- 1hr=60minutes
- 1hr=3600seconds

Examples

1.Change 180km/hr to m/s

Distance in metres

1km=1000m

180km=(180x1000)m

180km=180000m

Time in seconds

1hr=3600sec

1hr=(1x3600)sec

1hr=3600sec

Speed =($\frac{180000}{3600}$)m/s

Speed =($\frac{1800}{36}$ 50 / 1)m/s

Speed =50m/s

2.Change 144km/hr to m/s

Distance in metres

1km=1000m

144km=(144x1000)m

144km=144000m

Time in seconds

1hr=3600sec

1hr=(1x3600)sec

1hr=3600sec

Speed =($\frac{144000}{3600}$)m/s

Speed =($\frac{1440}{36}$ 40/1)m/s

Speed =40m/s

3.A lorry covers a distance of 144km in 2hours.Calculte its speed in meters per second

Distance in metres

1km=1000m

144km=(144x1000)m

144km=144000m

Time in seconds

2hr=3600sec

2hr=(2x3600)sec

2hr=7200sec

Speed =($\frac{144000}{7200}$)m/s

Speed =($\frac{1440}{72}$ 20/1)m/s

Speed =20m/s

Activity

1.Convert the following into metres per second.

a) 36km/hr b) 72km/hr c) 72km/hr d) 18km/hr

2.A cyclist covers a distance of 72km in 2 hours. Calculate his speed in m/s

3.An aeroplane covered a distance of 1800km in one hour. Find its speed in meters per second.

4.A motorist travelled a distance of 288km in 4hours.Calculate his speed in meters per second.

Converting speed from meters per second to km per hour

Points to note

- 1KM=1000m
- 1hr=60minutes
- 1hr=3600seconds

Examples

1.Change 5m/s into km/hr

Distance in km

1000m=1km

$5m=\frac{5}{1000}$ km

Time in hrs

3600sec= 1hr

$1sec=\frac{1}{3600}hr$

Speed=D÷ T

$Speed=(\frac{5}{1000}\div\frac{1}{3600})km/hr$

$Speed=(\frac{5}{1000}\times\frac{3600}{1})km/hr$

$Speed=(\frac{18\cancel{000}}{1\cancel{000}})km/hr$

Speed=18km/hr

2.Change 30m/s into km/hr

Distance in km

1000m=1km

$30m=\frac{30}{1000}$ km

Time in hrs

3600sec= 1hr

$1sec=\frac{1}{3600}hr$

Speed=D÷ T

$Speed=(\frac{30}{1000}\div\frac{1}{3600})km/hr$

$Speed=(\frac{30}{1000}\times\frac{3600}{1})km/hr$

$Speed=(\frac{108\cancel{000}}{1\cancel{000}})km/hr$

Speed=108km/h

3. A cyclist covers a distance of 30m in 2sec.Find his speed in km/hr

Distance in km

1000m=1km

$30m=\frac{30}{1000}$ km

Time in hrs.

3600sec= 1hr

$1sec=\frac{1}{3600}hr$

$2sec=\frac{2}{3600}hr$

$Speed=(\frac{30}{1000}\div\frac{2}{3600})km/hr$

$Speed=(\frac{30}{1000}\times\frac{3600}{2})km/hr$

$Speed=(\frac{54\cancel{108000}}{1\cancel{2000}})km/hr$

Speed=54km/hr

Activity

1. Express the speed below in km/hr

   a) 10m/s b) 50m/s c) 60m/s d) 30m/s

2.In a rally, a car covered 200m in 4 seconds. Calculate its speed in km/hr

3.A bus covered a distance at 15m/s. Calculate its speed in km/hr

4.An air craft covers a distance of 400m in 10sec.Find its speed in km/hr

Calculating average speed

Average speed=$\frac{Total\ distance\ covered}{Total\ time\ taken}$

Examples

1. A car takes 3hrs to cover a certain journey at 60km/hr but it takes only 2 hours to return through the same route. Calculate its average speed for the whole journey.

First journey

D=SxT

D=$\frac{60km}{hr}$ x 3hr

D=(60x3)km

D=180km

Distance for the return journey

=180km

Average speed

A. speed=$\frac{Total\ distance\ covered}{Total\ time\ taken}$

A. speed=$\frac{180km+180km}{3hrs+2hrs}$

A. speed=$\frac{360km}{5hr}$

A. speed=72km/hr

2.A motorist takes 2hrs to cover a journey from at 90km/hr .He returns through the same route at a speed of 60km/hr. Calculate his average speed for the whole journey

First journey

D=SxT

D=$\frac{90km}{hr}$ x 2hr

D=(90x2)km

D=180km

Distance for the return journey

=180km

Time for the return journey

T=$\frac{D}{S}$

T=$\frac{180}{60}$hrs

T=3hrs

A. speed=$\frac{Total\ distance\ covered}{Total\ time\ taken}$

A. speed=$\frac{180km+180km}{2hrs+3hrs}$

A. speed=$\frac{360km}{5hr}$

A. speed=72km/hr

Activity

1.A motorist travelled at speed of 60km per hour for 2hours from town A to B. He returned to town A using the same route in 3hour.

Calculate the motorist's average speed for the whole journey.

2.A motorist takes 4hrs to cover a journey from at 90km/hr .He returns through the same route at a speed of 60km/hr. Calculate his average speed for the whole journey

3) A car takes 4 hours to cover a journey a journey at a speed of 60km/hr but it returns in only 2hours using the same route. Find its average speed for the whole journey.

4. A cyclist travelled at a speed of 80kph for 3hours from town X to town Y. He continued to town Z at speed of40kph for 2hours.

a) What distance did he cover for the whole journey?

b) Workout his average speed for the whole journey.

5.A motorist travelled at speed of 40km per hour for $1\frac{1}{2}$hours.He rested for 30minutes and later continued with the journey at a speed of 80km per hour.

a) What distance did the motorist cover for the whole journey?

b) Calculate his average speed for whole journey?

INTERPRETING TIME TABLES

When interpreting time tables, it is important to identify the arrival time and departure time at a given place.

The table below shows a distance – time table for a bus travelling from Masindi to kitgum.

TOWN	DISTANCE	ARRIVAL	DEPARTURE
MASINDI	0km		9:00am
KIGUMBA	39KM	9:40am	10:00am
KAMUDINI	115KM	11:10am	11:25am
LIRA	191KM	12:30pm	1:00pm
KITGUM	125KM	3:15pm	4:55pm

(a)At what time did the bus arrive at Kamudini

b) What was the departure time of the bus from Lira?

c) What is the distance between Kigumba and Lira?

d) How long does the bus take to travel from Masindi to Kitgum?

2.The timetable below shows the arrival and departure time for a taxi travelling from town A to town F

TOWN	ARRIVALTIME	DEPARTURE TIME
A		0845hours
B	0930hours	0935hours
C	1000hours	1010hours
D	1045hours	1055hours
E	1140hours	1150hours
F	1215hours	

a) At what time does the taxi take to travel from town B to E?

b) For how long does the taxi stay at town D?

C)Express the taxi's arrival time to town F in 24hour clock.

d)Find the total time taken by the taxi for the whole journey.

e)If the distance from A to F is 210km, Find the average speed of the taxi for the whole journey.

2.The timetable below shows how a bus travelled from Iganga to Kampala

TOWN	*ARRIVAL*	*DEPARTURE*
Iganga		6:00am
Kakira	6:30am	6:45am
Jinja	7:20am	7:50am
Mbiiko	8:25am	8:30am
Lugazi	11:40am	12:00noon
Mukono	1.26pm	2:09pm
Kampala	4:10pm	

a) At what time did the bus leave Iganga?

b) Express the bus' arrival time to Mukono in 24hour clock.

c) For how long did the bus stay at Lugazi?

d) Find the time taken by the bus to travel from Iganga to Kampala.

4. The timetable below shows how a bus travels from Mbale to Kampala.

Mbale	Departure	9:00am
Tororo	Arrival	9:45am
	Departure	10:00am
Iganga	Arrival	11:15am
	Departure	11:30am
Jinja	Arrival	12:00noon
	Departure	12:20pm
Kampala	Arrival	1:30pm

a) How long does the bus take to travel from Mbale to Kampala?

b) Find the total time taken by the bus for all the stop overs.

c) Express the bus' arrival time to Tororo in 24hour clock.

d) How long does the bus take to travel from Tororo to Jinja.

e) If Kampala is 252km from Mbale, find the average speed of the bus for the whole journey?

4.The time table below shows a journey made by a bus a bus from Kampala to Kabulasoke.

Distance in km	Station	Departure	Arrival
0	Kampala	8:00am	
20	Mpigi	9:45am	9:00am
30	Gomba	11:20am	11:00am
50	Kinoni	12:10pm	1:00pm
75	Kabulasoke		3:30pm

a) What is the distance from Mpigi to Kinoni?

b) Express the arrival time of the bus to Kabulasoke in 24hour clock.

c)How far is Kabulasoke from Gomba?

d)At what speed did the bus travel between Mpigi and Gomba?

e) Calculate the bus' average speed for the whole journey.

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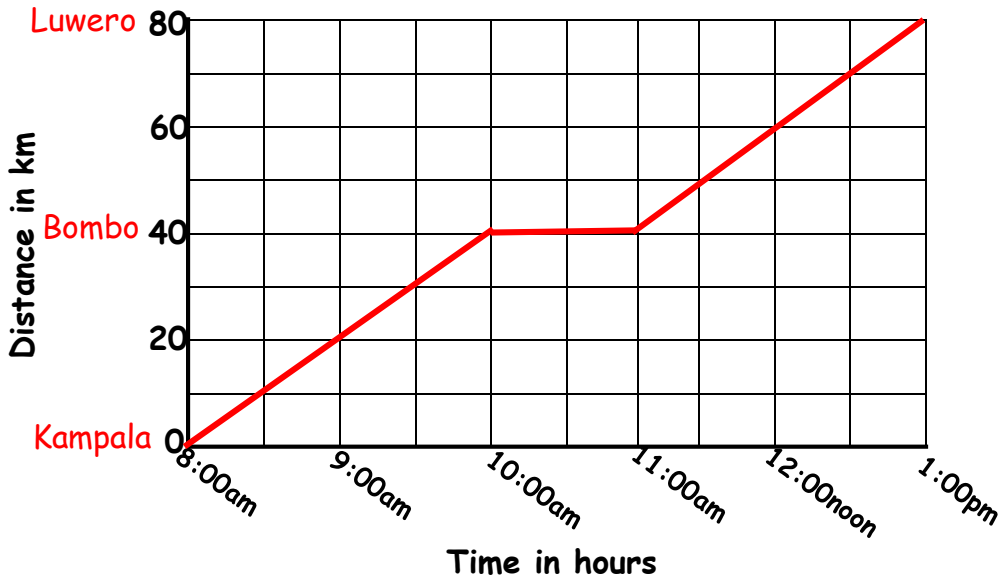
TRAVEL GRAPH (DISTANCE -TIME GRAPH)

Points to note

- A travel graph is also called a distance – time graph because it is plotted with distance (on the vertical axis) against time (on the horizontal axis).
- When interpreting a travel graph, the scale on both vertical and horizontal axis must be identified.
- The scale is determined by identifying the representation of a single square since a travel graph is drawn on a squared paper.

Examples

1.The graph below shows a cyclist's journey from Kampala to Luwero via Bombo



1.State the scale on the vertical axis.

One small square represents 10km.

2. State the scale the scale on the horizontal scale.

One small square represents 30minutes.

3.At what time did the cyclist start his journey?

At 8:00am

4.For how long did the cylist rest at Bombo?

For one hour

5.How far is Luwero from Bombo?

(80-40)=40km

6.How long did the cyclist take to travel from Kampala to Luwero?

He took 5hours

7.Express his arrival time to Luwero in 24hour clock system.

1:00pm + 12:00hrs=1300hrs

8.Calculate the cyclist's average speed for the whole journey

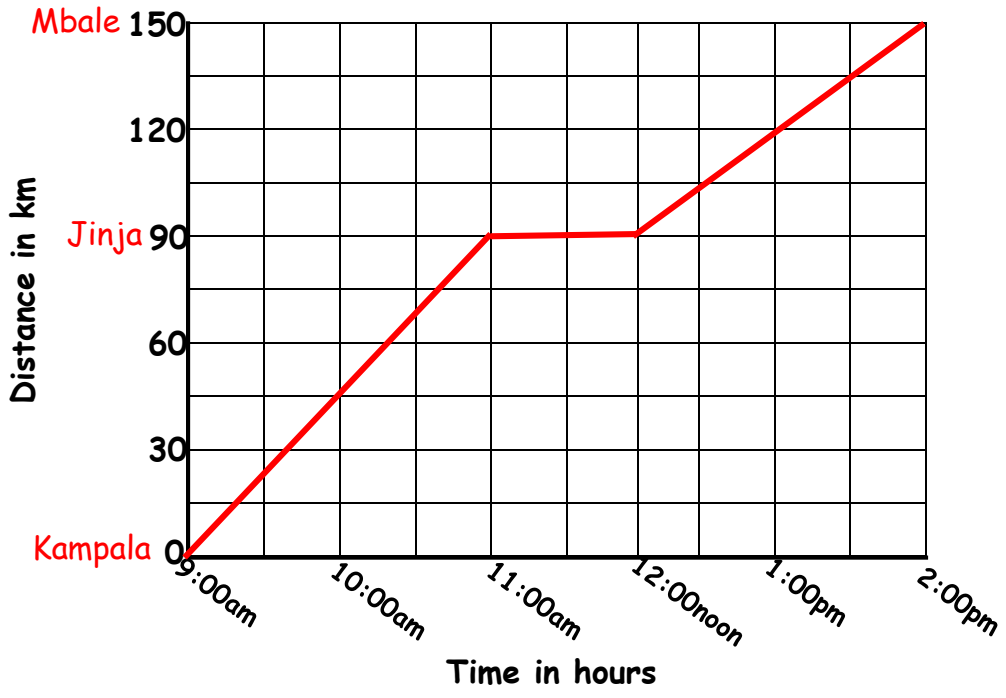
A. speed=$\frac{Total\ distance\ covered}{Total\ time\ taken}$

A. speed=$\frac{80km}{5hr}$

A. speed=16km/hr

Activity

1.The graph below shows Kato's Journey from Kampala to Mbale via Jinja. Stuty it carefully and use it to answer the questions that follow



a) State the scale on the vertical axis
b) State the scale on the horizontal axis.
c) Express Kato's departure time from Kampala in 24hour clock system
d) For how long did Kato rest at Jinja?
e) For how long did Kato to travel from Jinja to Mbale?
f) How far is Mbale from Jinja?
g) Calculate Kato's speed between Kampala and Jinja.
h) Workout Kato's average speed for the whole journey.

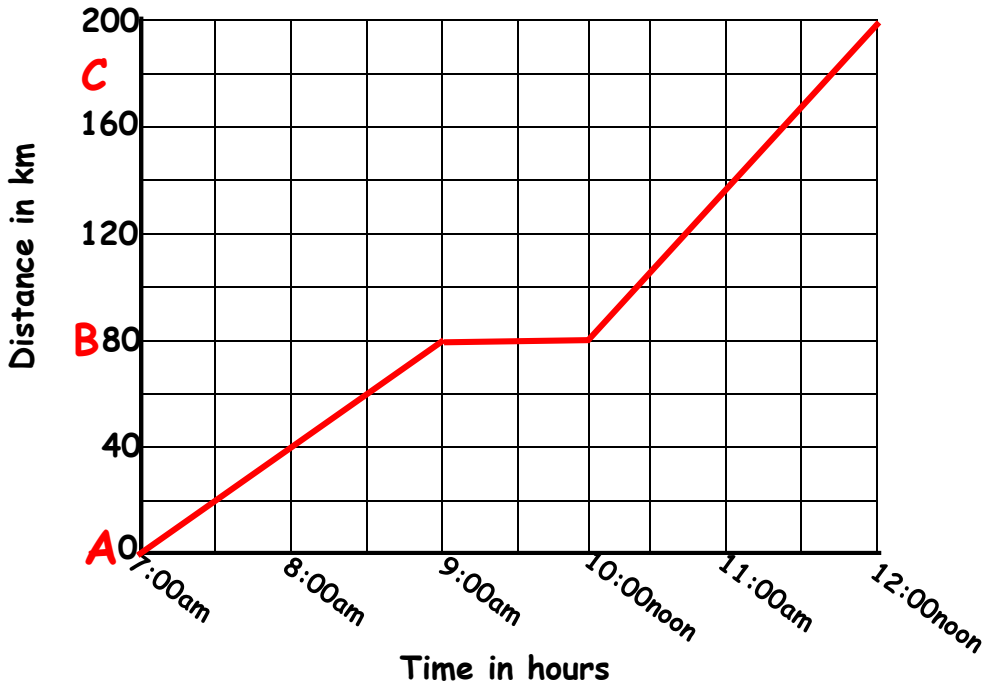
Plotting distance covered and time taken on a graph

Examples

1.A bus left Town A at 7:00am and travelled for 2hours at a speed of 40km per hour to town B. He rested for one hour at town B and later continued to town C for another 2 hours at a speed of 50km per hour.

a) Show the above journey on a graph.

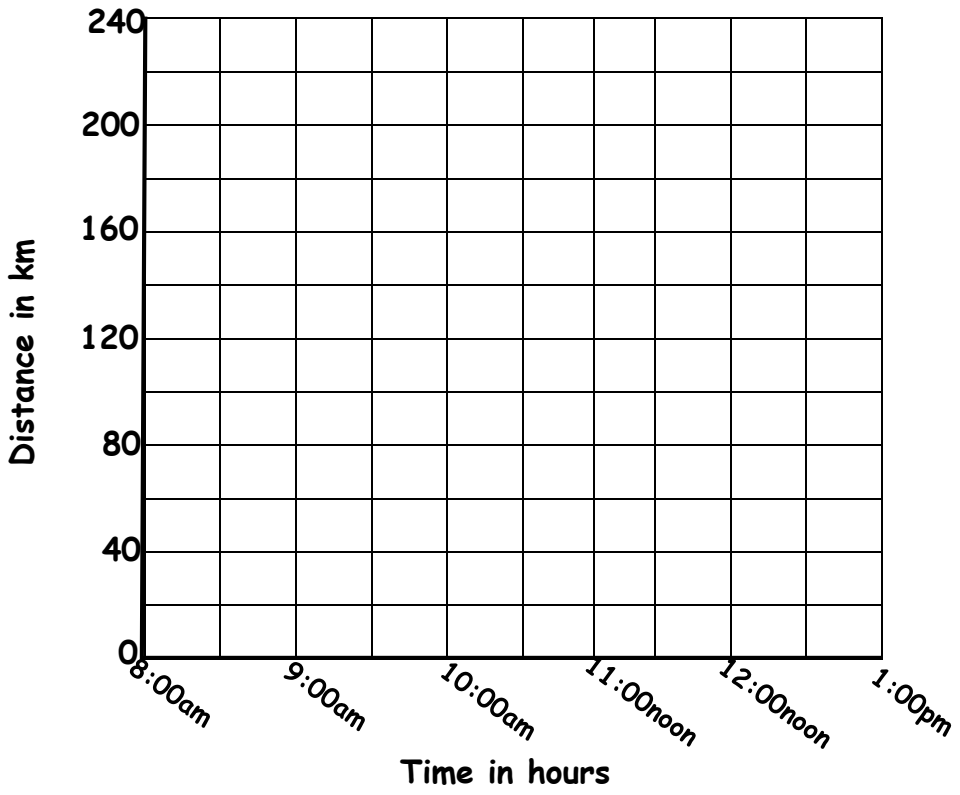
Distance from A to		Distance from B to C
Distance=Speed x Time $=\frac{40km}{\cancel{hr}} \times 2\cancel{hr}$ =(40x2)km =80km	Resting at B =1hour	Distance=Speedx Time $=\frac{50km}{\cancel{hr}} \times 2\cancel{hr}$ =(50x2)km =100km



Activity

1.Kato left Town X at 8:00am and travelled for $2\frac{1}{2}$hours at a speed of 40km per hour to town Y. He rested for 30minutes at town Y and later continued to town Z for another 2 hours at a speed of 50km per hour.

a) Show the above journey on a graph.



b) At what time did he reach town Z?

c) Calculate Kato's average speed for the whole journey

Other timetables(class timetables and work timetables)

1.The timetable below shows how a pupil spent her time last Saturday. Study it carefully and use it to answer the questions that follow.

TIME	ACTIVITY
7:00am-10:30am	Digging
10:45am-12:45pm	Washing
1:00pm-2:45pm	Playing
5:00pm-7:30pm	Reading

a) How long did he take playing?

b) How long did he take reading?

c) Which activity took more time than others?

2.Below is a class time for a primary six class.

From	8:30am	9:10am	9:50am	10:30am	11:00am	11:40am	12:20pm	1:00pm	2:00pm	2:40pm	3:20pm
To	9:10am	9:50am	10:30am	11:00am	11:40am	12:20pm	1:00pm	2:00pm	2:40pm	3:20pm	4:30pm
MON	ENG	MTC	P.E	BREAK	ENG	ENG	Library	LUCNCH	RE	SST	GAMES
TUE	MTC	SST	RE		ENG	MUSIC	Computer		SST	SCI	
WED	SCI	SCI	MUSIC		SST	MTC	SST		MUSIC	MTC	
THUR	MTC	SST	MTC		RE	SCI	SCI		SCI	ENG	
FRI	SCI	SCI	SCI		MTC	MTC	ENG		ENG	MTC	

a)At what time do the lessons begin in the morning?

b)How many mathematics lesson are taught the whole week?

c)How long does break time take?

e)How many computer lessons are shown on the timetable?

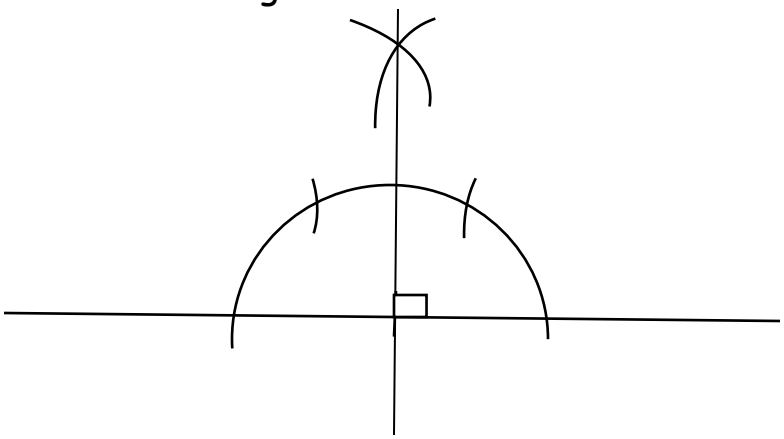
f) How long does games activity take?

LINES, ANGLES AND GEOMETRIC CONSTRUCTION

Construction of special angles (90^0 and 60^0)

i) 90^0

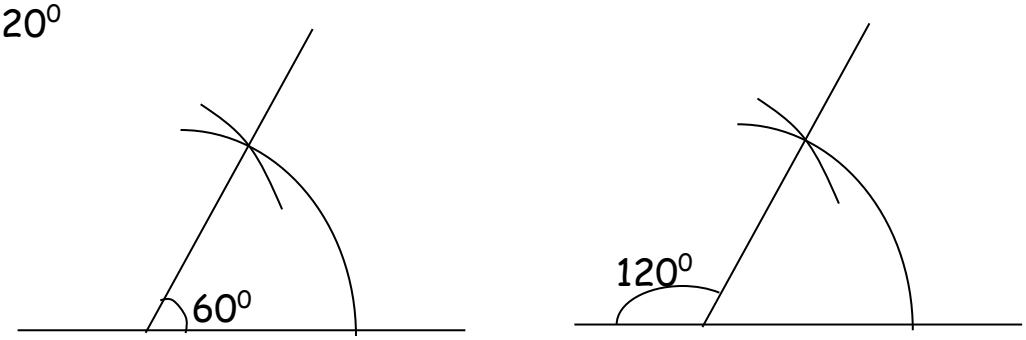
- Draw a horizontal straight line and mark off its centre.
- Basing at the centre of the line, draw a semi-circle / two arcs intersecting either side of the line.
- Use the two points of intersection of the arcs and the line to draw two intersecting arcs above the straight line.
- Connect the point of intersection of the arcs to the centre of the line.
- Each smaller angle formed measures 90^0.



(i) 60^0

- Draw a horizontal straight line and mark off its centre.
- Draw a big arc intersecting one side / either side of the line, basing at the centre.
- Use the new point of intersection of the line and the arc to draw another smaller arc to intersect the first one.
- Connect the point of intersection of the arcs to the centre of the straight line.

- The smaller angle formed is an angle of 60^0 while the larger angle is 120^0



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ACTIVITY

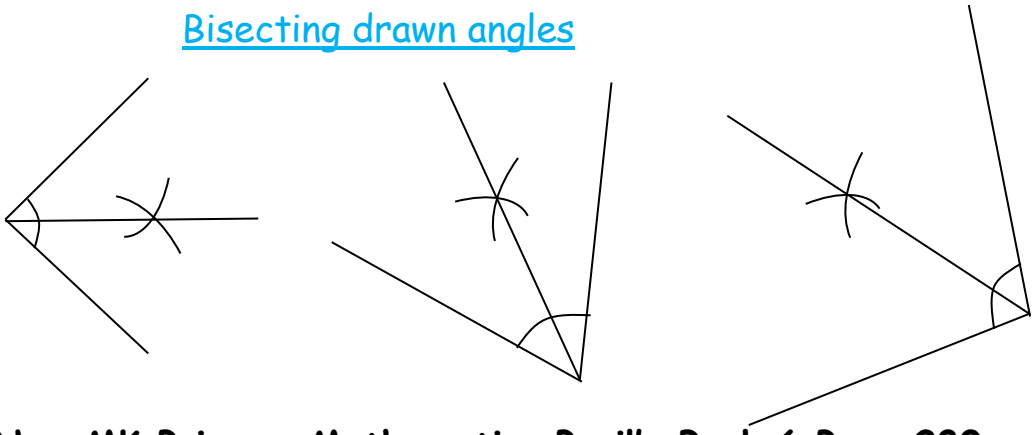
Using a pair of compasses, a ruler and a pencil only, construct the following angles.

a) 90^0
b) 60^0
c) 120^0
d) 270^0

Bisecting angles

To bisect an angle means to divide that particular equally into two parts.
When you bisect the special angles, other smaller angles are formed.
e.g
(i) Bisecting an angle of 90^0 forms that of 45^0
(ii) Bisecting an angle of 60^0 forms that of 30^0

Bisecting drawn angles



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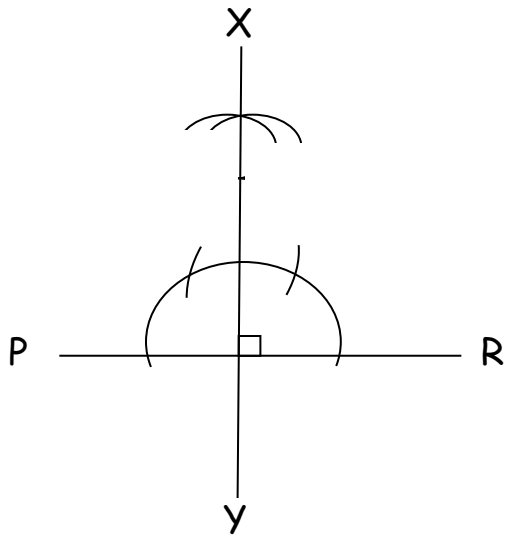
Constructing perpendicular lines.

Constructing a perpendicular line XY through line PR

- Place the compass point at P draw two arcs, one above the line PR and another below it.
- Place the compass at R and draw another arc intersecting the first one respectively.
- Drop a straight line through the points of intersection of the arcs.



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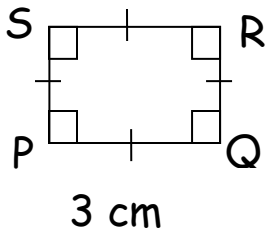
Construction of squares

Example

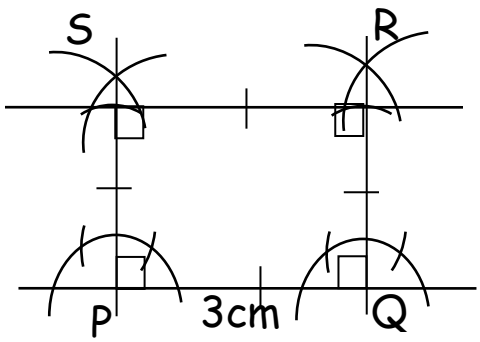
Using a ruler, pencil and a pair of compasses, construct a square PQRS of side 3cm

(i)Draw a sketch. (ii) Follow the sketch to draw an accurate diagram.

Sketch



Accurate diagram



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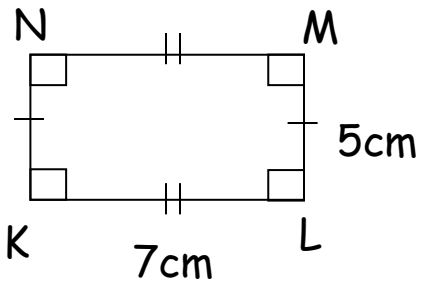
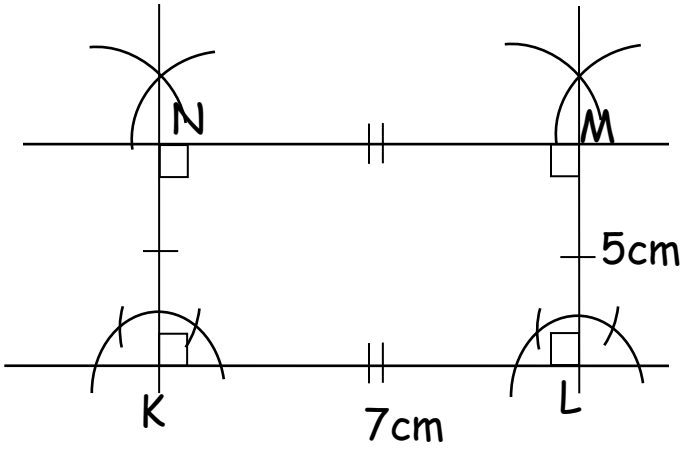
Construction of rectangles

Example

Using a ruler, a pencil and a pair of compasses, construct rectangle KLMN where KL = 7cm and LM = 5 cm. (ii) Follow the sketch to draw an accurate diagram.

i) Sketch

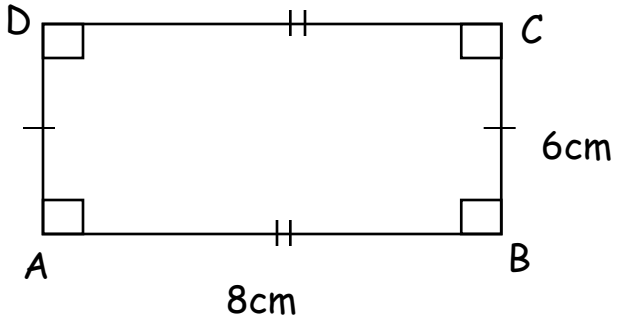




ACTIVITY

Using a pair of compasses, a ruler and a pencil only, construct the following.

1. A square ABCD where line AB = 5cm
   Measure the length of its diagonal.
2. A square KLMN where line MN = 6cm
   Measure the length of its diagonal
3. A rectangle WXYZ where line WX = 7cm and line XY = 5 CM.
   Measure the length of its diagonal.
4. Below is a sketch of a rectangle.



a) construct the rectangle

b) Work out the area of the triangle ABC

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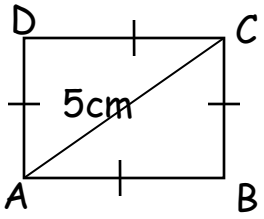
Constructing a square given the length of the diagonal

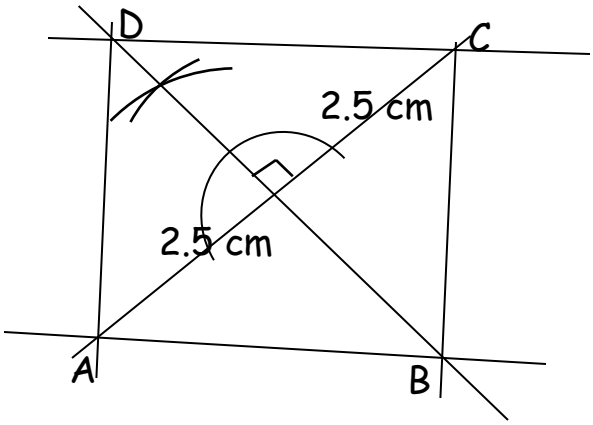
Examples

a) Using a pair of compasses, a ruler and a pencil only, construct a square ABCD where diagonal AC = 5cm.

b) Measure the length of its side.

Sketch

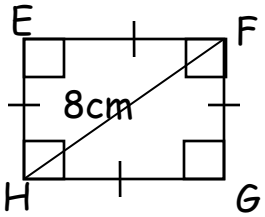




Length of the AB = 3.5 cm

ACTIVITY

1. a) Using a pair of compasses, a ruler and a pencil only, construct a square PQRS where line PR = 10cm.
   b) Measure the length of line RS.
2. Construct a square whose length of the diagonal is 3cm. Measure the length of its side.
3. a) Using a ruler, a pencil and a pair of compasses only, construct a square whose sketch is shown below.



b) Measure the length of side HG

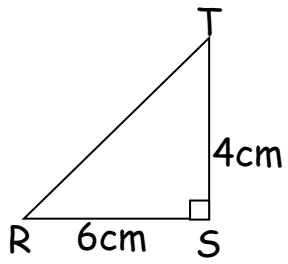
Construction of triangles.

- When length of each of the three sides is given.
- When length of one side and two base angles are given.
- When lengths of two sides are given with an angle.

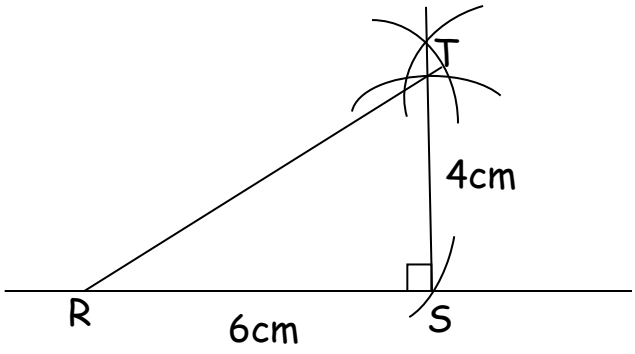
Examples

(i) Construct triangle RST such that RS = 6 cm, ST = 4 cm and angle RST = 90^0

Sketch

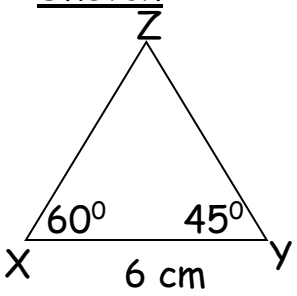


Accurate diagram

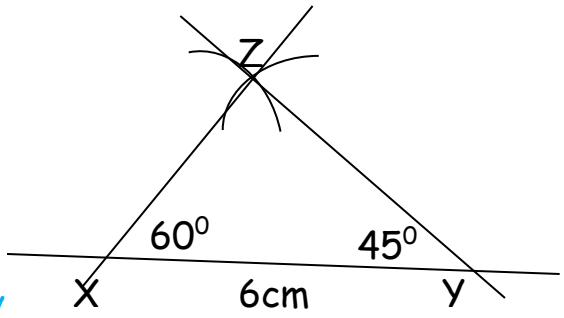


Construct triangle XYZ in which XY = 7 cm, angle XYZ = 45^0, ZXY = 60^0

Sketch



Accurate diagram



ACTIVITY

1. Construct a triangle ABC such that line AB = 5cm, line BC = 4 cm and line AC = 4cm.
2. Construct a triangle RST where angle R = 60^0, angle S = 45^0 and RS = 5cm

3. Construct a triangle KLM in which angle K = 90^0, lines KL= Km = 6cm.
4. Construct a triangle RST such that RS = 6cm, RT = 7cm and angle R = 90^0. Measure angle RST and line ST.

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Construction of a regular hexagon.

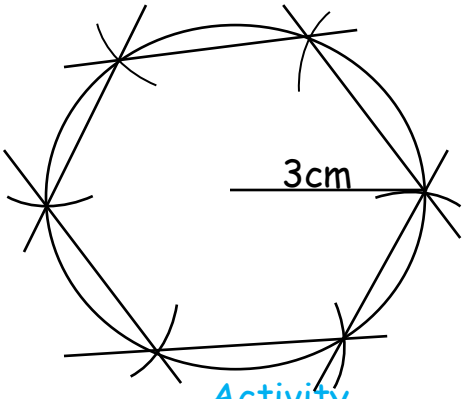
Example

Construct a regular hexagon in a circle of radius 3cm

(i)Draw a circle of the given radius.

(ii) Use the same radius to mark off six arcs around the circle.

(iii) Connect the points such that a regular hexagon is formed.



Activity

1. Construct a regular hexagon in a circle of radius;

a) 3.5 cm

b) 2.5 cm

c) 4cm

2. Construct a regular hexagon in a circle of diameter;

a) 6 cm

b) 5cm

c) 7cm

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Construction of a regular pentagon

Note:

(i) A regular pentagon has all its five sides equal in length.

(ii) The centre angle / exterior angle of a regular pentagon is 72^0 ie $360^0 \div 5 = 72^0$

Example

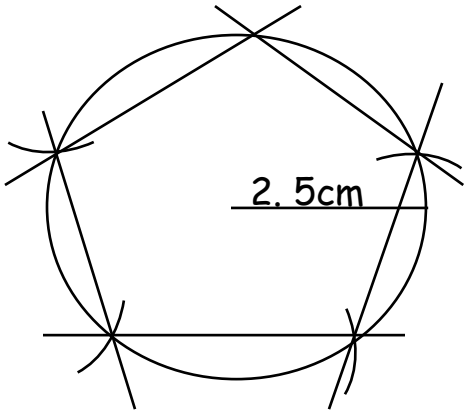
Using a ruler, pencil and a pair of compasses, construct a regular pentagon ABCDE in a circle of radius 2.5cm.

(i) Draw a circle of the given radius and mark its centre with letter O.

(ii) Place your protractor at the centre "O" to measure and mark off the centre angle (72^0)

(iii) Use the adjacent AB to mark off other points around the edge of the circle.

(iv) Connect / join the points such that a pentagon is formed.



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LESSON 9

Constructing parallel lines

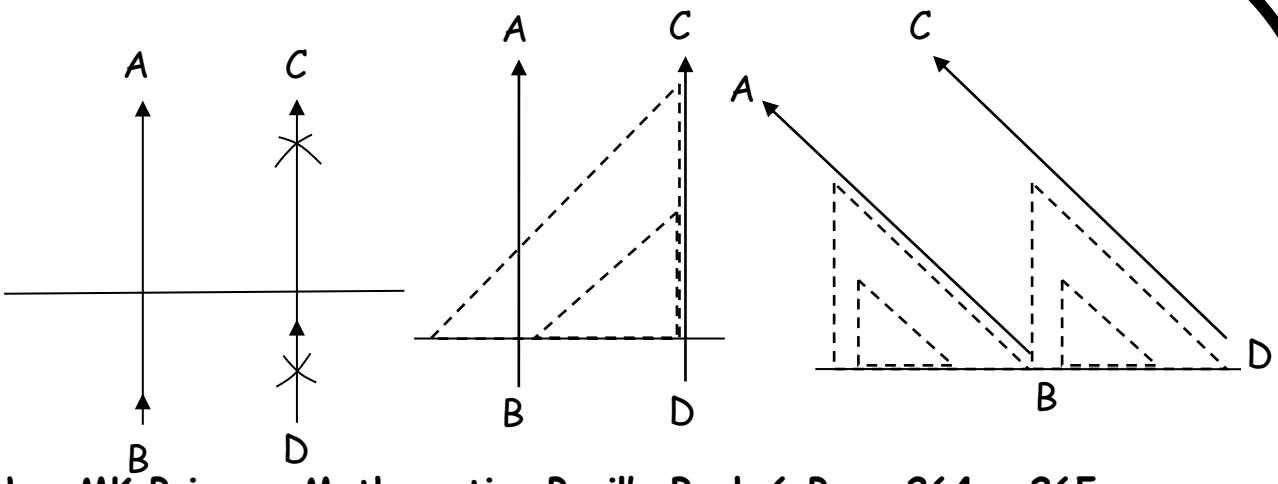
Lines are parallel only if they are unable to meet at any point.

Parallel lines keep the same distance apart at every point.

Example

Construct line CD parallel to line AB

i) Using a pair of compasses. ii) Using a protractor



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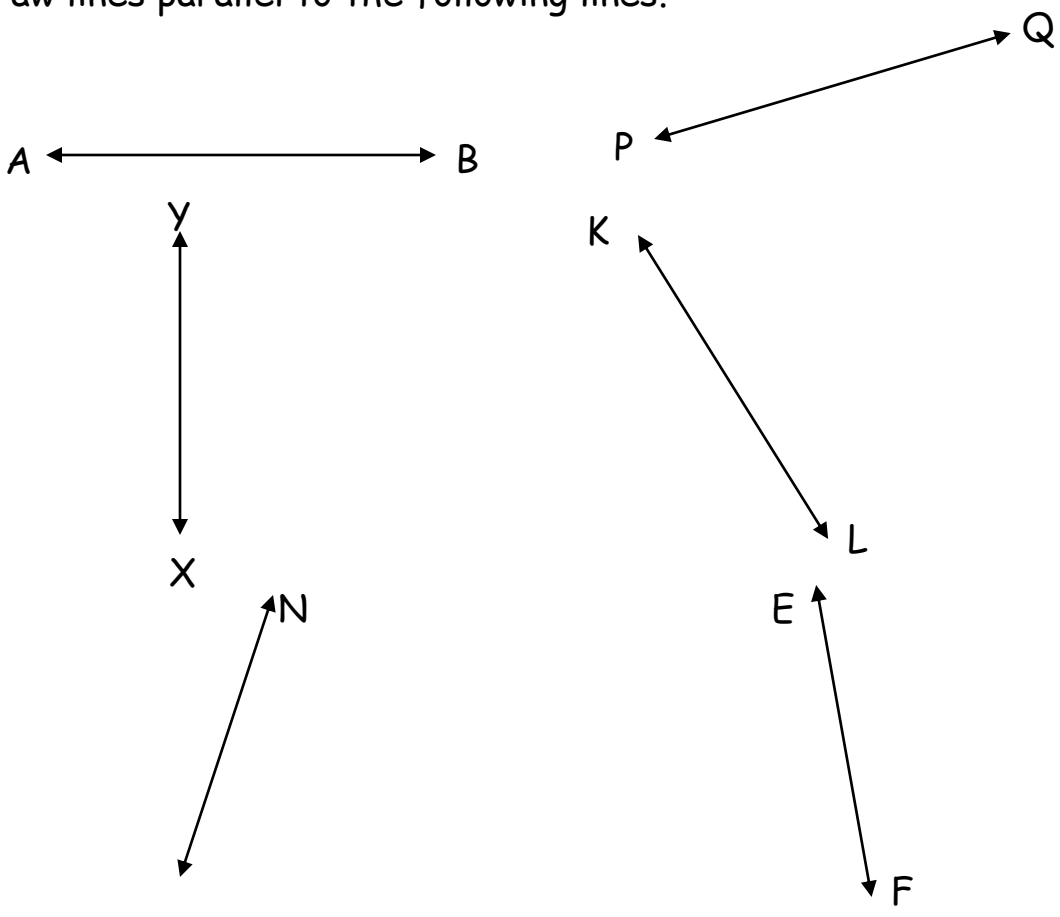
ACTIVITY

Draw lines parallel to the following lines.

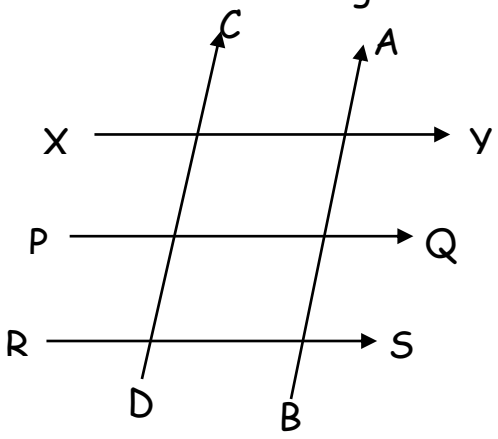


Identifying parallel lines

- // is the symbol for parallel lines.
- The arrows on lines show the which lines are parallel to each other.

Example

Name the parallel lines in the diagram below.



(i) AB//CD

(ii) XY//PQ//RS

(iii) XY is not //to AB.

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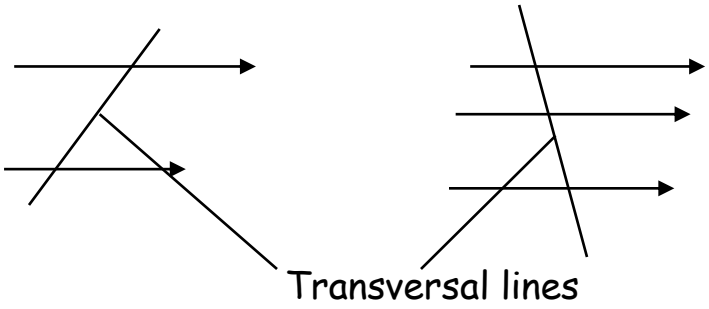
Angle properties of parallel lines

A line which intersects a set of parallel lines is called a transversal line.

e.g

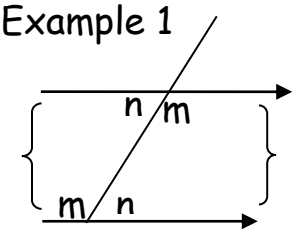


Transversal lines

When a transversal line intersects a pair of parallel lines, there are several angles formed.

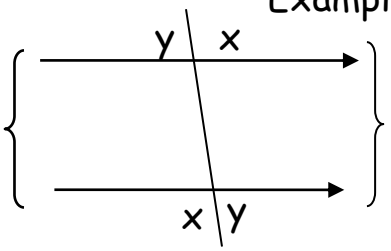
(a) Co-interior and co-exterior angles.

Example 1



Co interior)

Example 2



Co exterior)

Angles m + n = 180^0 (co interior)

Angles x + y = 180^0 (Co exterior)

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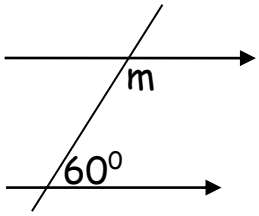
Examples

Find the value for the unknown angle.

a)

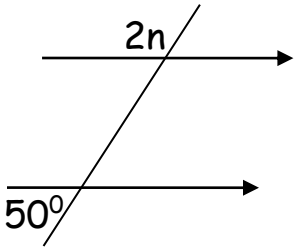


$M + 60^0 = 180^0$

$M + 60^0 - 60^0 = 180^0 - 60^0$

$M = 120^0$

b)



$2n + 50^0 = 180^0$

$2n + 50^0 - 50^0 = 180^0 - 50^0$

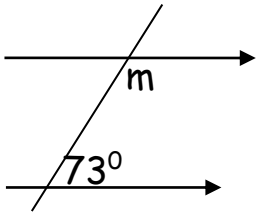
$\frac{2n}{2} = \frac{130^0}{2}$

$n = 65^0$

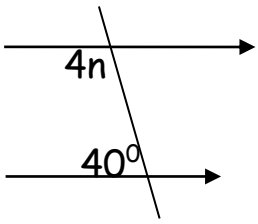
Activity

Solve for the unknown.

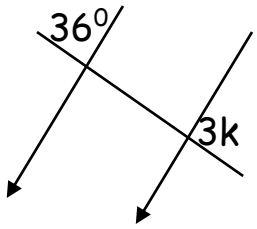
a)



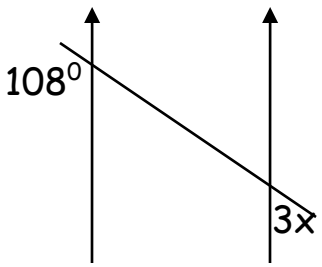
c



b)



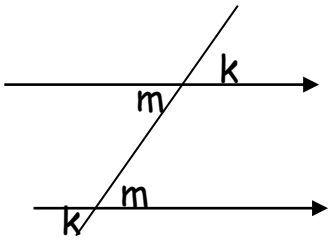
d



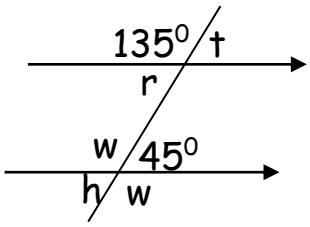
(b) Corresponding angles.

✓ Corresponding angles are equal.

Example 1



Example 2



✓ Angle k is corresponding to angle m.

Angle k = m

✓ Angle t is corresponding to 45^0

Angle h = r

✓ Angle w is corresponding to 135^0

Angle w = 135^0

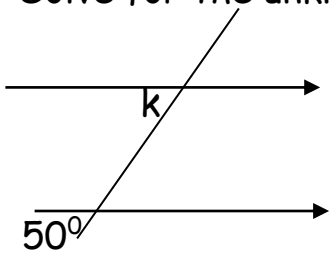
✓ Angle t is corresponding to angle 45^0.

Angle t = 45^0

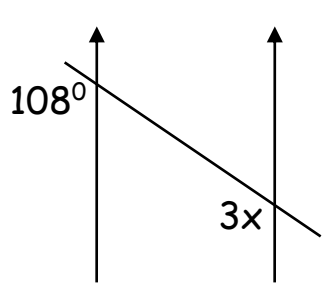
Activity

Solve for the unknown

a)



c



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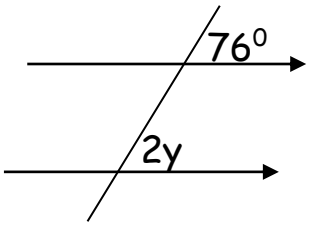
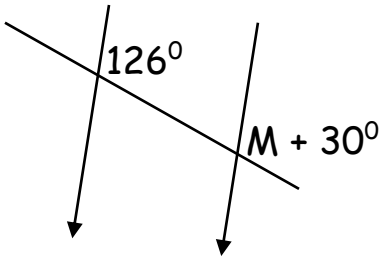


d



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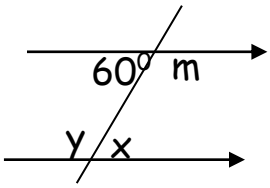
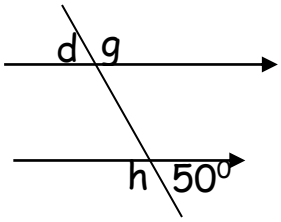
LESSON 13

(C) Alternate angles.

✓ Alternate angles are equal.





- Angle x = 60^0 (Alternate interior)
- Angle d = 50^0 (Alternate exterior angle.
- Angle m = y (alternate interior angles)
- Angle g = h (alternate exterior angles)

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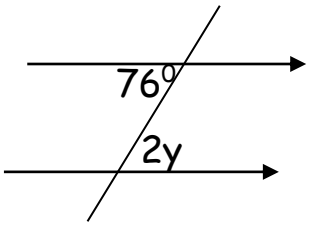
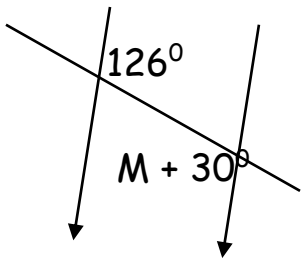
Activity

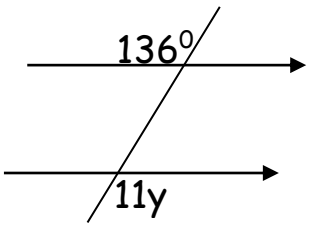
a)



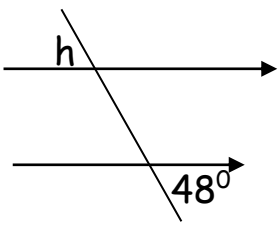
c



b)



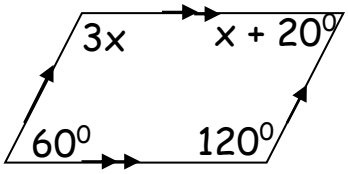
d



Recognizing angles formed by parallel lines.

Example

Find the value of x in the figure below.



i) $3x + 60^0 = 180^0$ (co-interior angles)

$3x + 60^0 - 60^0 = 180^0 - 60^0$

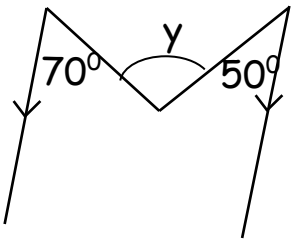
$3x = 120^0$

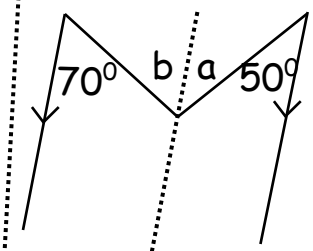
$\frac{3x}{3} = \frac{120^0}{3}$

$x = 40^0$

(i) $(x + 20) + 120^0 = 180^0$ (co-interior angles)

Find the value of y





Angle a = 50^0

Angle b = 70^0

Angle y = $50^0 + 70^0$

Y = 120^0

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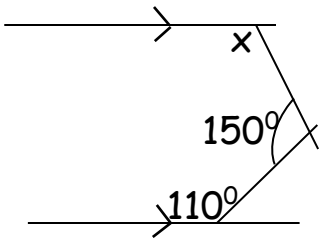
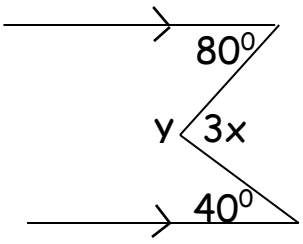
Activity

Find the values of the letters on the diagram.

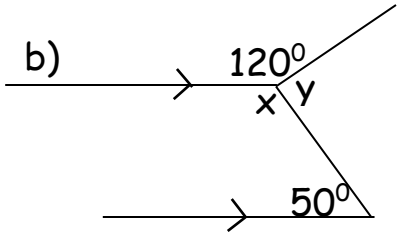
a)



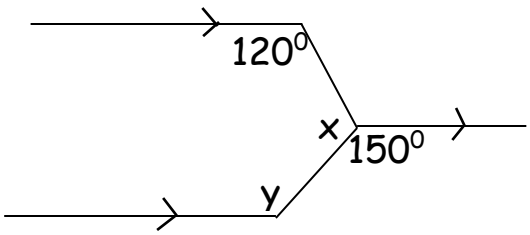
c)



b)

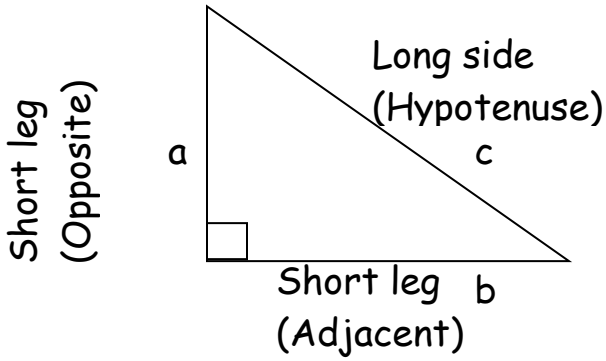


d)



Introduction to pythagoras theorem.

Study the two triangles below.



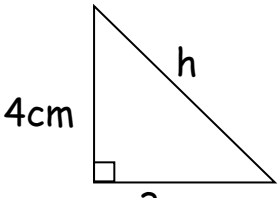
- The pythagoras theorem states that the sum of the square of the opposite and the square of the adjacent is equivalent to the square of the hypotenous.

  $a^2 + b^2 = c^2$

Finding the longest side (hypotenuse) of a right angled triangle.

Example

Find the value of h.



$a^2 + b^2 = c^2$

$3^2 + 4^2 = h^2$

$(3 \times 3) + (4 \times 4) = h^2$

$9 + 16 = h^2$

$25 = h^2$

$5 = h$

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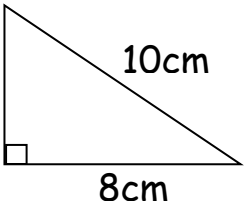
Finding the length of the short side of a right angles triangle.

Example

The longest side of a right angled triangle is 10cm and one of the shorter sides is 8cm. find the length of the other side.



$$a^2 + 8^2 = 10^2$$
$$a^2 + 8 \times 8 = 10 \times 10$$
$$a^2 + 64 = 100$$
$$a^2 + 64 - 64 = 100 - 64$$
$$a^2 = 36$$
$$a = 6cm$$

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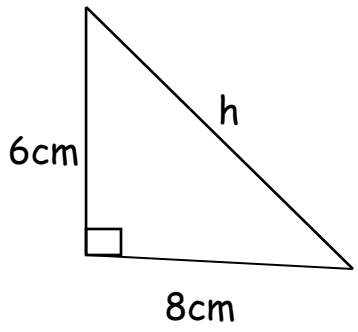
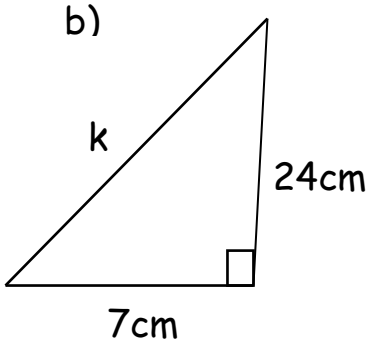
Activity

Find the missing side of each of the following triangle.

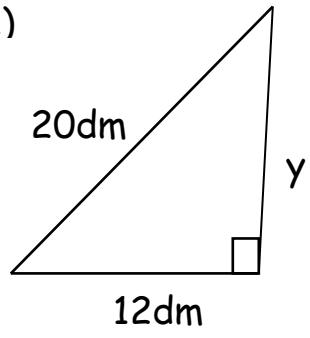
a)



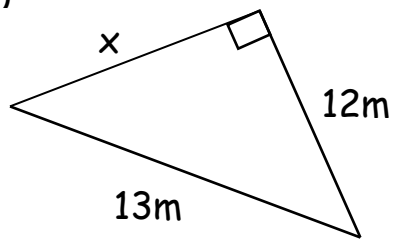
b)



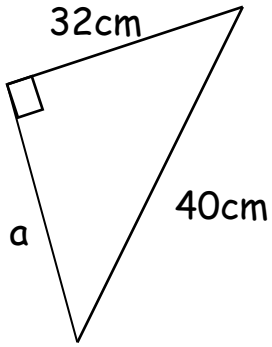
c)



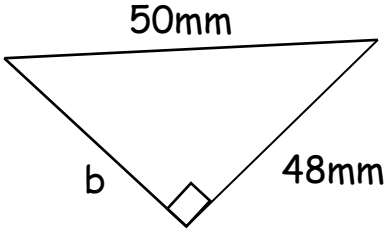
d)



e)



f)

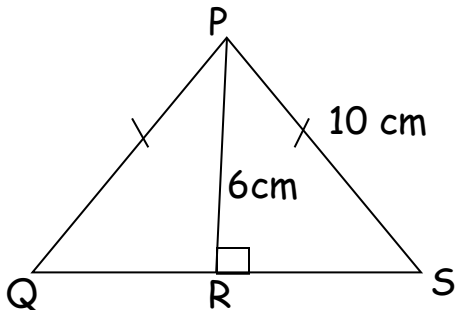


An isosceles triangle and Pythagoras Theorem

Example

Given that PQ=PS =10cm, PR = 6cm and bisects angle QPS.

(i) Find the length of QS.



$(RS)^2 + (PR)^2 = (PS)^2$

$(RS)^2 + 6^2 = 10^2$

$(RS)^2 + 36 = 100$

$(RS)^2 + 36 = 100$

$-36 \quad -36$

$(RS)^2 = 64$

$(RS)^2 = 64$

$RS = 8cm$

Line QS

= (8 + 8) cm

= 16 cm

(ii) Calculate the perimeter of the figure above.

P = 10cm + 10cm + (8x2) cm

20 cm + 16 cm

= 36 cm

(iii) Find the area of the figure.

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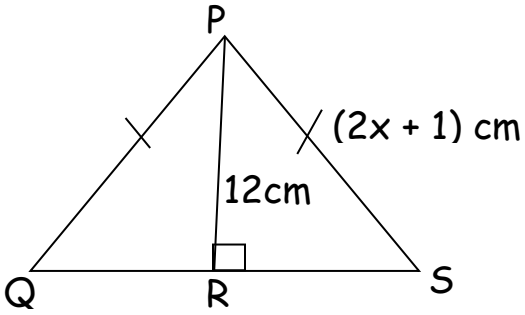
Activity

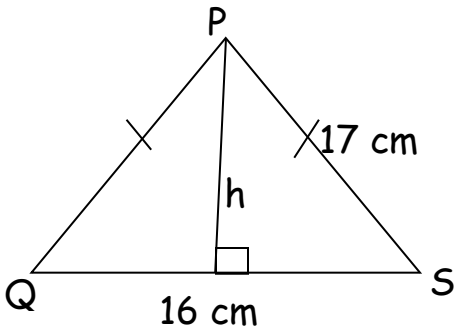
1. PQR is an isosceles triangle. PQ is 13 cm

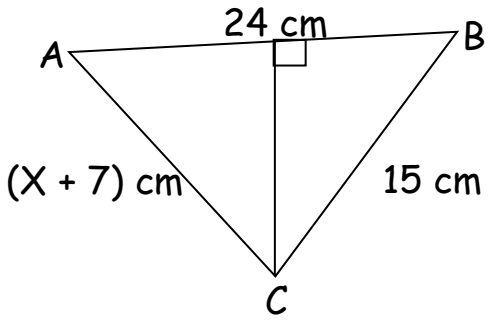


a) Find the value of x.

b) Find the length QS

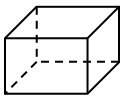
2. Find the height, perimeter and the area of the following figures.





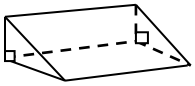
Solid figures (prisms, cylinders and their properties)

Cylinder



Rectangular prism

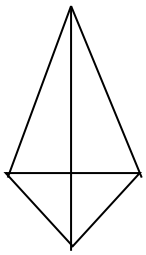
(Cuboid)



Triangular prism

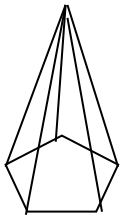
Pyramids and their properties.

Names of pyramids come from the shape of their bottom face.

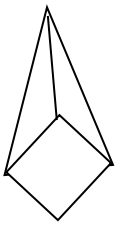


Tetrahedron

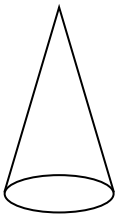
Triangular pyramid



Pentagon based pyramid



Square based pyramid



Square based pyramid

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Regular polygons

Name of polygon	Number of sides
Equilateral triangle	3 sides
Square	4 sides
Pentagon	5 sides
Hexagon	6 sides
Heptagon	7 sides
Octagon	8 sides
Nonagon	9 sides
Decagon	10 sides
Nuodecagon	11 sides
Duodecagagon	12 sides

Facts about regular polygons

- The centre angle of all regular polygons is 360^0.
- The sum of all exterior angle is 360^0
- Interior and exterior angles of a regular polygon add up to 180^0

Examples

1. The interior angle of a regular polygon is 120^0. Find the size of its exterior angle.

Let the exterior angle be y.

Interior angle + exterior angle = 180^0

$Y + 120^0 = 180^0$

$Y + 120^0 - 120^0 = 180^0 - 120^0$

$Y = 60^0$

2. The interior angle of a regular polygon is 20^0 more than the size of its exterior angle find the size of each;
   i) Interior angle
   ii) Exterior angle

Let the exterior angle be k

Exterior	Interior	Sum
k	$K + 20^0$	180^0

$K + k + 20^0 = 180^0$

$2k + 20^0 = 180^0$

$2k + 20^0 - 20^0 = 180^0 - 20^0$

$\frac{2k}{2} = \frac{160^0}{2}$

$K = 80^0$

ii) Interior angle

$80^0 + 20^0$

$= 100^0$

3. The interior angle of a regular polygon is 3 times the size of its exterior angle. Find the size of each exterior and interior angle.

Exterior	Interior	Total
Y	3Y	180^0

$Y + 3Y = 180^0$

$4Y = 180^0$

$\frac{4Y}{4} = \frac{180^0}{4}$

$Y = 45^0$

Exterior angle

$= 45^0$

Interior angle

$= 45^0 \times 3$

$= 135^0$

4. The interior and exterior angles of a regular polygon are in the ratio of 2:3 respectively. Find the size of each exterior and interior angles.

Total ratio = 3 + 2
=5

Interior angle	Exterior angle
$\frac{3}{5} \times 180^0$ 36^0	$(180^0 - 108^0)$
$= 3 \times 36^0$	$= 72^0$
$= 108^0$	

Activity

1. The exterior angle of a regular polygon is 20^0. What is the size of its interior angle?
2. The interior angle of a regular polygon is 36^0 more than the size of its exterior angle.
   a) Calculate the size of the exterior angle.
   b) What is the size of its interior angle?
3. The interior and exterior angles of a regular polygon are in the ratio of 3:7 respectively. Find the size of each angle.
4. The interior angle of a regular polygon is 5 times the size of its exterior angle. Work out the size of each angle.

Finding number of sides of a regular polygon.

Number of sides of a regular polygon = $\frac{\text{all exterior angles}}{\text{Each exterior angle } (360^0)}$

Examples

1. The exterior angle of a regular polygon is 72^0.
   a) Work out the size of its exterior angle.

   Exterior angle = $\frac{360^0}{72^0}$

   = 5 sides

   b) Name the polygon

A pentagon

2. The interior angle of a regular polygon is 120^0.
   a) How many sides has the polygon?
      Let the exterior angle be y.
      Interior angle + exterior angle = 180^0
      $Y + 120^0 = 180^0$
      $Y + 120^0 - 120^0 = 180^0 - 120^0$
      $Y = 60^0$
      Number of sides = $\frac{360^0}{60^0}$
      = 6 sides

   b) name the polygon
      A hexagon

3. The interior and exterior angles of a regular polygon are in the ratio of 2:7 respectively. Find the size of each exterior. Name the polygon.

   Total ratio = 2 + 7
   =5

   Interior angle
   $\frac{2}{9} \times \frac{180^0}{} = 20^0$
   $= 2 \times 20^0$
   $= 40^0$

   Number of sides

   $= \frac{360^0}{40^0}$

   = 9 sides

   A nonagon

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Activity

1. The exterior angle of a regular polygon is 30^0.
   a) How many sides has the polygon?
   b) Name the polygon.
2. The interior angle of a regular polygon is 108^0.
   a) What is the size of each exterior angle?

b) Name the polygon.

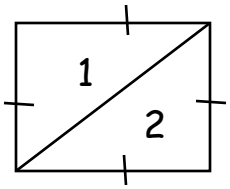
3. The interior and exterior angles of a regular polygon are in the ratio 1: 2. Name the polygon.
4. Calculate the number of sides of a regular polygon whose interior angle is 4 times the size of its exterior angle.
5. One of the exterior angles of a regular polygon is 18^0. How many sides has the polygon?

Finding number of triangles in a given polygon. (triangulation)

- Triangulation is the formation of triangles in a regular polygon from the common vertex.
- The number of triangles formed depends on the number of sides the polygon has.

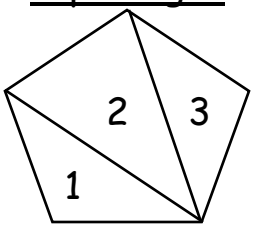
Illustration of triangulation

A square



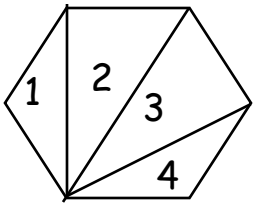
Two triangles

A pentagon



3 triangles

A hexagon



4 triangles

Name of polygon	Number of sides(n)	Number of triangles
Equilateral triangle	3	(3 - 2) = 1
Square	4	(4 – 2) = 2
Pentagon	5	(5 – 2) = 3
Hexagon	6	(6 – 2) = 4
Heptagon	7	(7 – 2) = 5
	n	(n – 2) = 2

Therefore number of triangles = n -2

Examples

1. How many triangles can be formed from an octagon?

n – 2 = 8 - 2

= 6 triangles

2. If 10 triangles can be formed from a regular polygon. How many sides has the polygon?

n – 2 = number of triangles
n – 2 = 10
n – 2 + 2 = 10 + 2
n = 12 sides

Activity

1. Find the number of triangles in a regular polygon whose number of sides are;
   a) 9 sides?
   b) 13 sides?
   c) 20 sides?
   d) 18 sides?
   e) 36 sides
   f) 15 sides?
2. Calculate the number of sides of a regular polygon whose number of triangles are;
   a) 8 triangles
   b) 7 triangles
3. Name the regular polygon whose number of triangles are;
   a) 10 triangles
   b) 14 triangles
   c) 11 triangles

Finding number of right angles in a regular polygon.

- There are two right angles in a triangle.
- Therefore number of right angles = 2 (n - 2)
  = 2n – 4

Examples

1. Calculate the number of right angles in a polygon with 5 sides

Number of right angles = 2 (n - 2)
= 2(5 - 2)
= 2 x 3
= 6 right angles

2. Name the regular polygon with 12 right angles

$2(n - 2)$ = number of right angles

$2n - 4 = 12$

$2n - 4 + 4 = 12 + 4$

$2n = 16$

Activity

1. Find the number of right angles of a regular polygon with;
   a) 5 sides
   b) 7sides
   c) 12 sides
2. Find the number of sides of a regular polygon whose number of right angles are;
   a) 18 right angles
   b) 20 right angles
   c) 24 right angles
3. Name the regular polygon whose number of right angles are;
   a) 14 right angles
   b) 16 right angles
   c) 10 right angles

Interior angle sum

We can find interior angle sum in three ways.

1. Each interior angle x number of sides
2. Number of right angles (2n - 4) x size of each right angle (90^0)
3. Number of triangles (n - 2) x size of each triangle (180^0).

Examples

1. One of the interior angles of a regular hexagon is 120^0. Calculate the interior angle sum of the polygon

   Interior angle sum = interior angle x number of sides

   $= 120^0 \times 6$

   $= 720^0$

2. Calculate the interior angle sum of a regular polygon with 7 sides.

Method 1 (triangulation)	Method 2 (using right angles)	
Interior angle sum = $180^0(n - 2)$	$90^0(2n - 4)$	
$= 180^0(7 - 2)$	$90^0(2x7 - 4)$	$= 90^0 \times 10$
$= 180^0 \times 5$	$90^0(14 - 4)$	$= 900^0$
$= 900^0$		

Activity

1. The size of each interior angle of an equilateral triangle is 60^0. Calculate its interior angle sum.
2. Calculate the interior angle sum of a nonagon whose interior angle is 40^0.
3. A regular polygon has 10 sides. Calculate its interior angle sum.
4. Calculate the interior angle sum of a regular nuodecagon.
5. A regular polygon has 20 sides. Calculate its interior angle sum.

More about interior angle sum

Examples

1. Each exterior angle of a regular polygon is 300. Calculate the interior angle sum of the polygon.

Method 1	Method 2	Method 3
Number of sides = $3600 \div 300$	$90^0(2n - 4)$	$180^0(n - 2)$
$=12$ sides	$90^0(2x\ 12 - 4)$	$180^0(12 - 2)$
Interior angle = $180^0 - 30^0$	$90^0(24 - 4)$	$180^0(12 - 2)$
$= 150^0$	$90^0 \times 20$	$180^0 \times 10$
Interior angle sum = $150^0 \times 12$	$= 1800^0$	$= 1800^0$
$= 1800^0$		

Activity

1. Each interior angle of a regular polygon is 45^0. Calculate the interior angle sum of the polygon.

2. The size of each interior angle of a regular polygon is 140^0. Calculate the interior angle sum of the polygon.
3. Calculate the interior angle sum of a regular polygon whose exterior angle is 36^0.
4. The size of each interior angle of a regular polygon is 90^0. Calculate its interior angle sum.
5. Find the interior angle sum of a regular polygon whose interior angle is 108^0.
6. A regular polygon has one of its exterior angle as 400.
   a) How many sides has the polygon?
   b) How many right angles has the polygon?
   c) Calculate the interior angle sum of the regular polygon.

Solving problems involving interior angle sum.

Examples

1. The sum of interior angles of a regular polygon is 1440^0

a) How many sides has the polygon?

$180^0(n - 2)$ = number of right angles

$180^0 (n - 2) = 1440^0$

$180^0n - 360^0 = 1440^0$

$180^0n - 360^0 + 360^0 = 1440^0 + 360^0$

$$\frac{180^0n}{180^0} = \frac{1800^0}{180^0}$$

$n = 10$ sides

b) Find the size of each exterior angle.

$$\text{Exterior angle} = \frac{360^0}{10}$$

$= 36^0$

Activity

1. The sum of interior angles of a regular polygon totals to 12 right angles.
   a) How many sides has the polygon?
   b) What is the size of each exterior angle?
2. The interior angle sum of a regular polygon is 1260^0.
   a) Calculate the number of sides of the polygon.
   b) Find the size of each interior angle.

THEME: NUMERACY

TOPIC: OPERATION ON WHOLE NUMBERS

Consider; 4 + 5 = 9

In the above mathematical problem, 4 and 5 are called addends while 9 is the sum.

Consider 20 – 14 = 6

In the above mathematical problem, 20 is the minuend, 14 is the subtrahend while 6 is the difference.

REVISION ACTIVITY

1. Work out: 8975631 + 2867542
2. Find the sum of 231048 and 524628
3. Increase 341678 by 987326
4. There were 351 272 books in a library and 189 242 more books were donated to the same library. How many books are there altogether?
5. Atiku paid sh.245,385 for a fridge and sh.437,498 for a television set. How much money did she spend altogether?
6. Work out: 6432578 – 2323451
7. Find the difference of 678231 and 354986
8. What must be added to 237428 to get 885643?
9. Subtract 452 367 from 872 291

   Decrease 845654 by 518349
10. A dairy processed 5300,450 litres of milk and sold 3450,833 litres. How many litres were left?
11. A lorry carried 750458 mangoes. If 678432 were ripe and the rest were raw, find the number of raw mangoes.

MULTIPLICATION OF WHOLE NUMBERS

Consider 3 × 7 = 21

In the above mathematical problem, 3 is the multiplier, 7 is the multiplicand while 21 is the product.

Examples

1. Work out: 357 × 9

$$\begin{array}{r} {\scriptstyle 5\ \ 6\ \ \ } \\ 3\ 5\ 7 \\ \times\ \ \ 9 \\ \hline 3\ 2\ 1\ 3 \end{array}$$

Method II

$$\begin{array}{r} 3\ 5\ 7 \\ \times\ \ \ 9 \\ \hline \\ \hline \end{array}$$

9 x 7 = 63

9 x 50 = 450

9 x 300 = 2700

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ \ } \\ 2\ 7\ 0\ 0 \\ \ \ \ 4\ 5\ 0 \\ +\ \ \ \ 6\ 3 \\ \hline 3\ 2\ 1\ 3 \end{array}$$

2. Find the product of 348 and 26.

```
   6
  2 4
  3 4 8
  × 2 6
 -------
  2 0 8 8
+ 6 9 6
 -------
  9 0 4 8
 -------
```

Method II

```
  3 4 8
  × 2 6
 -------
```

6 x 8	= 48
6 x 40	= 240
6 x 300	= 1800
20 x 8	= 160
20 x 40	= 800
20 x 300	= 6000

```
  1   1
  6 0 0 0
  1 8 0 0
    8 0 0
    2 4 0
    1 6 0
+       4 8
 -----------
  9 0 4 8
 -----------
```

3. Find the product of 4520 and 739.

```
    4 5 2 0
    × 7 3 9
  ----------
    4 0 6 8 0
  1 3 5 6 0
+ 3 1 6 4 0
 ------------
  3 3 4 0 2 8 0
 ------------
```

The product of 4520 and 739 is 3,340,280

4. There are 24 bottles of soda in a crate. How many bottles are in 297 crates?

(297 x 24) bottles

```
    2 9 7
    × 2 4
  --------
    1 1 8 8
+ 5 9 6
 --------
    7 1 4 8
 --------
```

There are 7,148 bottles of soda in 297 crates

5. A carpenter needs 46 screws to fix a bed. How many screws does he need to fix 792 beds?

(792 x 46) screws

```
    7 9 2
    × 4 6
  --------
    4 7 5 2
+ 3 1 6 8
 ---------
  3 6 4 3 2
 ---------
```

He needs 36,432 screws to make 792 beds

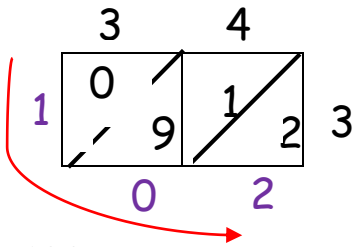
4 **Activity** 4

1. Work out the product of the following numbers
   a) 84 and 32 b) 637 and 18 c) 2508 and 16
2. To plant a garden of bananas on a hectare of land, you need 538 suckers. How many suckers do you need to plant on 63 hectares of land?
3. A bus carries 67 passengers per trip. How many people can be carried by the same bus in 98 trips?
4. A school consumes 3568kg of rice per month. How many kilograms can the same school consume in 47 seven months?

MULTIPLICATION OF WHOLE NUMBERS USING LATTICE METHOD

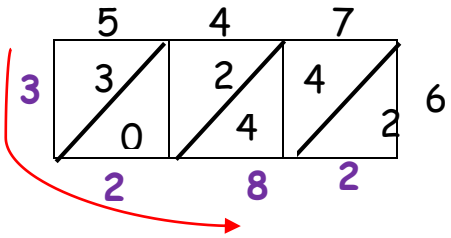
Examples

1. Work out 34 x 3 using lattice method.



34 x 3 = 102

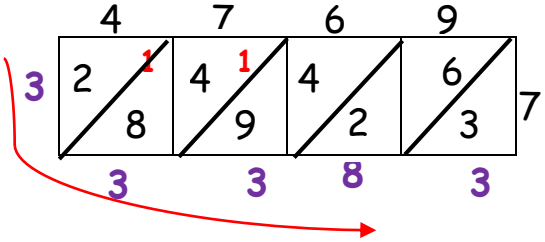
2. Work out 547 x 6 using lattice



547 x 6 = 3,282

3. A university uses 4769 litres of water daily. How much water does it use in a week? (Use lattice method)

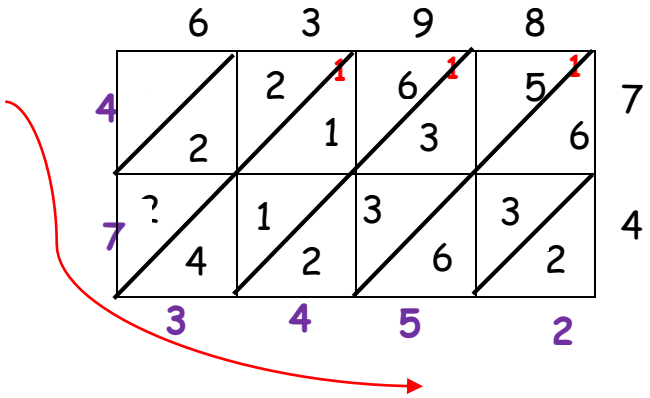
(4769 x 7) litres



The university uses 33,383 litres of water in a week

4. Mulema collects 6398 eggs daily on his farm. How many eggs does he collect in 74 days?

(6398 x 74) eggs



He collected 473,452 eggs in 74 days

ACTIVITY

1. Work out the following using lattice method.
   a) 82 x 4 b) 753 x 6 c) 2,3647 x 5 d) 438 x 69

2. There are 94 books in each bookshelf. If there are 75 bookshelves, how many books are there altogether?
3. A maize mill processes 873 bags of flour in a day. How many bags of flour are processed in 69 days?

DIVISION OF WHOLE NUMBERS

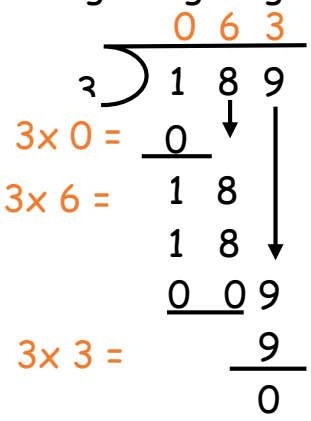
Consider; 10 ÷ 2 = 5

In the above division problem, 10 is the dividend, 2 is the divisor while 5 is the quotient.

Examples:

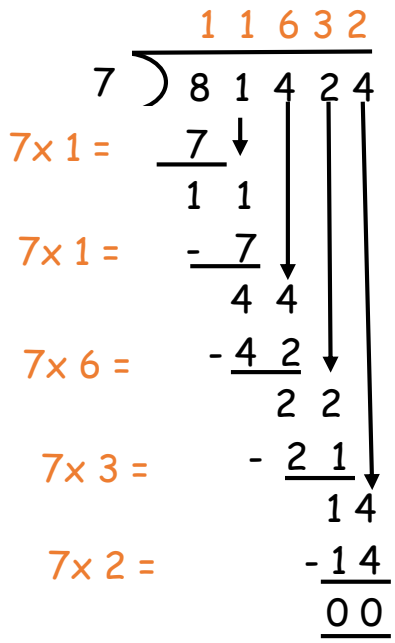
1. Work out the following using long division.

a) 1 8 9 ÷3



189 ÷ 3 =63

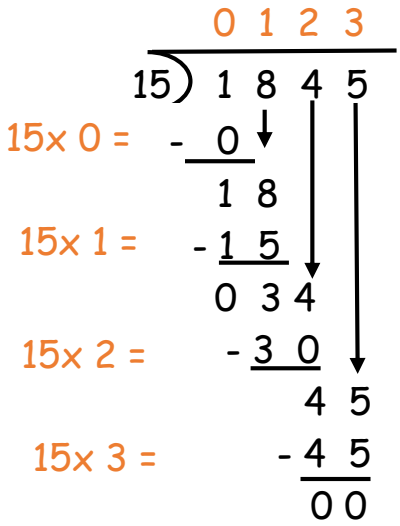
b) 81424 ÷ 7



81424 ÷ 7 =11,632

C) 1 8 4 5 ÷ 1 5

1X15 =15
2X15 =30
3X15 =45
4X15 =60
5X15 =75
6X15 =90

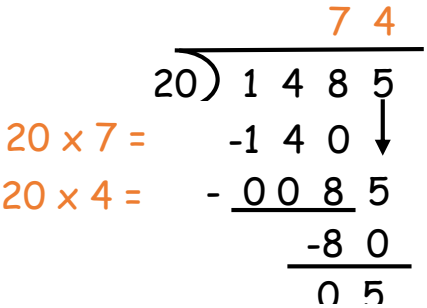


1845 ÷ 15 = 123

2. The minister of health distributed 1485 cartons of masks to 20 sub-counties. How many cartons did each sub-county get?

1485 ÷ 20 =

1x20 =20
2x20 =40
3x20=60
4x20=80
5x20=100
6x20=120
7x20=140
8x20=160



Each got 74 and 5 cartons remained

3. There are 24 bottles in a crate of soda. How many bottles can be obtained in 20,808 bottles?

$$
\begin{array}{r}
867 \\
24\overline{)20808} \\
-192 \\
\hline
0160 \\
-144 \\
\hline
0168 \\
-168 \\
\hline
000
\end{array}
$$

1x24=24
2x24=48
3x24=72
4x24=96
5x24=120
6x24=144
7x24=168
8x24=192
9x24=216

867 crates can be obtained in 20,808 bottles

ACTIVITY

1. Work out the following using long division.
   a) 8412 ÷ 4 b) 18360 ÷ 6 c) 7254 ÷ 18 d) 16,384 ÷ 64
2. Share 594 carpets among 18 vendors.
3. Find the quotient of 2880 and 36.
4. Kapere the poultry farmer collected 6,500 eggs in 50 days. How many eggs did he collect daily?
5. The Baby coach carried 3450 passengers in 50 trips. How passengers did it carry per trip?
6. Jambi supplies 25kg of rice to each restaurant. If he has 527 kg, how many kilograms will remain?

COMBINED OPERATIONS

In case of more than one operation in a problem, we follow the order of BODMAS.

B O D M A S

- S → Subtraction
- A → Addition
- M → Multiplication
- D → Division
- O → Of
- B → Brackets

Examples

1. Work out the following correctly:

a) 17 – 9 + 23

Brackets

b) 8 x 12 ÷ 4

(12÷4) x 8

3 x 8

24

c) 58 + (7 x 6)

(7 x 6) + 48

42 + 58

100

d) $\frac{1}{2}$ of 10 + 15 ÷ 3

$\frac{1}{2}$ of 10 + (15 ÷ 3)

($\frac{1}{2}$ of 10) + 5

$\frac{1}{2} \times 10 + 5$

(1 x 2) + 5

2 + 5

7

e) (8 – 5) – (3 x 2) + (2 x 2)

(8 – 5) – (3 x 2) + (2 x 2)

3 - 6 + 4

(3 + 4) – 6

7 - 6

1

2. Janie had sh.3000 on her mobile money account. She received sh.2500 more from her mother and later used sh.1700 as airtime. How much was left on her account?

Sh.3000 + sh.2500) – sh.1700

(sh.3000 + sh.2500) – sh.1700

Sh.5500 - sh.1700

Sh.3800

She was left with sh. 3800 on her account

3.Kependi had sh.81000 and used $\frac{1}{3}$ of it to pay electricity bills. She then sold her hen at sh.16000. How many money does have now?

$sh.81000 - (\frac{1}{3} \times$ sh.81000) + sh.16000

Sh.81000 - ($\frac{1}{3} \times$ sh.81 000) + sh.16000

Sh.81000 – sh.27000) + sh.16000

She has sh.70,000 now

(sh.81000 + sh.16000) - sh.27000

Sh.97000 - sh.27000

Sh. 70,000

Activity

1. Work out the following correctly

a) 8 – 26 + 22
b) 2.8 ÷ 4 x 2
c) 6 ÷ 6 + 2 – 3
d) 42 ÷ (7 x 6) + 2
e) (8 – 5) – (4 x 3) + (5 x 2)
f) $\frac{3}{10}$ of 40 + $\frac{2}{5}$ of 25
g) 33 x 2 + 12 ÷ 12
h) 28 – 4 x 5

2. Kiku had 24 fruits and have away $\frac{1}{4}$ of them to a friend. Kiku later got 12 fruits more from his daddy. How many fruits did he remain with altogether?
3. Andema had sh.7500 and received sh.4500 more from a friend. He later equally shared the money with his elder brother. How much did each get?

BASES

- This is the counting and grouping of numbers.
- Grouping objects/numbers in twos forms base two, grouping in threes forms base three, grouping numbers in fours forms base four, etc.

Names of base and digits used

Base	Base name	Digits used
One	Unary	0
Two	Binary	0, 1
Three	Ternary	0, 1, 2
Four	Quaternary	0, 1, 2, 3
Five	Quinary	0, 1, 2, 3, 4
Six	Senary	0, 1, 2, 3, 4, 5,
Seven	Septenary	0, 1, 2, 3, 4, 5, 6
Eight	Octal	0, 1, 2, 3, 4, 5, 6, 7,
Nine	Nonary	0, 1, 2, 3, 4, 5, 6, 7, 8
Ten	Decimal/ denary	0, 1, 2, 3, 4, 5, 6, 7, 8, 9

PLACE VALUES AND VALUES OF NON-DECIMAL BASES.

Examples

1. Write the place value of each digit in each number below.

a) 101_{two}

$1\ 0\ 1_{two}$

- 1 → Ones
- 0 → Twos
- 1 → Two twos

b) 2341_{five}

2341_{five}

- 1 → One
- 4 → Fives
- 3 → Five fives
- 2 → Five five fives

c) 637_{nine}

637_{nine}

- 7 → One
- 3 → Nines
- 6 → Nine nines

2. What is the value of each digit in the following numbers?

a) 212_{three}

212_{three}

- 2 → Ones (2x1) =2
- 1 → Threes (1x 3) =3
- 2 → Three threes (2x3x3)=18

b) 146_{seven}

146_{seven}

- 6 → Ones (6x1) = 6
- 4 → Sevens (4x7) = 28
- 1 → Seven sevens (1x7x7) = 49

3. Expand the following numbers as instructed in the brackets

a) 342_{five}(using place values)

342_{five}

- 2 → Ones
- 4 → Fives
- 3 → Five fives

$(3x5x5) + (4x5) + (2x1)$

b) 110_{two} (using values)

110_{two}

- 0 → Ones (0x1)=0
- 1 → Twos (1x2)=2
- 1 → Two twos (x2x2)=4

$4 + 2 + 0$

c) 432_{five} (using exponents)

5^2	5^1	5^0
4	3	2

$(4x5^2) + (3x5^1) + (2x5^0)$

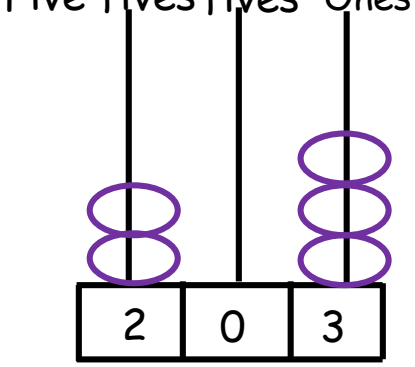
d) 1011_{two} (using exponents)

2^3	2^2	2^1	2^0
1	0	1	1

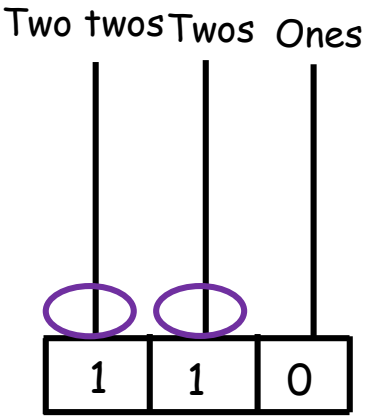
$(1x2^3) + (0x2^2) + (1x2^1) + (1x2^0)$

Show the following numbers on the abacus.

a) 203five



b) 110_{two}



Activity

1. Write the place value of the underlined digits.
   a) $\underline{5}\ 6\ 4_{eight}$ b) $1\ 1\ \underline{0}\ 1\ 1_{two}$
2. What is the value of 2 in the following numbers?
   a) 3426_{nine} b) 1230_{four}
3. Expand the following as instructed in the brackets
   a) 322_{five}(Using values) b) 1302_{four} (using exponents)
4. Show the following numbers on the abacus.
   a) 221three b) 1431_{six}
5. What base five number has been expanded to give $(2x5^3)+(4x5^2)+(3x4^1)+(1x5^0)$

CONVERTING FROM NON-DECIMAL SYSTEM TO DECIMA SYSTEM

Examples

1. Convert the following into base ten/denary base /decimal base.

a) 1101_{two}

$1\ 1\ 0\ 1_{two}$

Ones (1x1) = 1

Twos (0x2) = 0

Two twos (2x2) = 4

Two two twos (2x2x2) = 8

1 + 0 + 4 + 8

13

$1101_{two} = 13_{ten}$

2^3	2^2	2^1	2^0
1	1	0	1

$(1x2^3) + (1 \times 2^2) + (0 \times 2^1) + (1\times 2^0)$

(1x2x2x2) + (1x2x2) + (0x2) + (1x1)

8 + 4 + 0 +1

13

$1101_{two} = 13_{ten}$

b) 1234_{five} $1\ 2\ 3\ 4_{five}$

Ones (4x1) = 4

Fives (3x5) = 15

Five fives (2x5x5) = 50

Five five fives (1x5x5x5) =125

125 + 50 + 15 + 4

$1234_{Five} = 194_{ten}$

5^3	5^2	5^1	5^0
1	2	3	4

$(1x5^3) + (2 \times 5^2) + (3 \times 5^1) + (4\times 5^0)$

(1x5x5x5) + 2x5x5) + (3x5) + (4x1)

125 + 50 + 15 + 4

$1234_{Five} = 194_{ten}$

CONVERTING FROM DECIMAL SYSTEM TO NON-DECIMAL SYSTEM

EXAMPLES

1. Convert 63_{ten} into binary base.

BASE	NUMBER	REMAINDER
2	63	1
2	31	1
2	15	1
2	7	1
2	3	1
2	1	1
	0	

$63_{ten} = 111111_{two}$

2. Express 100_{ten} a base five numeral.

BASE	NUMBER	REMAINDER
5	100	0
5	20	0
5	4	4
	0	

$100_{ten} = 400_{five}$

2. Express 43_{ten} to ternary base.

BASE	NUMBER	REMAINDER
3	43	1
3	14	2
3	4	1
3	1	1
	0	

$23_{ten} = 1121_{three}$

4. Convert 200_{ten} into nonary base

BASE	NUMBER	REMAINDER
9	200	2
9	22	4
9	2	2
	0	

$200_{ten} = 2\ 4\ 2_{Nine}$

ACTIVITY

1. Express the following in decimal system;

a) 1011_{two} b) 302_{four} c) 132_{eight} d) 224_{six}

2. Convert the following as instructed in the brackets;

i) 48_{ten} (into quinary base) ii) 51_{ten} (into binary base)

iii) 77_{ten} (into ternary base) iv) 92_{ten} (into octal base)

CONVERTING NON DECIMAL BASE TO ANOTHER NON DECIMAL BASE

Examples

1. Convert 1011_{two} to base three.

2^3	2^2	2^1	2^0
1	0	1	1

$= (1x2^3) + (0x2^2) + (1x2^1) + (1x2^0)$

$= (1x2x2x2) + (0x2x2) + (1x2) + (1x1)$

$= 8 + 0 + 2 + 1$

$= 1\ 1_{ten}$

B	N	R
3	11	2
3	3	0
3	1	1
	0	

$= 1\ 02_{three}$

2. Express 132_{eight} to base six

8^2	8^1	8^0
1	3	2

$= (1x8^2) + (3x8^1) + (2x8^0)$

$= (1x8x8) + (3x8) + (2x1)$

$= 64 + 24 + 2$

$= 90_{ten}$

B	N	R
6	90	0
6	15	3
6	2	2
	0	

$= 230_{six}$

3. Change 302_{four} to quinary base.

4^2	4^1	4^0
3	0	2

$(3x4^2) + (0x4^1) + (2x4^0)$

$(3x4x4) + (0x4) + (2x1)$

$48 + 0 + 2$

50_{ten}

B	N	R
5	50	0
5	10	0
5	2	2
	0	

$= 200_{five}$

4. Express 224_{six} as an octal base.

6^2	6^1	6^0
2	2	4

$(2x6^2) + (2x6^1) + (4x6^0)$

$(2x6x6) + (2x6) + (4x1)$

$72 + 12 + 4$

88_{ten}

B	N	R
8	88	0
8	11	3
8	1	1
	0	

$= 130_{eight}$

ACTIVITY

1. Convert 34_{five} to binary base.
2. Express 151_{six} to base eight.
3. Convert 1001_{two} to base five.
4. What is 26_{nine} as a base seven number?
5. Convert 130_{five} to four

OPERATION ON NON-DECIMAL NUMBERS

ADDING NUMBERS IN NON-DECIMAL SYSTEM

Examples

1. Work out: $1\ 1\ 0_{two} + 1\ 1_{two}$

$$\begin{array}{r} {\scriptstyle 1}\ \ \ \ \ \ \\ 1\ \ 1\ \ 0_{two} \\ +\ \ 1\ \ 1_{two} \\ \hline \mathbf{1\ \ 0\ \ 0\ \ 1_{two}} \end{array}$$

$2 \div 2 = 1 rem 1$

$2 \div 2 = 1 rem 1$

2. Find the sum of $1\ 2\ 4_{Five}$ and 42_{Five}.

$$\begin{array}{r} {\scriptstyle 1\ \ 1}\ \ \ \ \ \ \\ 1\ \ 2\ \ 4_{Five} \\ +\ \ 4\ \ 2_{Five} \\ \hline \mathbf{2\ \ 2\ \ 1_{Five}} \end{array}$$

$6 \div 5 = 1 rem 1$

$7 \div 2 = 1 rem 2$

3. Work out: $2\ 5\ 6_{Seven} + 4\ 3\ 1_{seven}$

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ 1}\ \ \ \ \ \ \\ 2\ \ 5\ \ 6_{Seven} \\ +\ 4\ \ 3\ \ 1_{Seven} \\ \hline \mathbf{1\ \ 0\ \ 2\ \ 0_{Seven}} \end{array}$$

$7 \div 7 = 1 rem\ 0$

$9 \div 7 = 1 rem 2$

$7 \div 7 = 1 rem\ 0$

$$\begin{array}{r} {\scriptstyle 1\ \ 1\ \ 1}\ \ \ \ \ \ \\ 2\ \ 1\ \ 2_{Three} \\ +\ \ 2\ \ 2_{Three} \\ \hline \mathbf{1\ \ 1\ \ 1\ \ 1_{Five}} \end{array}$$

$4 \div 3 = 1 rem\ 1$

$4 \div 3 = 1 rem 1$

$3 \div 3 = 1 rem\ 1$

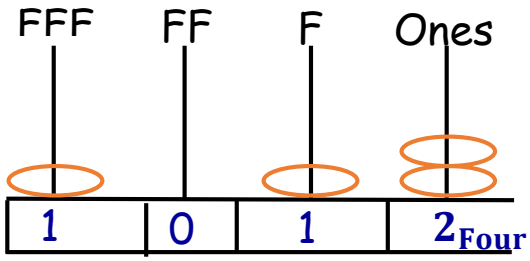
5. Represent the sum of $3\ 1\ 4_{four}$ and 32_{Four} on an abacus

$$\begin{array}{r} {\scriptstyle 1\ \ 1}\ \ \ \ \ \ \\ 3\ \ 1\ \ 4_{Four} \\ +\ \ 3\ \ 2_{Four} \\ \hline \mathbf{1\ \ 0\ \ 1\ \ 2_{Four}} \end{array}$$

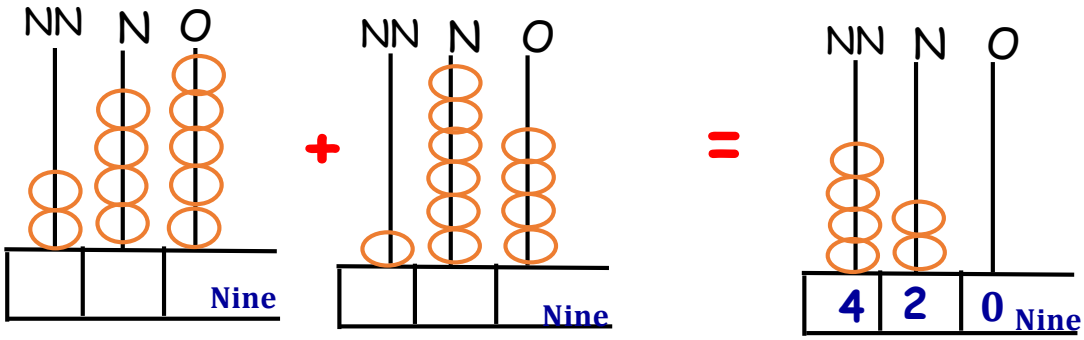
$6 \div 4 = 1 rem\ 2$

$5 \div 4 = 1 rem 1$

$4 \div 4 = 1 rem\ 0$



6. Work out and complete the abacus below correctly.



$$\begin{array}{r} {\scriptstyle 1\ \ 1}\ \ \ \ \ \ \\ 2\ \ 4\ \ 5_{nine} \\ +\ 1\ \ 6\ \ 4_{nine} \\ \hline \mathbf{4\ \ 2\ \ 0_{Nine}} \end{array}$$

$9 \div 9 = 1 em\ 0$

$11 \div 9 = 1 rem 2$

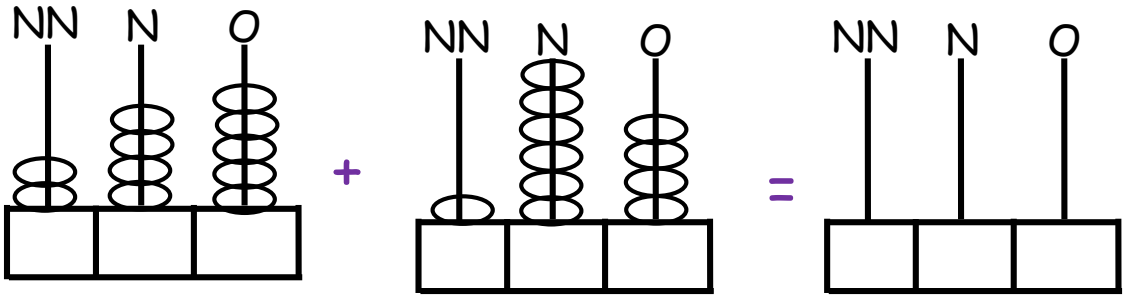
ACTIVITY

1. Work out the following.

a) $110_{two} + 11_{two}$ b) $102_{three} + 22_{three}$ c) $156_{seven} + 64_{seven}$

2. Represent the sum of 374_{eight} and 45_{eight} on the abacus

3. The abaci below show the addition problem of base nine. Work out and complete the abacus correctly.



SUBTRACTION IN NON-DECIMAL SYSTEM

EXAMPLES

1. Work out: $123_{five} - 31_{five}$

$$\begin{array}{r} {\scriptstyle 0\ \ 2+5} \\ \cancel{1}\ \cancel{2}\ 3_{five} \\ -\ \ 3\ 1_{\ five} \\ \hline 0\ 4\ 2_{five} \end{array}$$

$3 - 1 = 2$

$2 + 5 = 7 - 3$

$= 4$

2. Find the difference between 342_{six} and 142_{six}

$$\begin{array}{r} {\scriptstyle 2\ \ 2+6} \\ 3\ \cancel{2}\ \cancel{3}_{six} \\ -\ 1\ 4\ 2_{six} \\ \hline 1\ 4\ 1_{six} \end{array}$$

$3 - 2 = 1$

$2 + 6 = 8 - 4$

$= 4$

$2 - 1 = 1$

3. Show the difference between 451_{nine} and 123_{nine} on the abacus.

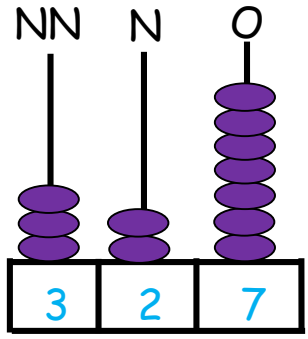
$$\begin{array}{r} {\scriptstyle 4\ \ 1+9} \\ 4\ \cancel{5}\ \cancel{1}_{nine} \\ -\ \ 1\ 2\ 3_{nine} \\ \hline 3\ 2\ 7_{nine} \end{array}$$

$(1 + 9) = 10 - 3$

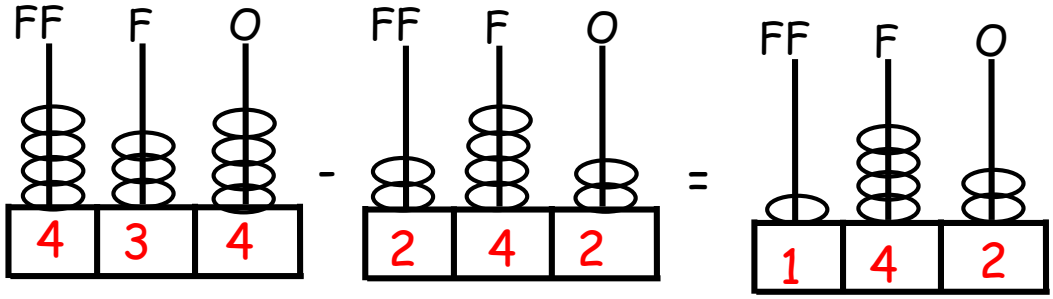
$= 7$

$4 - 2 = 2$

$4 - 1 = 3$



4. Complete the abaci below correctly.



3 3+5

$4\ \cancel{3}\ 4_{five}$

$-2\ 4\ 2_{five}$

$1\ 4\ 2_{five}$

$3 + 5 = 8 - 4$

$= 4$

Activity

1. Work out:

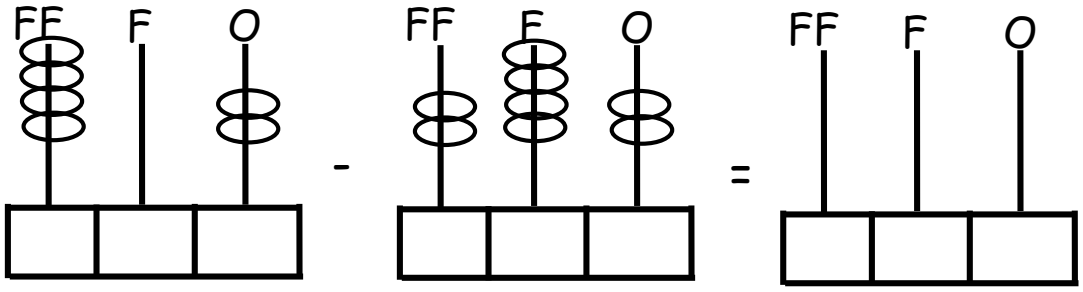
a) $1\ 1\ 0_{two}$ $-1\ 0\ 1_{two}$

b) $4\ 1\ 1_{five}$ $-\ 1\ 2\ 3_{five}$

c) $2\ 1\ 2_{three}$ $-\ 1\ 2\ 2_{three}$

2. Subtract 211_{four} from 301_{four} and show your answer on the abacus.

3. Complete the abaci below correctly.



MULTIPLICATION IN NON-DECIMAL SYSTEM

Examples

1. Work out the following

$a)\ 1\ \ 1\ \ 1\ \text{two} \times \ \ 1\ \ 0_{\text{two}}$

$$\begin{array}{r} 1\ 1\ 1_{\text{Five}} \\ \times\ \ 1\ \ 0_{\text{Five}} \\ \hline 0\ 0\ 0 \\ +1\ 1\ 1 \\ \hline 1\ 1\ 1\ 0_{\text{Five}} \\ \hline \end{array}$$

b) $1\ \ 0\ \ 1\ \text{two} \times \ \ 1\ \ 1_{\text{two}}$

$$\begin{array}{r} 1\ 0\ 1_{\text{two}} \\ \times\ \ 1\ \ 1_{\text{two}} \\ \hline 0\ 0\ 0 \\ +1\ 1\ 1 \\ \hline 1\ 1\ 1\ 0_{\text{two}} \\ \hline \end{array}$$

1. Find the product of 43_{fives} and 123_{five}

$$\begin{array}{r} 1\ 2\ 3_{\text{Five}} \\ \times\ \ 4\ 3_{\text{Five}} \\ \hline 4\ 2\ 4 \\ +\ 1\ 1\ 3\ 2 \\ \hline 2\ 2\ 3\ 0\ 4_{\text{five}} \\ \hline \end{array}$$

$9 \div 5 = 1$ rem 4
$(6+1) \div 5 = 1$ rem 2
$(3+1) = 4$
$(12 \div 5) = 2$ rem 2
$(8+2) \div 5 = 1$ rem 3
$(4+1) = 1$rem 1

2. What is the product 424_{five} and 4?

$$\begin{array}{r} {\scriptstyle 3\ \ 2\ \ 2} \\ 4\ 2\ 3_{\text{Five}} \\ \times\ \ 4 \\ \hline 3\ 3\ 2\ 2_{\text{five}} \\ \hline \end{array}$$

$12 \div 5 = 2$ rem 2
$(8+2) \div 5 = 2$rem 0
$(16+2) \div 5 = 3$ rem3

5) Work out : $1\ 2\ 1\ \text{three} \times \ \ 1\ 2_{\text{three}}$

$$\begin{array}{r} 1\ 2\ 1_{\text{three}} \\ \times\ \ 1\ 2_{\text{three}} \\ \hline 1\ 0\ 1\ 2 \\ +\ 1\ 2\ 1 \\ \hline 2\ 2\ 2\ 2_{\text{five}} \\ \hline \end{array}$$

$4 \div 3 = 1$ rem 1
$3 \div 3 = 1$rem 0

ACTIVITY

Work out the following

1.	421five	x	22five	5.	53six	x	45six
2.	101two	x	10tw	6.	203seven	x	112seven
3.	34three	x	43three	7.	132eight	x	33eight
4.	121four	x	22four	8.	33nine	x	221nine

FINDING UNKNOWN BASES

Examples

Solve for the unknown value in the following

w^1	w^0
5	2

a) $54_n = 34_{ten}$

$(5xp^1) + (4xp^0) = 34$

$(5xp) + (4x1) = 34$

$5p + 4 = 34$

$5p + 4 - 4 = 34 - 4$

$\frac{5p}{5} = \frac{30}{5}$ 6

$P = 6$

P is base six

b) $52_w = 17_{ten}$

$(5xw^1) + (2xwp^0 = 17$

$(5xw) + (2x1) = 17$

$5w + 2 = 17$

$5w + 2 - 2 = 17 - 2$

$\frac{5w}{5} = \frac{15}{5}$ 3

$w = 3$

P is base three

c) $43_m = 35_{six}$

m^1	m^0
4	3

=

6^1	6^0
3	5

$(4xm^1) + (3xm^0) = (3x6^1) + (5x6^0)$

$(4xm) + (3x1) = (3x6) + (5x1)$

$4m + 3 = 18 + 5$

$4m + 3 - 3 = 23 - 3$

$\frac{4m}{4} = \frac{20}{4}$ 5

$w = 5$

P is base five

d) $32_k = 1011_{two}$

k^1	k^0
3	2

=

2^3	2^2	2^1	2^0
1	0	1	1

$(3xk^1) + (2xk^0) = (1x2^3) + (0x2^2) + (1x2^1) + (1x2^0)$

$(3xk) + (2x1) = (1x2x2x2) + (0x2x2) + (1x2) + (1x1)$

$3k + 2 = 8 + 0 + 2 + 1$

$3k + 2 = 11$

$3k + 2 - 2 = 11 - 2$

$\frac{3k}{3} = \frac{9}{3}$ 3

$k = 3$

k is base three

Activity

Work out the value of the unknown base in each of the following

1) $14_n = 7_{ten}$ 2) $75_d = 26_{ten}$ 3) $83_k = 35_{ten}$ 4) $50_m = 50_{six}$

5) $46_q = 33_{five}$ 6) $28_p = 10110_{two}$ 7) $34_b = 31_{nine}$ 8) $25_y = 102_{three}$

FINITE SYSTEM

NOTE

Finite system is the system of counting and grouping objects where remainders are considered.

This system is also called Remainder – arithmetic, clock arithmetic or modular system.

DIFFERENT FINITES AND DIGITS USED

Finite	Digits used
2	{0,1}
3	{0,1,2}
4	{0,1,2,3}
5	{0,1,2,3,4}
6	{0,1,2,3,4,5}
7	{0,1,2,3,4,5,6}
8	{0,1,2,3,4,5,6,7}
9	{0,1,2,3,4,5,6,7,8}
10	{0,1,2,3,4,5,6,7,8,9}
11	{0,1,2,3,4,5,6,7,8,9,10}
12	{0,1,2,3,4,5,6,7,8,9,10,11}

COUNTING AND GROUPING IN FINITE FIVE, SEVEN AND TWELVE

Examples

1. Count and group the following numbers in fives (finite five)

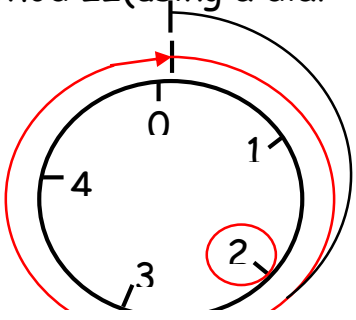
a) 7

Method I

(7÷5) = 1 rem 2

7 = 2(finite 5)

Method II(using a dial



7 = 2(finite 5)

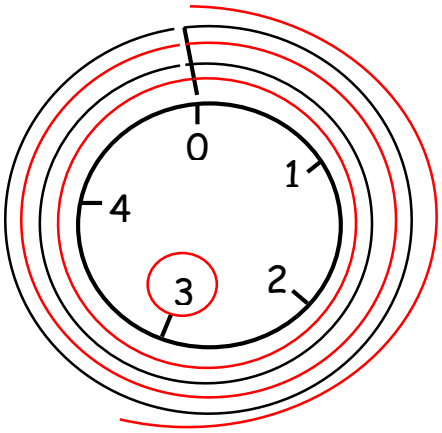
b) 23

Method I

23÷5 = 4 rem 3

23 = 3(finite 5)

Method II (using a clock)



2. Count and group in sevens (finite 7)

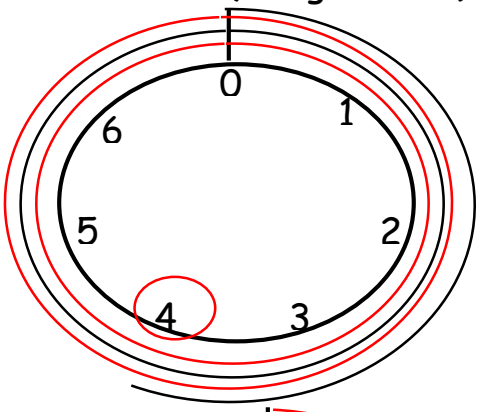
i) 25

Method I

25÷7 = 3 rem 4

25 = 4(finite 7)

Method II (using a clock)



3. Count and group in twelves (finite 12)

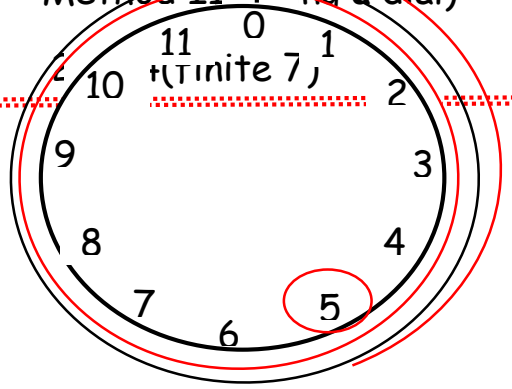
i) 29

Method I

29 ÷12 = 2 rem 5

29 = 5(finite 12)

Method II (using a dial)



29 = 5(finite 12)

3. Write down the equivalences of

a) 3(finite 7)

(3+7)=10
(10+7)=17
(17+7)=24
(24+7)=31

3(finite7) =10,17,24,31…

b) 0(finite 5)

(0+5) =5
(5+5) =10
(10+5) =15
(15+5) =20

0(finite5) =5, 10, 15,20, …

c) 7(finite 12)

(7+12) =19
(19+12)=31
(31+12)=43
(43+12)=55

7(finite 12) =19, 31, 43, 55 …

d) 1(finite 4)

(1+4) =5
(5+4)=9
(9+4)=13
(13+4)=17

1(finite 4) =5, 9, 13,17 …

ACTIVITY

1. Without using a dial, count and group the following as indicated in the brackets.

a) 5 (in fours)

2. Using a dial, count and group the following as indicated in the brackets.

(e)18 (in eights)

(f)12 (in sixe Finite 7

3. Complete the tables below correctly

Finite 5

a)

0	1	2	3	4

(

b)

0	1	2	3	4	5	6

ADDITION IN FINITE SYSTEM

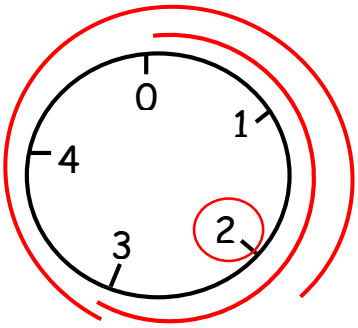
Example

1. Work out the following

a) 3 + 4 = -----(mod 5)

Method II (using a dial)

3 + 4 =---- (mod5)



3 + 4 =5 (mod5)

2. Workout: 6 + 4 = ---(finite 7)

Method I

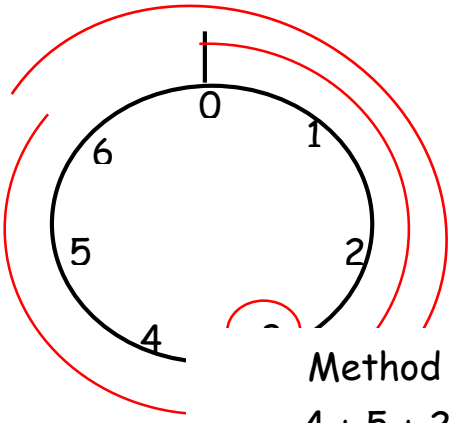
6 + 4 =10

10 ÷ 7 = 1 rem 3

6 + 4 = 3(finite 7)

Method II

6 + 4 =---- (finite7)



Method II

4 + 5 + 2 + 1

6 + 4 =3 (finite7)

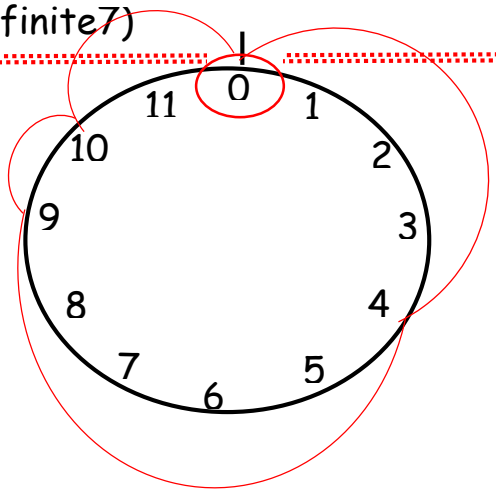
4. Work out: 4 + 3 + 2 + 1 = ----(mod 12)

Method I

4 + 5 + 2 + 1 =12

12(mod 12)

12÷12 = 1 rem 0



4 + 5 + 2 + 1 = 0(finite 12)

ACTIVITY

(1) Add the following using a dial or clock arithmetic

(i) 2 + 3 = ____ (finite 5)

(ii) 9 + 7 = ____ (finite 12)

(iii) 3 + 6 = ____ (mod 7)

(iv) 5 + 3 = ____ (mod 6)

(2) Workout the following without using a dial.

(i) 6 + 7 =____(mod 5)

(ii) 4 + 5 =____(mod 7)

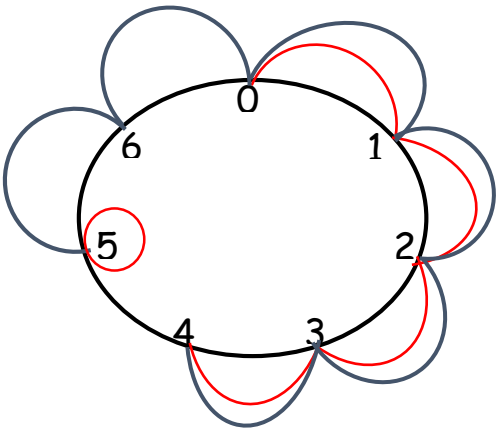
(iii) 6 + 5 + 1 =____(finite 12)

(iv) 2 + 1 +2 =____(finite 3)

SUBTRACTION IN FINITE SYSTEM WITH AND WITHOUT A DIAL

EXAMPLE

1. Workout: 4 – 6 = ____ (mode 7)



Method I (using a dial)

Method II

4 - 6 = ____ (mod 7)

(4 + 7) – 6 = ____ (mod 7)

11 – 6 = ____ (mod 7)

= (5 mod 7)

4 – 6 = 5 (mod 7)

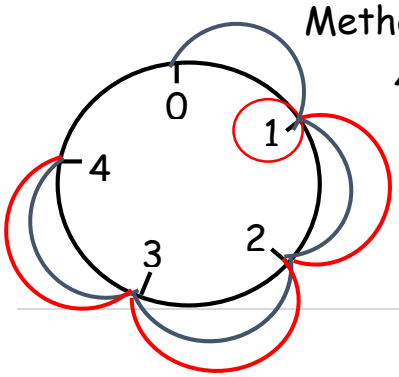
3. Work out: 4 - 3 =__ (mod 5)

Method I

4 – 3 = ____ (mod 5)

4 - 3 = 1 (mod 5)

4 – 3 = 1 (mod 5)



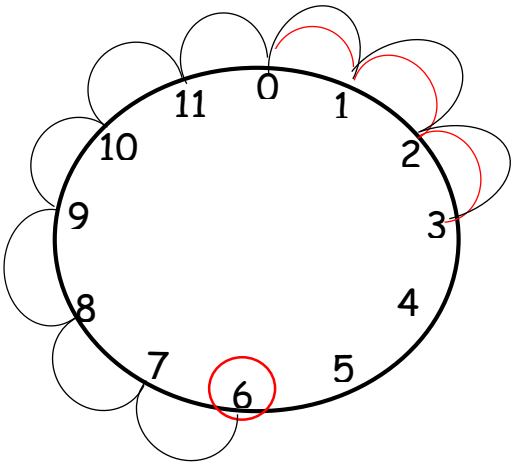
Method II

4 – 3 = ____ (mod 5)

4 – 3 = 1 (mod 5)

Method I

3 – 9 = ___ (mod 12)



3 – 9 = 6 (mod 12)

Method II

3 – 9 = ___ (finite 12)

(3 + 12) – 9 = ___ (finite 12)

15 – 9 = 6 finite 12

ACTIVITY

(1) Workout the following using a dial.

(i) 4 – 2= ___ (finite 5)

(ii) 3 – 5 = ___ (mode 7)

(iii) 1 – 7 = ___ (finite 8)

(iv) 4 – 7 = ___ (mode 12)

(2) Without using clock arithmetic, simplify the following;

(i) 7 – 7=___(finite 12)

(ii) 2 – 5 =___(finite 7)

(iii) 0 – 3 =___(mode 4)

(iv) 3 – 5 =___(finite 6)

APPLICATION OF FINITE SYSTEM FINITE 7

Consider the table,

Sun	Mon	Tue	Wed	Thu	Fri	Sat
0	1	2	3	4	5	6

Examples

1. If today is Friday. What day of the week will it be after 23days from now?

5 stands for Friday

Day + 23 =___(mode 7)

5 + 23 =___ (mode 7)

28 =___ (mode 7)

=28 ÷ 7

=4 remainder 0

0 stands for Sunday

Therefore the day will be Sunday

Method II

Sun	Mon	Tue	Wed		Thu	Fri	Sat
							1
2	3	4	5		6	7	8
9	10	11	12		13	14	15
16	17	18	19		20	21	22
23							

The day will be Sunday

2. Today is Tuesday. What day of the week was it 45 days ago?

Method I

2 stands for Tuesday

Day - 45=___ (finite 7)

2 - 45 = ___ (finite 7)

First express 45 in (finite 7)

6 rem .3

7 ⟌45

- 42

01

45 =3(finite 7)

Method II

Sun	Mon	Tue	Wed	Thu	Fri	Sat
2	1					
9	8	7	6	5	4	3
16	15	14	13	12	11	10
23	22	21	20	19	18	17
30	29	28	27	26	25	24
37	36	35	34	33	32	31
44	43	42	41	40	39	38
						45

2 – 3 = ___ (finite 7)
(2+ 7) – 3 = ___ (finite 7)
9 – 3 =6(finite 7)
6 stands for Thursday
Therefore the day was Thursday

The day will be Saturday

ACTIVITY

1. The examination started at 11:00 and lasted for 3hours. At what time did it end?
2. It is 3:00a.m now, what time will it be after 14hours from now?
3. A train left Mombasa at 10:00pm, it reached Kasese after 42hours. At what time did it arrive at Kasese?
4. A plane left London at 7:30am. If it landed at Entebbe after 36 hours, at what time did it land?
5. A meeting started at 8:00am. It lasted for 8hours, at what time did it end?
6. Cissy travelled for 81 hours after leaving at 2:30p.m. At what time did she arrive at the destination?

MONTHS OF THE YEAR.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Equivalency in finite	1	2	3	4	5	6	7	8	9	10	11	0

Examples

1. This month is July. Which month of the year will it be after 32 months?
   7 stands for July

   7 + 32 = ___ (mode 12)
   = 39 (mode 12)
   = 39 ÷ 12
   = 3 remainder 3
   3 stands for March

So the month will be March.

2. It is April now, which month of the year was it 346 months ago?
4 stands for April

4 – 34 = ___(finite 12)
Express 346 in finite 12)

```
      28 rem 10
  12 | 346
  2 x 12 -24
         106
8 x 12 = - 96
         - 10
```

= 28 remainder 10
10 stands for October
Therefore the month was October.

ACTIVITY

1. Kapere left school in August. He stayed home for 17 months. In which month of the year did he resume school?
2. If is February now, which month of the year was it 124 months ago?
3. Kavuma was born 1341 months ago, in which month was he born if it August now?
4. If this month is October, which month of the year will it be after:-
(i) 43 months
(ii) 92 months
(iii) 131 months?
5. My sister went to America in March. She will spend $2\frac{1}{2}$ years there. What month of the year will she come back?
6. Allan left Uganda in May and lived in Canada for $4\frac{2}{3}$ years. In which month did he return?

TOPICAL TEST

1. Workout: 5 – 9 + 4
2. Find the product of 125 and 50
3. Use >, <, or = to make this statement true.

   $\frac{1}{2}$ kg _____ 0.5kg
4. Kazooba sold the following trays of eggs in a week. 4, 8, 5, 0, 7, 9 and 2. Find the average number of trays Kazooba sold each day.
5. A school bought 3435kgs of soya beans last month and 8237kgs this month. If 1304kgs were stolen and bad soya beans how many kgs were good to eat?
6. A passenger train has 8 wagons each carrying 124 people. If the train Makes 2 trips each day, how many people does the train carry each day?
7. What bas eight numeral is equal to 124_{ten}?
9. Express 321_{nine} as a denary system numeral.
10. List down 5 whole numbers which are equivalent to 3 (finite 7)
11. What base has been used in this operations 123 + 22 = 200
12. Add: $24_{five} + 324_{six}$ (give the answer in base seven)
13. Telephone poles are 15metres apart. What is the distance from the 1^{st} pole to the 10^{th} pole?
14. If today is Monday. What day of the week will it be after 47 days?

LESSON NOTES FOR TERM 1 2022

SET CONCEPTS

TERM 1: WEEK 1(Lesson 1 Review of P.5 work on sets)

Definition of a set: A set is a collection of well-defined elements.

Kinds/types of Sets

a) Equal set and unequal sets
b) Equivalent set and nonequivalent sets
c) Joint(intersecting sets) and disjoint sets
d) Union sets
e) Difference and complement of sets
f) Universal sets and the concept of subsets
g) Subsets and proper subsets

WEEK 1: Lesson 2.

Equal sets

Equal sets are sets with exactly the same members and the same number of elements. The set symbol for equal sets is" =" and unequal sets have the same members but with different number of elements and "≠ "is the symbol for unequal sets

Examples of equal sets

1. Set A = { 1, 2, 3, 4} and set B = {3, 1, 4, 2}

2. Set C = {u, o, i, a, e} and Set D = {a, e, i, o, u}

3. Set M = {A, ,B, C, D, E} and set N ={D, E, B, A, C}

Examples of unequal sets

1. Set A = { 1, 2, 3, 4} and set B = {1, 4, 2}
2. Set C = {u, o, i, a, e} and Set D = {i, o, u}
3. Set M = {C, D, E} and set N ={D, E, B, A, C}

Equivalent sets: These are sets with same number of members but different number. The symbol is "↔ "

Examples of equivalent sets

1. Set A= {1, 2, 3, 4, 5} and set B={a, e, i, o, u}
2. Set M={A, B, C, D} and set N={ p, u, t, k}
3. Set G={1, 4, 9} and set H={ a, e, i}

Nonequivalent sets: These are sets with different number of elements and different members.

Examples of Nonequivalent sets

1. Set A= {1, 2, 3, 4, 5} and set B={e, i, o, u}
2. Set M={C, D} and set N={ p, u, t, k}
3. Set G={1, 4, 9} and set H={i}

Evaluation activity

State the relationship between sets below using equal or equivalent sets.

1. A= {q, e, t, w} and B= {1, 2, 3, 4}

2. B= {1, 3, 5, 7} and C= {5, 7, 1, 3}
3. D= {A, D, G, 4, H} and K= {a, e, i, o, u}
4. E= {MAP, S} and H= {map, s}
5. P= { M, A, R, K} and L= {m, a, r, k}
6. R= { 1, 2, 3, 5, 6} and P= { 5, 6, 1, 3, 2}

Ref: MK Pupils` book 5 page 3

WEEK I: Lesson 3

Joint and Disjoint sets

Joint sets are sets with common member(s).

Examples of Joint sets

1. R= {1, 3, 5, 8, 9} and P= {5, 7, 1, 3, 2} i.e. 1, 3, and 5 are common in both sets.
2. D= {A, D, G, 4, H} and K= {a, A, E, u, D} i.e. A and D are common in both sets.

Disjoint sets are sets with no common member.

Examples of disjoint sets

1. D= {A, D, G, 4, H} and K= {a, e, i, o, u}
2. E= {MAP, S} and H= {map, s}

Evaluation activity

State the relationship between sets below using joint or disjoint sets.

1. G= {q, e, t, w} and D= {1, 2, 3, 4}
2. W= {1, 3, 5, 7} and F= {5, 7, 1, 3}
3. R= {A, D, G, 4, H} and K= {a, e, i, o, u}
4. B= {MAP, S} and C= {map, s}
5. D= { 1, 2, 3, 5, 11} and P= { 5, 8, 1, 0, 2}
6. A= { k, e, f, s} and B= { c, h. e, f}

WEEK 1: Lesson 4

Intersection sets. These are sets which form common members. The set symbol for intersection of sets is "∩"

Listing members of intersection of sets

Examples:

1. Given that set K= { 1, 2, 3, 4} and set R= {3 4 5, 6, 8},
   K ∩ R = {3, 4}
2. Given that set A= { a, e, I, o, u} and set B= { 1, 4, e, o},
   A ∩ B= {e, o}

Union set: This is a set of all members without repeating the common members.

Listing the Union sets.

Examples:

1. Given that set G= {q, e, t, w} and D= {e w y, q, o},
   G ∪ D = {q, e, t, w, y, o}

2. Given that set D= {2, 4, 6, 8} and set E= { 1, 2, 3, 4},

   $D \cup E = \{2, 4, 6, 8, 1, 3\}$

Evaluation activity

1. Set G= {q, e, t, w} and set D= {a, e, i. o, u}

   Find; a) $G \cap D$ b) $G \cup D$

2. Set W= {1, 3, 0, 5, 7} and set F= {5, 7, 9, 3}

   Find; a) $W \cap F$ b) $W \cup F$

3. Set R= {A, D, G, 4, H} and set K= {G, W, 2, 4, 5}

   Find; a) $R \cap K$ b) $R \cup K$

4. Set B= {1, 3, 5, 7} and set C= {2, 3, 5, 8, 9}

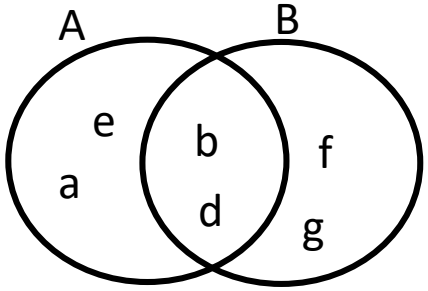
   Find; a) $B \cap C$ b) $B \cup C$

WEEK : Lesson 5

Difference of sets

Examples:

1. Study the Venn diagrams below and answer the questions that follow.



a) Find n(A – B)

A-B= {e, a}

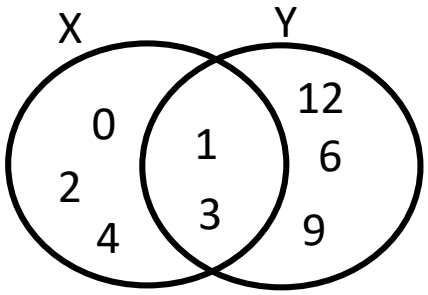
n(A-B)= 2

b) n(B – A)

B-A= {f, g}

n(B-A)= 2

2. Given that X = { 0, 1, 2, 3, 4} and Y = { 1, 3, 6, 9, 12}



a) Find n(X-Y)

X-Y = {0, 2, 4}

n(X-Y)= 3

b) n(Y-X)

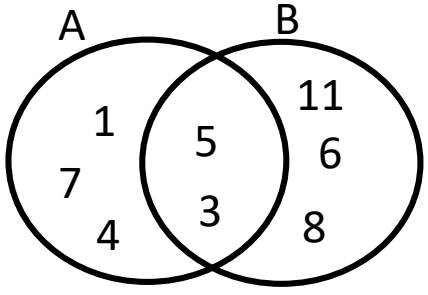
Y-X = {12, 6, 9}

n(Y-X)= 3

Evaluation activity

Study the venn diagrams below and answer the questions that follow.

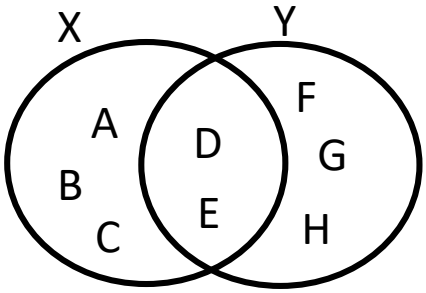
1.



a) Find n(A – B)

b) Find n(B-A)

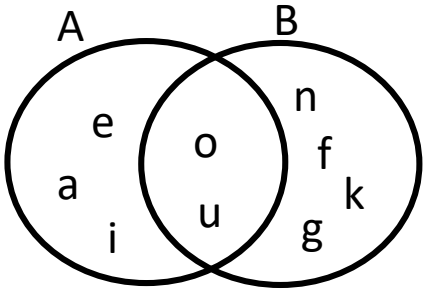
1.



a) Find n(X-Y)

b) Find n(Y-X)

2.



a) Find n(A-B)

b) Find n(B-X)

WEEK : Lesson 6

Complement of sets.

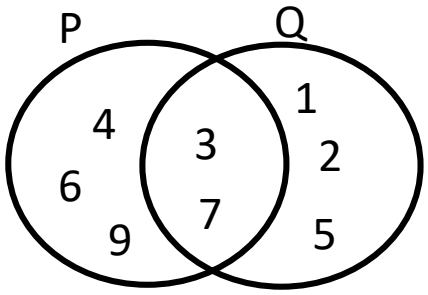
Complement of a set means a set of members not in the given set.

OR

Elements in the universal set but not in the given set.

Example

1. Given that; P = {4, 3, 6, 7, 9} and Q = {1, 2, 3, 5, 7}



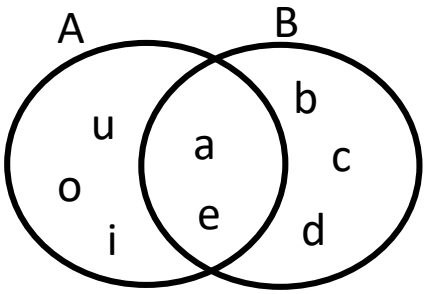
a) Write down members in P' (Complement of set P)

P' = {1, 2, 3}

b) Write down members in Q' (Complement of set Q)

Q' = {4, 6, 9}

2. Given that; A = {a, e, i, o, u} and B = {a, b, c, d, e}



a) Write down members in A' (Complement of set A)

A' = {b, c, d}

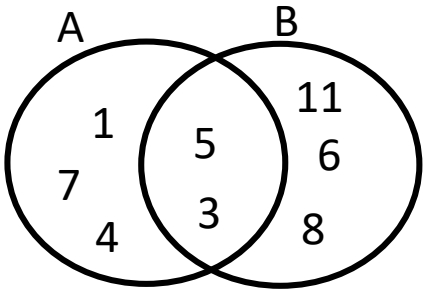
c) Write down members in B' (Complement of set B)

B' = {u, o, i}

Evaluation activity

Use the venn diagrams below to answer the questions that follow

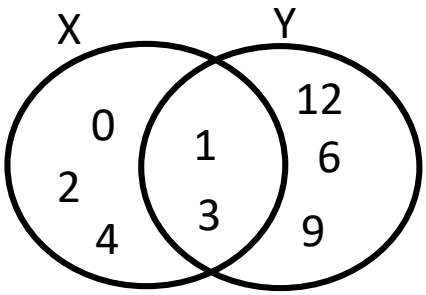
1.



a) Write down members in A' (Complement of set A)

b) Write down members in B' (Complement of set B)

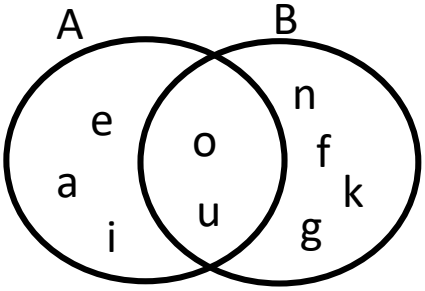
2.



a) Write down members in X' (Complement of set X)

b) Write down members in Y' (Complement of set Y)

3.



a) Write down members in A' (Complement of set A)

b) Write down members in B' (Complement of set B)

WEEK : Lesson 7

WEEK 1: Lesson 5

SUBSETS

A subset is a small set got from a big set.

The bigger set from which a subset is got is called a

Universal set or Super set.

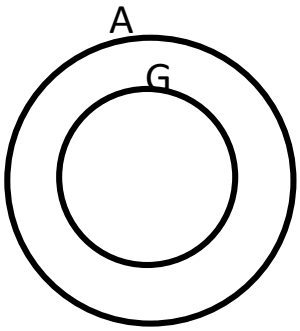
The symbol for is a subset of is $\subset$

The symbol for is not a subset of is $\not\subset$. The symbol for

Universal set is ξ.

1. Draw a Venn diagram to show that all goats (G) are

Animals (A)



2. Given that set Q = {a, b, c}. List down all the subsets in

set Q.

{a}, {b}, {c}

{a, b}, {a, c}, {b, c}

{}, {a, b, c} ⟹ 8 Subsets

3. Given that set R = {1, 2, 3, 4}. List down all the subsets in

set R.= { }, {1}, {2}, {3}, {4}, {1, 2}, {1, 3}, {1, 4}, {2, 3}, {2, 4},

{3, 4}, {1, 2, 3}, {1, 2, 4}, {1, 3, 4}, {2, 3, 4}, {1, 2, 3, 4}

N.B The empty set and the set itself (universal) are subsets of every set.

Evaluation activity

List the subsets for each of the following sets:

1. B = {p, q}
2. C= {x, y, z}
3. D= { t }
4. E={ p, q, r, s}
5. { }
6. Draw a venn diagram to show that ;
   a) All dogs (D) are animals (A)
   b) All girls (G) are female (F)
   c) All boys (B) are male (M)

WEEK : Lesson 6

Finding number of subsets:

To find the number of subsets in set i.e. Z = {7, 5, 3},

No. of subsets = 2^n where n represents the number of elements in the given set.

∴ Set Z has 3 elements

∴ No. of subsets = 2^n

= 2^3

= 2 x 2 x 2

= 4 x 2

= 8 subsets

NB: Adequate examples can be given before the activity

Evaluation activity

How many subsets are in each of the sets below?

1. Set K= {a, e}
2. Set M= {1, 2, 3}
3. Set H= {w, y, z, u}
4. Set N= {1, 4, 9, 16, 25}
5. Set P= {a, e, I, o, u}

Finding number of elements when given number of subsets

Examples

Set A has 8 subsets. How many elements are in set A?

2^n = No. of subsets

$2^n = 8$

2	8
2	4
2	2
	1

$2^n = 2^3$

n = 3

Note: Give adequate examples to the learners before giving the activity.

Evaluation activity

Find the number of elements in a set with the following number of subsets;

1. 4 subsets
2. 16 subsets
3. 32 subsets
4. 64 subsets
5. 128 subsets
6. 256 subsets

WEEK: Lesson 7

PROPER SUBSETS

A Proper subset is a sub set with less members.

The symbol for is a proper subset of is $\subset$

The symbol for is not a proper subset of is $\not\subset$. The symbol for Universal set is ξ.

1. Given that set Q = {a, b, c}. List down all the proper subsets in

   set Q.

   {a}, {b}, {c}

   {a, b}, {a, c}, {b, c}, { } $\Longrightarrow$ 7 proper Subsets

2. Given that set R = {1, 2, 3, 4}. List down all the proper subsets in set R.= { }, {1}, {2}, {3}, {4}, {1, 2}, {1, 3}, {1, 4}, {2, 3}, {2, 4}, {3, 4}, {1, 2, 3}, {1, 2, 4}, {1, 3, 4}, {2, 3, 4}

N.B The empty set is a proper subsets of every set.

Evaluation activity

List the proper subsets for each of the following sets:

1. B = {p, q}
2. C= {x, y, z}
3. D= { t }
4. E={ p, q, r, s}
5. { }

WEEK: Lesson 8

Finding number of proper subsets:

To find the number of proper subsets in set i.e.

Z = {7, 5, 3},

No. of proper subsets = $2^n - 1$ where n represents the number of elements in the given set.

∴ Set Z has 3 elements

∴ No. of subsets = $2^n - 1$

$= 2^3 - 1$

$= (2 \times 2 \times 2) - 1$

$= (4 \times 2) - 1$

= 8 - 1

= 7 proper subsets

NB: Adequate examples can be given before the activity

Evaluation activity

How many proper subsets are in each of the sets below?

1. Set K= {a, e}
2. Set M= {1, 2, 3}
3. Set H= {w, y, z, u}
4. Set N= {1, 4, 9, 16, 25}
5. Set P= {a, e, I, o, u}

Finding number of elements when given number of proper subsets

Examples

Set A has 7 proper subsets. How many elements are in set A?

$2^n - 1$ = No. of proper subsets

$2^n - 1 = 7$

$2^n - 1 + 1 = 7 + 1$

$2^n = 8$

8	4	2	1
2	2	2	

$2^n = 2^3$

n = 3

Note: Give adequate examples to the learners before giving the activity.

Evaluation activity

Find the number of elements in a set with the following number of proper subsets;

1. 3 proper subsets
2. 15 proper subsets
3. 31 proper subsets
4. 63 proper subsets
5. 127 proper subsets
6. 255 proper subsets

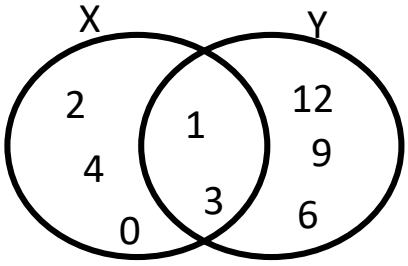
WEEK: Lesson 9

Listing and finding number of number of elements from venn diagrams:

Examples

Given that X = {0, 1, 2, 3, 4} and Y = {1, 3, 6, 9, 12}

a) Represent the two sets on the Venn diagram



b) Find n(X-Y)

X-Y = {2, 4, 0}

n(X-Y) = 3

c) Find n(Y-X)

Y-X = {12, 9, 6}

n(Y-X) = 3

d) Find n(X∩ Y)

X∩ Y = {1, 3}

n(X∩ Y) = 2

e) Find n(X ∪ Y)

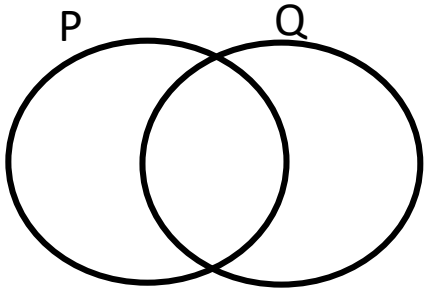
X ∪ Y = {2, 4, 0, 1, 3, 12, 9, 6}

n(X ∪ Y) = 8

Evaluation activity

1. Given that set P={3, 4, 6, 7, 9} and set Q= {1, 2, 3, 5, 7}

   a) Represent the two sets on the Venn diagram



   b) Find n(P-Q)

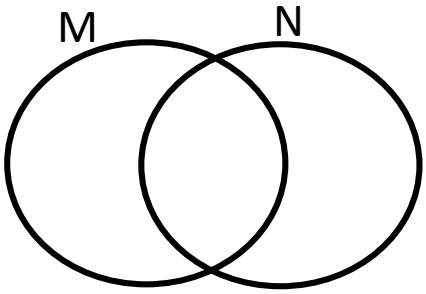
   c) Find n(Q-P)

   d) Find n(P∩ Q)

e) Find n(P ∪ Q)

2. Given that set M={a, e, I, o, u} and set N ={a, b, c, d, e}.

a) Represent the two sets on the Venn diagram



a) Find n(M)'

b) Find n(N)'

c) Find n(M∩ N)

d) Find n(M ∪ N)

e) Find n(M)

f) Find n(N)

g) Find n(M-N)

h) Find n(N-M)

WEEK: Lesson 10

Representing sets on venn diagram

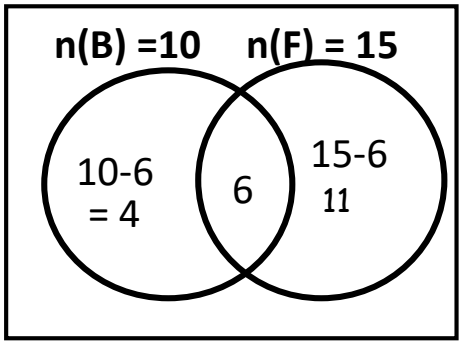
In a group of swimmers, 15 do free style (F) 10 do backstroke (B) and 6 do both

n(F) = 15

n(B) = 10

$n(F \cap B) = 6$

a) Represent the above information on a Venn diagram.



b) How many swimmers swim only back stroke?

10 - 6

4 swimmers

c) How many do only free style?

15 – 6

19 swimmers

d) How many swimmers are in that group?

(10 + 6) + 6 + (15 – 6)

4 + 6 + 9

10 + 9

= 19 swimmers

e) How many swim only one style?

Backstroke only + free style

(10 – 6) + 15 – 6

4 + 9

= 13 swimmers

Evaluation activity

1. Given that n (A) = 15 n (B) = 25 n (A∩B) = 5

a) Represent the above information on a Venn diagram

b) Find n(A ∪ B)

c) Find n(A∩B)'

d) Find n(A-B)

2. In a class, 30 pupils like Mathematics (M) 20 like Science (S) and 5 pupils like both subjects

a) Represent the above information on a Venn diagram

b) How many pupils do not like Science?

c) How many pupils do not like Mathematics?

d) How many pupils are in the class altogether?

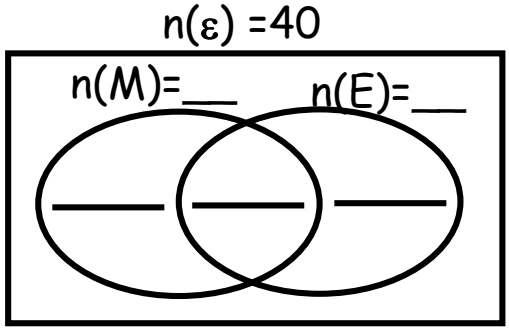
e) How many pupils like only one subject?

WEEK: Lesson 11

Interpreting venn diagrams

1. In a class of 40 pupils, 23 pupils like Maths (M), K pupils like English (E) and 4 pupils like both subjects.

a) Complete the Venn diagram below.



b) Find the value of K.

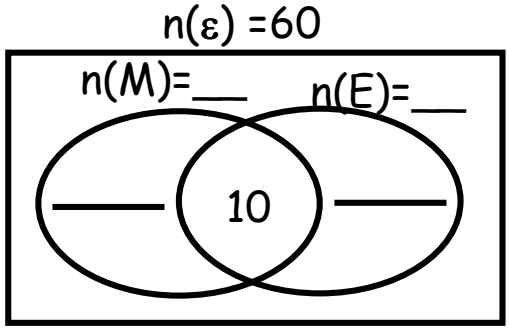
2. In a class of 60 pupils, 23 pupils like Mathematics (M), 28 pupils like English (E), and some pupils like both subjects. If 3 pupils like neither of the subjects.

a) Draw a venn diagram to show the above information.

b) How many pupils like both subjects?

3. In a class of 60 pupils, 28 pupils like mathematics (M), k pupils like English and 10 pupils like both subjects.

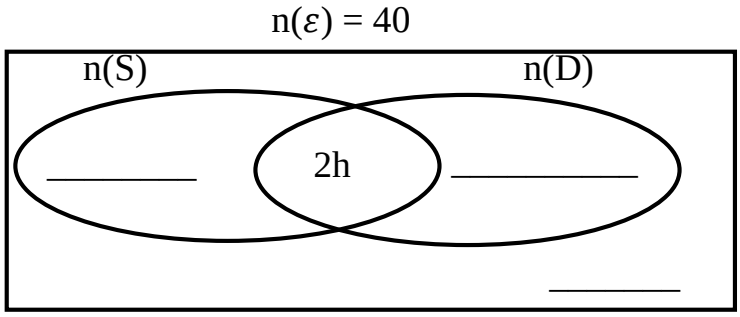
a) Complete the Venn diagram below.



b) Find the value of K.

c) How many pupils like English only?

4. In a class of 40 pupils, 20 like English (E), 25 like Mathematics (M), 2h like both subjects while 5 pupils do not like any of the two subjects.
a) Complete the Venn diagram below.



b) Find the value of h.

PROBABILITY: This refers to the likelihood for an event to happen. Probability is also known as chance.

Probability = $\frac{No.of\ total\ chances}{No.of\ desired\ chances}$

Tossing a coin

A coin has 2 faces ahead and a tail. When it is tossed, the probability of a head or a tail showing up is a half.

Example: A coin is tossed once, what is the probability that a head will show up?

Total chances = 2 i.e. a head and a tail

Desired chances = 1 i.e. a head

Probability = $\frac{1}{2}$

Tossing a dice

A dice has 6 faces i.e. {1, 2, 3, 4, 5, 6}.The probability of getting one of the faces showing up is a sixth.

Example: A die is tossed once, what is the chance that an even number will show on top?

Total chances = 6 i.e. {1, 2, 3, 4, 5, 6}

Desired chances = 3 i.e. {2, 4, 6)

Probability = $\frac{3}{6}$

Evaluation activity

1. A coin is tossed once, what is the probability that;
   a) A head will show up?
   b) A tail will show up?
2. A die is tossed once, what is the probability that;
   a) An odd number will show up?
   b) A number less than 3 will show up?

c) A multiple of 3 will show up?

d) A prime number will show up?

e) A number greater than 4 will show up?

WEEK 3: Lesson 2

More about probability

Example.

1) What is the probability of picking a ripe mango, if there are 4 ripe mangoes and 6 rotten mangoes in a basket?

   Total chances = 10 i.e. 4+6 = 10

   Desired chances = 4 i.e. 4 ripe mangoes

   Probability = $\frac{4}{10}$

2) We shall go on a tour next week. What is the probability that we shall go on a day that begins with letter "T"?

   Total chances = 7 i.e. {Mon, Tue, Wed, Thurs., Fri, Sat, Sun}

   Desired chances = 2 i.e. {Tue, Thurs}

   Probability = $\frac{2}{7}$

3) Our school will play a football match with Kampala Parents` School. What is the probability that our school will win the match?

Total chances = 3 i.e. {win, lose, draw}

Desired chances = 1 i.e. {win}

Probability = $\frac{1}{3}$

Evaluation activity

1. What is the probability of picking a ripe mango, if there are 4 ripe mangoes and 5 raw mangoes in a basket?
2. We shall go for a wedding party next week. What is the probability that we shall go on a day that begins with letter "S"?
3. In a bag, there are 3 red pens, 5 black pens, 7 green pens and 4 blue pens. Find the chance of picking;

   A back pen. b) a red pen.

END OF SET CONCEPTS

THEME: **ALGEBRA**

TOPIC: **ALGEBRA**

EXPRESSING ALGEBRAIC PHRASES AS EXPRESSIONS

Examples

Express the following phrases as expressions

1. The sum of 9 and m.
   (9 + m)
2. The difference of 10 and k.
   (10 – k)

Ref: Old MK pupils' book6 pages 374

3. $\frac{3}{5}$ of a number
   $\frac{3}{5}y$
4. Thrice the difference of m and n.
   3(m + n)
5. Double the sum of 3k and 4.
   2(3k + 4)
6. Half of m.
   $\frac{1}{2}$m
7. Square of a number.

Let the number be m

M^2

8. Five times the sum of 2w and 2y
   5(2w + 2y)
9. Divide twice the difference between 3n and 5.

$$\frac{(3n-5)}{2}$$

Activity

1. Express the following phrases as expressions.
2. Double the difference between 3k and 16
3. The difference between 3m and 6 divided by k
4. The sum of 3p and 10 multiplied by y
5. Triple the difference between 3m and r
6. Divide the difference between d and f by the product of w and 5c
7. Half the sum of m and 19 plus thrice the difference of m and 36
8. Third the sum of m and d plus half the product of n and k.
9. Half the difference between k and 8.
10. Square the sum of 7 and p and add it to the sum of y and 17.

11. Thrice the difference between n and 18.
12. Four times the sum of r and 3k
13. Subtract the sum of r and p from the sum of 2p and w
14. Add the sum of 4a and 3b times five to twice the difference between b and c.
15. Multiply the difference between 2d and c by 5b.

EXPRESSING ALGEBRAIC EXPRESSIONS AS PHRASES.

Examples

Express the following as expressions

1. (18 – W)
   The difference of 18 and w.

2.4n + 3

The sum of 4n and 3

3.4(4m + p)

Four times the sum of 4m and p.

4.$\frac{1}{3}$ $(4m + n)$

A third of the sum of 4m and n

5. Y^2

The square of y

6. k^3

The cube of k

7.$\frac{n}{5} - 3$

Divide a number by five and subtract 3 from the quotient

8.$\frac{x-4}{5}$

Divide the difference between x and 4 by five

9.$(p+8)^2$

Square the sum of p and 8

10.$\frac{5(y+2)}{6}$

Five times the sum of y and 2 divided by six.

11.$\frac{3+6m+5k+7w}{4}$

The average of 3, 6m, 5k and 7w

Ref: Old MK pupils' book6 pages 375

ACTIVITY

Express the following expressions as phrases.

a) n-19
b) 3k +20
c) 3(a - 8)
d) w^2
e) $\frac{m}{3} + 5$
f) 4(5b + 7)
g) $\frac{k}{9}$
h) $\frac{3k+3+y+3r}{4}$
i) $\frac{w+8}{2}$
j) W^2 -10
k) $(P- 6)^2$
l) $\frac{3q+18}{3}$
m) $\frac{5a-9}{2}$

COLLECTING LIKE TERMS

Examples

1. Write in short: a + a + a

(a + a) + a

2a + a

3a

2. Simplify: x + y + 2x + 3y

(x + 2x) + (y + 3y)

3x + 4y

3. Simplify: 5a + b + a – 2b + 3b + 4a

(5a + a + 4a) + (3b + b) – 2b

10a + 4b – 2b

10a – 2b

4. Simplify 7y – 8m + y + 10m – 6

7y + y + 10m – 8m – 6

8y -2m – 6

5. Simplify: 2ab + ab + 5ab

3ab + 5ab

8ab

6. Simplify: $7a^2b^2c- 3a^2b^2$

$4a^2b^2c$

7. Simplify: 13y – ⁻3y- 6y

(13y – ⁻3y)- 6y

(13y +3y)- 6y

16y – 6y

10y

8. Simplify: 4w -9k + 2 + 3k – 8w

4w – 8w + 3k – 9k + 2

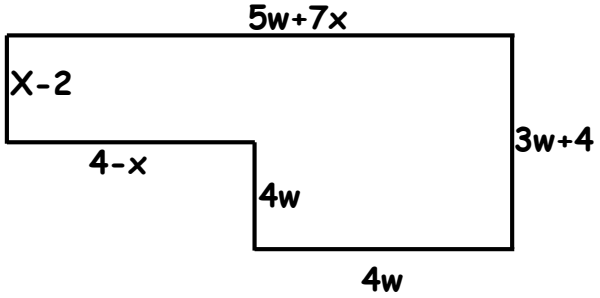
-4 – 6 + 2

8. Simplify: -b+4p+2b-6p

-6p + 4p + 2b – b

-2b + b

9. Find the perimeter of the figure below.



P= 5w + 7x + 3w + 4 + 4w + 4w + 4 –x + x-2

P= 5w + 3w + 4w + 4w + 7x + x – x + 4 +4 – 2

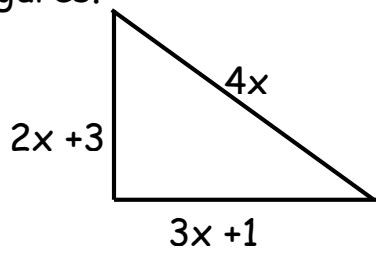
P= 16w +7x + 6

Activity

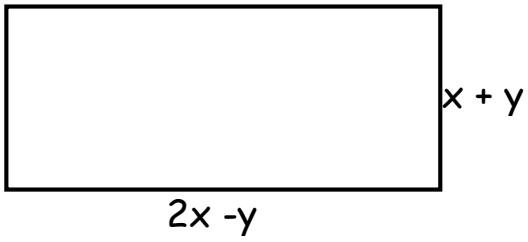
1. Simplify the following
   a) 6y – 4 + 3y +13
   b) 6p + 4x - 8p + x
   c) 14k – 3w -7k
   d) m + 4n +3m – 5n +6n
   e) 7ac – 5ad – 10ac + 3ad
   f) 3xy + 4xy – 5ac + 6ac
   g) 6ab – 2ab – 3ab
   h) 8x + 7y – 3x + 3y
   i) $Ab^2 + 3ab^2 + 5ab^2$
   j) $3ap^2 + 4ap^2$
   k) $11x^2y - 6xyz + 4x^2y - 2xyz$

2. Find the perimeter of the following figures.

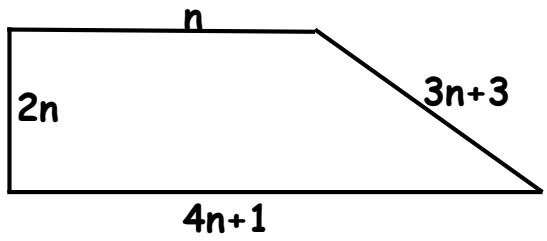
a)



b)



c)



SUBSTITUTION

Examples

1. Given that a=5, b=4 and c=2.

a) Find abc

a x b x c

5 x 4 x 2

40 2

40

b) Find a + b + c

(a + b) + c

(5 + 4) + 2

9 + 2

11

c.) 6a -3bc

(6 x a) – (3 x b x c)

(6 x 5) – (3 x 4 x 2)

30 – (12 x 2)

30 -24

6

2. Given that p= -3, q = 4 and r = 5

a.) Find pqr

p x q x r

-3 x 4 x 5

-12 x 5

-60

b.) Find p + q + r

p + q + r

-3 + 4 + 5

(4 + 5) - 3

9 – 3

6

c.) Find r (q + p)

5(4 -3)

5 x 1

5

d.) Find $6p^2$ – 2rq

$6(p \times p)$ – (2 x r x q)

$6(-3 \times -3)$ – (2 x 5 x 4)

6 x 9 – 40

54 – 40

14

2. Given that m = $\frac{2}{9}$ and w = $\frac{1}{3}$

a.) Find m ÷ w

$\frac{2}{9} \div \frac{1}{3} = \frac{2}{\cancel{9}} \times \frac{\cancel{3}}{1} = \frac{2}{3}$

Ref: New MK pupils' book 6 page 376

Activity

1. Given that a=5, b=7, c=9,d=4,f=6 and e=2.Find the value of;
   i) a+b+c ii) (a+b)+cd iii) 4(a+e) iv) $\frac{a(a-d)}{a}$ v) $\frac{bf}{e}$
2. Given that x=2, y=-3 and z=-5.Find the value of xzy
3. Given that y=10,z=15.Find $\frac{yz}{y+z}$
4. Given that x=$\frac{2}{3}$ and y=$\frac{1}{3}$.Find x + y
5. If m=$\frac{4}{5}$ and n=$\frac{1}{5}$, find the value of$\frac{m}{n}$.
6. If p=$\frac{1}{8}$, y=$\frac{2}{3}$ and z=$\frac{4}{5}$.Find the value of$\frac{xy}{z}$.
7. If p=$1\frac{1}{3}$,q=$2\frac{1}{2}$, find the value of pq-$\frac{1}{3}$
8. Given that x=$\frac{2}{3}$,y=$\frac{1}{4}$ and z=$\frac{-1}{2}$, find the value of x+y+z
9. If m=$\frac{3}{4}$ and n=$\frac{1}{5}$, find the value of 12m -10n
10. If x=$\frac{1}{2}$,y=$\frac{3}{4}$ and z=$\frac{1}{4}$, find the value of x(y-z)

REMOVING BRACKETS

Examples

Simplify the following:

a).3(x + y)

3x + 3y

b) -4(m + 3w)

-4m -12w

c) -5(2p – 7)

-10p + 35

d) -p(3p - 5ap)

(-p x 3p) + (p x 5ap)

$3p^2 + 5ap^2$

Simplify the following:

a) -2(x + y)
b) -3(-x + y)
c) –(p – y + z)
d) g(2a + w)
e) (3d + b)(y)
f) (3 + b + c)d
g) (-2k + y -y)-h
h) -4h(3x + 5h)

Ref: New MK pupils' book 6
Pages 380 - 382

REMOVING BRACKETS

Examples

1. Simplify the following

a) $(x + 2) + (x + 3)$

$x + 2 + x + 3$

$x + x + 2 + 3$

$2x + 5$

b) $3(x + 2) + 2(x-1)$

$3x + 6 + 2x - 2$

$3x + 2x + 6 - 2$

$5x + 4$

c) $3(x + 1) - 2(x - 1)$

$3x + 3 - 2x + 2$

$3x - 2x + 3 + 2$

$x + 5$

d) $2(y - 2) - 3(y - 1)$

$2y - 4 - 3y + 3$

$2y - 3y + 3 - 4$

$-y - 1$

e) Subtract $3p - 1$ from $5p - 3$

$5p - 3 - (3p - 1)$

$5p - 3 - 3p + 1$

$5p - 3p + 1 - 3$

$2p - 2$

f) Subtract $y+1$ from $2y + 1$

$2y + 1 - (y + 1)$

$2y + 1 - y - 1$

$2y - y + 1 - 1$

$y + 0$

y

g) $\frac{1}{3}(3a + 9b)$

$\frac{1}{\cancel{3}} \times \overset{a}{\cancel{3a}} + \frac{1}{\cancel{3}} \times \overset{3b}{\cancel{9b}}$

$a + 3b$

h) $\frac{1}{2}(2x + 8y) + \frac{1}{3}(6x + 9y)$

$\frac{1}{\cancel{2}} \times \overset{x}{\cancel{2x}} + \frac{1}{\cancel{2}} \times \overset{4y}{\cancel{8y}} + \frac{1}{\cancel{3}} \times \overset{2x}{\cancel{6x}} + \frac{1}{\cancel{3}} \times \overset{3y}{\cancel{9y}}$

$x + 4y + 2x + 3y$

$x + 2x + 4y + 3y$

3x + 7y

i)) $\frac{1}{2}(4a + 6ab)$ - $\frac{2}{3}(9a - 12ab)$

$$\frac{1}{\cancel{2}} \times \overset{2a}{\cancel{4a}} + \frac{1}{\cancel{2}} \times \overset{3ab}{\cancel{6ab}} - \frac{2}{\cancel{3}} \times \overset{3a}{\cancel{9a}} - \frac{2}{\cancel{3}} \times \overset{4ab}{\cancel{12ab}}$$

2a + 3ab - 6a + 8ab

2a - 6a + 3ab + 8ab

-4a +11ab

j) What is difference between $\frac{1}{7}(7ab - 14pq)$ and $\frac{1}{5}(10ab + 15pq)$

$$\frac{1}{\cancel{7}} \times \overset{ab}{\cancel{7ab}} + \frac{1}{\cancel{7}} \times \overset{2pq}{\cancel{14pq}} - \frac{1}{\cancel{5}} \times \overset{2ab}{\cancel{10ab}} + \frac{1}{\cancel{5}} \times \overset{3pq}{\cancel{15pq}}$$

ab + 2pq - 2ab + 3pq

ab - 2ab + 2pq + 3pq

-ab+5pq

Activity

Simplify the following:

a) (x + 2) - (x + 3)
b) (2x + 3) + (x + 4)
c) 6(y + 1) - 2(y - 3)
d) -2(x - 4) - 2(x - 1)
e) 5(t - 3) + (2t - 4)
f) 3(m + 2) + 4(m - 1)
g) 2(q - 1) + 3(q - 2)
h) Add 4(p + w) to 5(p - w)
i) $\frac{3}{4}(8m - 12p)$
j)) $\frac{1}{2}(2x + 8y)$ - $\frac{1}{3}(6x - 9y)$

2. What is the difference between $\frac{1}{10}(20t + 50p)$ and $\frac{1}{9}(18t - 36p)$?

Ref: New MK pupils' book 6
Pages 380 - 382

FORMING AND SOLVING EQUATIONS BY SUBTRACTING

Examples

1. Solve $\square + 6 = 20$

$\square + 6 - 6 = 20 - 6$

$\square = 14$

2. $11 + a = 23$

$11 - 11 + a = 23 - 11$

$a = 12$

3. Solve for y: $y + 12 = 48$

$y + 12 = 48$

$y + 12 - 12 = 48 - 12$

$y = 36$

4. $16 + y = 20$

$16 - 16 + y = 20 - 16$

$y = 4$

5. I think of a number, add 9 on it, the result is 14. What is the number?

Let the number be m

$m + 9 = 14$

$m + 9 - 9 = 14 - 9$

$m = 5$

Therefore the number is 5.

6. Jane had some money, her father added her more sh.1500 in total she has sh. 2300. How much money did she have at first?

Let the money she had be z.

z + sh.1500 = sh.2300

z + sh.1500 –sh.1500 = sh.2300 –sh.1500

z =sh. 800

Therefore she had sh.800 at first.

Ref: New MK pupils' book 6
Pages 385

Exercise

1. Solve the following equations:
   a) $\square + 3 = 9$
   b) $\square + 13 = 35$
   b) $g + 7 = 13$
   d) $v + 34 = 62$
   e) $15 + x = 38$
   f) $16 + m = 35$
2. I think of a number, add 16 to it the answer is 25. What is the number?
3. Think of a number; add 25 to it the result is 40. What is the number?
4. Tom had some eggs, his mother added him more 16eggs, he has 29 eggs now. How many eggs did he have at first?
5. What number must be added to 69 to get 90?

SOLVING EQUATIONS BY ADDING

Examples

1. Solve $\square - 34 = 7$

   $\square - 34 + 34 = 7 + 34$

   $\square = 41$

2. Solve for y: $y - 11 = 54$

   $Y - 11 + 11 = 54 + 11$

   $Y = 65$

3. I think of a number subtract 9 from it, the result is 6. What is the number?

   Let the number be z

   $Z - 9 = 6$

   $Z - 9 + 9 = 6 + 9$

   $Z = 15$

   Therefore the number is 15.

4. Anne had some books; the teacher took away 13books from her, she remained with 5books. How many books did she have at first?

   Let the books she had at first be w

   $W - 13 = 5$

   $W - 13 + 13 = 5 + 13$

   $W = 18$

   Therefore she had 18 books at first.

Ref: New MK pupils' book 6
Page 386

Exercise

1. Solve the following equations:

   a) $\square - 12 = 13$ b) $\square - 7 = 6$ c) $24 - \square = 13$

   d) $Y - 23 = 12$ e) $m - 14 = 33$

2. I think of a number, subtract 20 from it, the result is 14. What is the number?
3. There were some eggs in the basket. 27 eggs got broken. 17 eggs remained. How many eggs were in the basket at first?
4. Mr. Balikudembe had some cows in the farm. He sold 19 cows and remained with 23 cows. How many cows did he have at first?

5. After selling 49 eggs, the farmer remained with 64eggs. How many eggs did the farmer have at first?
6. Akiiki harvested some sacks of potatoes. She sold 15 of them and kept 2 for the family. Find the number of sacks she harvested?

SOLVING EQUATIONS BY MULTIPLYING

Examples

1. Find the missing number; □÷3 = 6

□÷ 3 x 3 = 6 x 3

□ = 18

Ref: New MK pupils' book 6 Page 389

2. Find the value of b. b ÷ 4 = 20

b ÷ 4 x 4 = 20 x 4

b = 80

2. Find the value of p. $\frac{p}{5} = 10$

$\frac{p}{5} \times 5 = 10 \times 5$

P = 50

4. Solve for y: 2y ÷3 = 8

2y ÷3 x 3 = 8 x 3

= 24

$\frac{2y}{2} = \frac{24}{2}$

y = 12

4. A man equally divided his money among 5 children and each got sh.450.How much money did he give out?

Let k be the amount he gave out

k÷ 5 = sh.450

k÷ 5 x 5 = sh.450 x 5

k = sh.2250

He gave out sh.2250 altogether.

5. Find the number of apples that can be divided among 8 girls such that each girl gets 12 apples.

Let the number of apples be m

$m \div 8 = 12$

$m \div 8 \times 8 = 12 \times 8$

$m = 96$ apples

The number is 96 apples.

6. What amount of money is needed to pay 15 workers if each worker earns sh.3000?

Let the amount needed be m

$m \div 15 = sh.3000$

$m \div 15 \times 15 = sh.3000 \times 15$

$m = sh.45000$

Sh.45000 is needed to pay 15 workers

Activity

1. Find the missing number in each of the following:

a) $\square \div 5 = 30$ b) $\square \div 9 = 12$

2. Solve the following equations:

i) $k \div 6 = 13$ ii) $\frac{w}{12} = 6$ iii) $3k \div 5 = 6$ iv) $\frac{2k}{9} = 10$

3. Four pupils shared x books equally. Each pupils received 16 books. How many books were there?

4. What number when divided by 7 gives 6?

5. When a number is divided by 8, the result is 15.What is the number?

6. Trailers were loaded with equal bags of cotton. Each trailer loaded 120 bags. How many bags were there altogether?

7. A farmer distributed x cows among 12 women. Each woman got 8 cows. How many cows did the farmer have?

8. A trade hired 8 trucks to carry bags of salt. Each truck carried 96 bags. How many bags were there altogether?

FORMING AND SOLVING EQUATIONS BY DIVIDING

Examples

Ref: New MK pupils' book 6
Pages 387

1. Solve the following equations.

a) $\square \times 8 = 48$

$\square \times 8 \div 8 = 48 \div 8$

$\square = 6$

b). $7b = 28$

$$\frac{\overset{b}{\cancel{7}b}}{\cancel{7}} = \frac{\overset{4}{\cancel{28}}}{\cancel{7}_{1}}$$

$b = 4$

c) $2y \div 3 = 8$

$2y \div 3 \times 3 = 8 \times 3$

$= 24$

$$\frac{\overset{y}{\cancel{2y}}}{\cancel{2}} = \frac{\overset{12}{\cancel{24}}}{\cancel{2}_{1}}$$

$y = 1$

2. The cost of 12 pens is sh.6000.What is the cost of each pen?

Let h be the cost of each pen

$12h = sh.6000$

$$\frac{\cancel{12h}}{\cancel{12}} = \frac{\overset{500}{\cancel{sh6000}}}{\cancel{12}_{1}}$$

$h = sh.500$

Each pen costs sh.500

3. A number multiplied by 7 gives 42.What is the number?

Let r be the number

$r \times 7 = 42$

$r \times 7 \div 7 = 42 \div 7$

$r = 6$

The number is 6

4. Nine buses carried k passengers each. Altogether the carried 540 passengers. How many passengers did each bus carry?

K x 9 = 540

K x 9÷ 9 = 540 ÷9

K = 60

Each bus carried 60 passengers

Activity

1. Solve the following equations:

a) □ x 4 = 36 b) 5n = c) 256

2. A number multiplied by 15 gives 90.Find the number.

3. The product of two numbers is 120.one of the numbers is 8. Find the second number.

4. A school received 980 pens in 7 equal boxes. How many books were in each box?

5. I think of a number, multiply it by 9.The result is 108, what number have I thought of?

MORE SOLVING EQUATIONS BY DIVIDING

Examples

Ref: New MK pupils' book 6
Pages 388-391

1. Solve for m.

   m + m +m = 45

   3m = 45

   $\frac{\cancel{3}m}{\cancel{3}} = \frac{\cancel{45}}{\cancel{3}}$

   m = 15

2. Jane is m years old, Matthew is three times as old as Jane. If their total age is 40years.Find Jane's' age.

   m + 3m = 40

   4m = 40

   $\frac{\cancel{4}m}{\cancel{4}} = \frac{\cancel{40}}{\cancel{4}}$

   m = 10

   Jane is 10 years.

Activity

1. Solve the equations below:

a) 4y + y = 200 b) 7p + 8p = 60 c) 7k – 3k = 32

2. Teddy is h years, her father is four times as old as Teddy. If their total age is 60 years. How old is each of them?

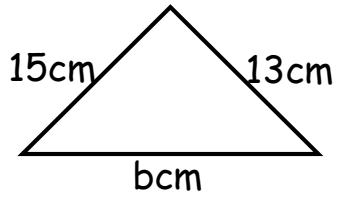
3. A mother is 5x years old and daughter 2x years. Their total age is 56 years. How old is each now?

4. Kent has thrice as many books as Batte. If both have 36 books, how many books does Batte have?

SOLVING EQUATIONS (GIVEN PERIMETER OF SHAPES)

Examples:

1. The perimeter of the figure below is 37cm.Find the value of b.



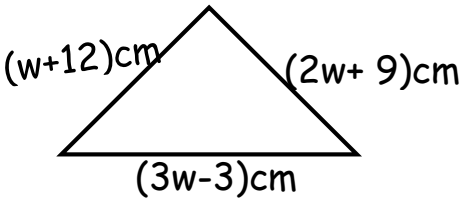
S + S + S = P

b + 15cm + 13cm = 37cm

b + 28cm = 37cm

b + 28cm -28cm = 37cm – 28cm b = 12cm

2. The perimeter of the figure below is 48cm. Find the value of w



S + S + S = P

(w + 12) + (2w + 9) + (3w – 3) = 48cm

w + 2w + 3w + 12 + 9 – 3)cm = 48cm

6w + 18cm = 48cm

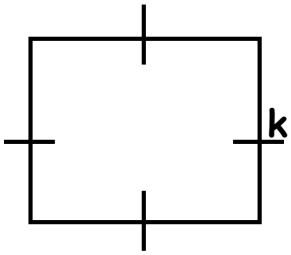
6w + 18cm – 18cm = 48cm – 18cm

6w = 30cm

$\frac{\cancel{6}w}{\cancel{6}} = \frac{\cancel{30}}{\cancel{6}}$

W = 5

3. The perimeter of a square below is 44m.Find the value of k.



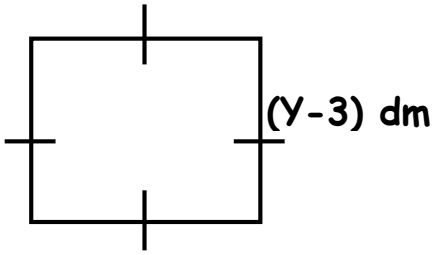
4S = p

4k = 44m

$\frac{4k}{4} = \frac{\cancel{44m}}{4}$ 11

k = 11m

4. The perimeter of the figure below is 64dm.Work out the value of y.



S + S + S + S = P

Y – 3 + y – 3 + y – 3 = 64dm

4y - 12 = 64dm

4y – 12 + 12 = 64 + 12

4y = 76

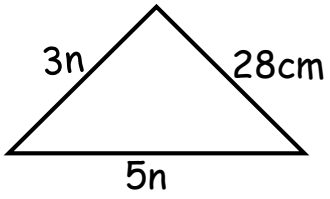
19

$\frac{4y}{4} = \frac{\cancel{76}}{4}$

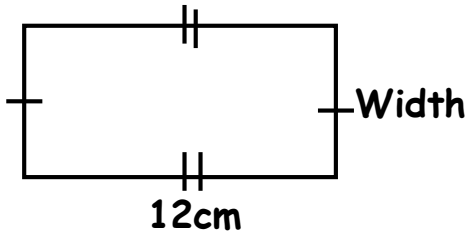
Y = 19

Activity

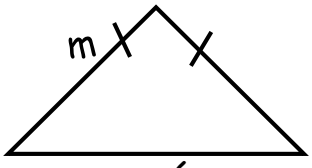
1. The perimeter of the triangle below is 70cm.Find the value of n.



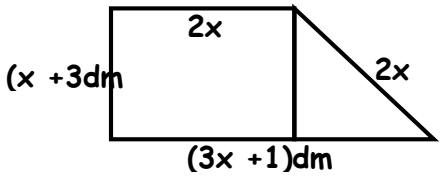
2. The perimeter of the rectangle below is 38cm.Find the width.



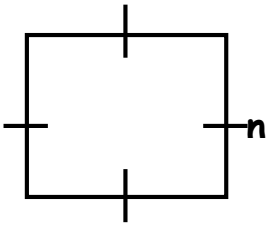
3. The perimeter of an isosceles triangle is 36cm.Find the value of m.



4. The p er of the figure below is 44dm.Find the value of x .



5. The perimeter of a rectangle is 40dm.Its length is (x + 4)cm and width is xdm.Find the value.
6. The perimeter of the square below is 24mm.Find the value of n.



Ref: New MK pupils' book 6
Page 391

FINDING MISSING SIDE OF SHAPES GIVEN AREA.

Examples

1. The area of a rectangle is $42cm^2$ and its width is 6cm.Find the length.

L x W = Area

L x 6cm = $42cm^2$

6cmL = $42cm^2$

$$\frac{\cancel{6cm}\ L}{\cancel{6cm}} = \frac{\cancel{42cm}\ \times cm}{\cancel{6cm}}$$

L = 6cm

2. The area of a triangle is $36cm^2$ and base is 9cm.Find its height.

$\frac{1}{2} \times$ base $\times$ height = Area

$\frac{1}{2} \times 9cm \times h = 36cm^2$

$\frac{9hcm}{2} = 36cm^2$

$\frac{\cancel{9}hcm}{\cancel{2}} \times \frac{\cancel{2}}{\cancel{9}} = \cancel{36}cm^2 \times \frac{2}{\cancel{9}}$ (4)

h = 4cm x 2

h = 8cm

3. A cuboid is 4cm long and 3cm wide. If its volume is $48cm^3$, find its width.

l x w x h = vol.

4cm x 3cm x h = $48cm^3$

$12cm^2h = 48cm^3$

$$\frac{\cancel{12cm \times 12cm}h}{\cancel{12cm \times cm}} = \frac{\cancel{48cm \times cm} \times cm}{\cancel{12cm \times cm}}$$

h = 4cm

Ref: New MK pupils' book 6 Page 391

Activity

1. The area of a rectangle is $60cm^2$ and length is 15cm.Work out width.
2. The area of a triangle is $40cm^2$ and its height is 8cm.Find its base.
3. The area of a triangle is $30cm^2$ and its base is 12cm. Work out its height.
4. A rectangle has an area of $50dm^2$ and width of 5cm.Find its length.
5. The area of a parallelogram is 28cm. If its base is 7cm, work out the height.
6. A cuboid is 9cm long and 5cm high. If its volume is $90cm^3$, calculate its width.

FORMING AND SOLVING ALGEBRAIC EQUATIONS

Examples

1. A boy is 2years older than his sister. Their total age is 20years.How old is the sister?

   Let r be the sister's age

Sister's age	Boy's age	Total age
r	r+2	20

   r + r + 2 = 20

   2r+ 2 = 20

   2r + 2 – 2 =20 -2

   2r = 18

   $\frac{\cancel{2}r^{1}}{\cancel{2}} = \frac{\cancel{18}^{9}}{\cancel{2}}$

   $_{1}$

   r = 9 years

2. A girl is 20years younger than the mother. The sum of their age is 70yeras.How old is the mother?

   Let p be the mother's age

mother's age	girl's age	Total age
p	P -20	70

p + p - 20 = 70

2p - 20 = 70

2p - 20 + 20 =70 +20

2p = 90

$\frac{\cancel{2}p^{1}}{\cancel{2}} = \frac{\cancel{90}^{45}}{\cancel{2}}$

$_{1}$

p = 45 years

3. Kampi weighs 10kg heavier than Betty. If their total weight is 64kg.Find the weight of Kampi.

   Let p be Betty's weight

Betty	Kampi	Total weight
p	P +10	64

   p + p + 10 = 64

   2p + 10 = 64

2p + 10 - 10 =64 10

2p = 54

$\frac{2p^{1}}{2} = \frac{54^{27}}{2}$

$_{1}$ $_{1}$

p = 27 kg

Kampi's weight = (27+10) kg

= 37kg

4. Jane is twice as old as Jack. Their total age is 66years.How old is Jane in 4years time?

Let k be Jack's age

Jack	Jane	Total age
k	2k	66

k + 2k = 66

3k = 66

$\frac{3k^{1}}{3} = \frac{66^{11}}{3}$

$_{1}$

k = 11years

Jane's age = (2x11) years

= 22years

Activity

1. Okum has 7 more goats than Martin. Altogether they have 29 goats. How many goats does Martin have?
2. Nakamatte got 8 more pens than the sister. The sum of their pens is 22.How many pens did the sister get?
3. Kiku is 9 years older than Kapere. Their total age is 29years.How old is Kapere?
4. Muto is 8 years younger than Ongom.If the sum of their age is 24 years. How old is Ongom?
5. A woman earns sh.3000 less than the husband. Their wage is sh.9000.
   a)How much does the man earn?
   b) How much does the woman earn?

6. Sarah has 400 less birds on the farm than Sauda.The sum of the birds on the farm is 2000.How many birds does each have?

SOLVING EQUATIONS INVOLVING BRACKETS

Examples

Solve the following equations:

a) $3(Y + 4) = 21$

$3Y + 12 = 21$

$3Y + 12 - 12 = 21 - 12$

$3Y = 9$

$\frac{3y}{3} = \frac{9^{3}}{3}$

$Y = 3$

b) $4(y - 3) = 16$

$4y - 12 = 16$

$4y - 12 + 12 = 16 + 12$

$4y = 28$

$\frac{4y}{4} = \frac{28^{7}}{4}$

$Y = 7$

c) $2y^2 = 18$

$\frac{2y^2}{2} = \frac{18^{9}}{2}$

$\sqrt{Y^2} = \sqrt{9}$

$Y = 3$

d) $4(x^2 - 1) = 32$

$4x^2 - 4 = 32$

$4x^2 - 4 + 4 = 32 + 4$

$4x^2 = 36$

$\frac{4x^2}{4} = \frac{36^{9}}{4}$

$\sqrt{x^2} = \sqrt{9}$

$x = 3$

Activity

Solve the following equations

1. y2 + 3 = 28
2. q2 – 7 = 18
3. $5x^2 = 45$
4. $7x^2 = 567$
5. $2(m + 3) = 18$
6. $6(3x - 2) = 50$
7. $6(x^2 + 2 = 306$
8. $4(x^2 - 1) = 21$

Ref: New MK pupils' book 6 Page

SOLVING EQUATIONS INVOLVING

Examples

Solve the following equations

1. $4x - 3 = x + 6$

$4x - x = 6 + 3$

$3x = 9$

$\frac{3x}{3} = \frac{9}{3}$ (3)

$x = 3$

2. $2m + 4 = m + 6$

$2m - m = 6 - 4$

$m = 2$

3. $4n - 9 = 15 - 2n$

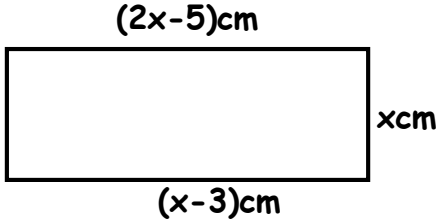
$4n + 2n = 15 + 9$

$6n = 24$

$\frac{6n}{6} = \frac{24}{6}$ (4)

$n = 4$

5. Study the rectangle below and find the value of x



Length = length

$2x - 5 = x - 3$

$2x - x = -3 + 5$

$X = 2$

Ref: New MK pupils' book 6
Pages 393 -394

Activity

1. Solve the following equations

a) $9 + 5x = 4 + x$

b) $11n + 6 = 2n + 19$

c) $13 + 3x = 25 - 3x$

d) $5a - 3 = 2a + 3$

e) $5n + 5 = 8n - 4$

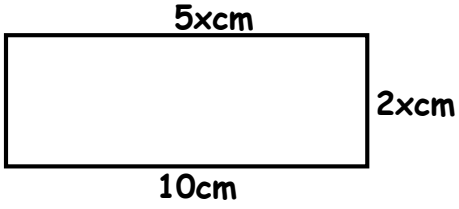
f) $10x - 12 = 9x - 2$

g) $11x + 3 = x + 33$

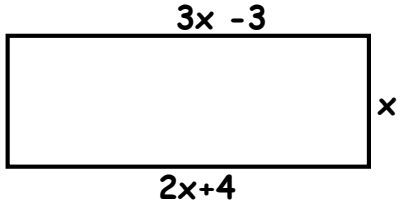
h) $6x - 8 = 4x + 4$

2. Find the value of x in the figures below;

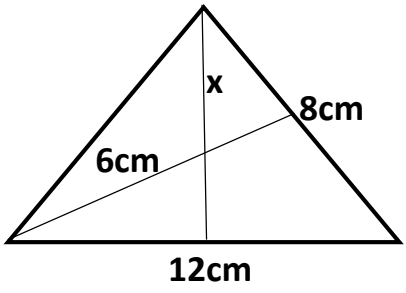
a)



b)



c)



SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations:

1. $\frac{1}{2}P = 6$ Multiply each term by the reciprocal of the fraction.

$\frac{1}{\cancel{2}}P \times \frac{\cancel{2}}{1} = 6 \times \frac{2}{1}$

P = 12

2. $\frac{m}{3} + 6 = 10$

$\frac{m}{\cancel{3}} \times \frac{\cancel{3}}{1} + 6 \times \frac{3}{1} = 10 \times \frac{3}{1}$

m + 18 = 30

m + 18 - 18 = 30 – 18

m = 12

3. $\frac{3m}{4} + 7 = 40$

$\frac{3m}{4} + 7 = 40$

$\frac{\cancel{3m}}{4} \times \frac{4}{\cancel{3}} + 7 \times \frac{4}{3} = 40 \times \frac{4}{3}$

$m + \frac{28}{3} = \frac{160}{3}$

$m + \frac{28}{3} - \frac{28}{3} = \frac{160}{3} - \frac{28}{3}$

$m = \frac{\cancel{132}}{\cancel{3}}$

m = 11

4. $4\frac{1}{3}p + 2 = 15$

$\frac{13p}{3} + 2 = 15$

$\frac{\cancel{13}p}{\cancel{3}} \times \frac{\cancel{3}}{\cancel{13}} + 2 \times \frac{3}{13} = 15 \times \frac{3}{13}$

$P + \frac{6}{13} = \frac{45}{13}$

$P + \frac{6}{13} - \frac{6}{13} = \frac{45}{13} - \frac{6}{13}$

$P = \frac{\cancel{39}}{\cancel{13}}$

P = 3

5. 0.4p +0 .5 = 2.1

0.4p + 0.5 - 0.5 = 2.1 - 0.5

0.4p = 1.6

$\frac{4p}{10} = \frac{16}{10}$

$\frac{\cancel{4p}}{\cancel{10}} \times \frac{\cancel{10}}{4} = \frac{\cancel{16}}{\cancel{10}} \times \frac{\cancel{10}}{4}$

P = 4

6.3x + 7 - $\frac{3x}{4}$ = 10

3x x 4 + 7 x 4 - $\frac{3x}{4} \times 4$ = 10 x 4

12x + 28 – 3x = 40

12x – 3x + 28 = 40

9x + 28 – 28 = 40 – 28

9x = 12

$\frac{9x}{9} = \frac{12}{9}$

X = $1\frac{1}{3}$

7. $\frac{2q^2}{6}$ = 12

$\frac{\cancel{2q^2}}{\cancel{6}} \times \frac{\cancel{6}}{\cancel{2}} = \cancel{12} \times \frac{6}{\cancel{2}}$

$\sqrt{q^2} = \sqrt{36}$

q = 6

8. $\frac{9q^2}{11}$ = 11

$\frac{\cancel{9q^2}}{\cancel{11}} \times \frac{\cancel{11}}{\cancel{9}} = \cancel{11} \times \frac{11}{\cancel{9}}$

$\sqrt{q^2} = \sqrt{\frac{121}{9}}$

q = $\frac{11}{3}$

q=$3\frac{2}{3}$

Ref: New MK pupils' book 7
Pages 393 -394

Activity

Solve the following equations:

1. $\frac{1}{3}x = 20$
2. $2\frac{1}{5}$y =22
3. $p - \frac{2}{3}p = 7$
4. P+$\frac{p}{5} = 6$
5. $1\frac{1}{2}p + 3 = 12$
6. 0.9p + 0.5 = 5.7
7. 0.3t – 5 = 0.2p = 8.1
8. $\frac{m}{5} + 7 = 11$

9. $4-\frac{3t}{4}$ =-2

10. $\frac{3m}{8}+2=7$

10. $\frac{3m^2}{9}=3$

12. $3\frac{1}{8}w^2$ = 8

SOLVING EQUATIONS INVOLVING FRACTIONAL TERMS

Examples

Solve the following equations;

a) $\frac{m+1}{3}+\frac{m}{4}=2$ LCD=12

$(\frac{m+1}{\cancel{3}})\times\cancel{12}+\frac{m}{4}\times\cancel{12}=2\times12$

4(m+1) + 3m = 24

4m + 4 + 3m = 24

7m + 4 = 24

7m + 4 – 4 = 24 -4

7m = 20

$\frac{\cancel{7m}}{\cancel{7}}=\frac{20}{7}$

$m = 2\frac{6}{7}$

b) $\frac{x-5}{2}+\frac{x}{8}=13$ LCD = 8

$(\frac{x-5}{\cancel{2}})\times\cancel{8}+\frac{x}{\cancel{8}}\times\cancel{8}=13\times8$

4x – 20 + x = 104

5x – 20 = 104

5x – 20 + 20 = 104 + 20

5x = 124

$\frac{\cancel{5x}}{\cancel{5}}=\frac{124}{5}$

$X = 22\frac{4}{5}$

c) $\frac{a+4}{3}-\frac{a}{5}=8$ LCD = 15

$(\frac{a+4}{\cancel{3}})\times\cancel{15}-\frac{a}{\cancel{5}}\times\cancel{15}=8\times15$

5a + 20 - 3a = 120

2a +20 = 120

2a +20 - 20 = 120 - 20

2a = 100

$$\frac{\cancel{2a}}{\cancel{2}} = \frac{100}{2}$$

$$X = 50$$

d) $\frac{3x+1}{4} = \frac{x+2}{2}$

$2(3x+1) = 4(x+2)$

$6x + 2 = 4x + 8$

$6x - 4x = 8 - 2$

$2x = 4$

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{4}{\cancel{2}}$$

$$X = 2$$

) $\frac{3x-1}{2} = \frac{7x+1}{6}$

$2(7x+1) = 6(3x-1)$

$14x + 2 = 18x - 6$

$14x - 18x = -6 - 2$

$-4x = -8$

$\frac{-4x}{-4} = \frac{-8}{-4}$

$$x = 2$$

Activity

Solve the following equations

a) $\frac{d-2}{3} + \frac{d}{3} = 4$

b) $\frac{2n+5}{5} + \frac{n}{5} = 8$

c) $\frac{k+3}{4} + \frac{k}{2} = 6$

d) $\frac{x+5}{4} + \frac{x}{5} = 2$

e) $\frac{d+3}{3} = \frac{5d+1}{9}$

f) $\frac{4x-9}{3} = \frac{3x+5}{7}$

g) $\frac{6p+4}{9} = \frac{4p-3}{7}$

h) $\frac{m+2}{5} = \frac{m+1}{20}$

Ref: New MK pupils' book 7
Pages 461-462

INEQUALITIES

Symbols used

$<$ Less than

$\leq$ Less than or equal to

$>$ Greater than

$\geq$ Greater than or equal to

SOLUTION SETS

Solution set is group of possible values that satisfy an inequality

Examples

1. If x is a negative integer, find the solution set for $x>-6$

   X = {-1,-2,-3,-4,-5}

2. Find the solution set for $y<5$ if y is a positive integer.

   Y={1,2,3,4,}

3. Find the solution set for x -4 when x is a negative integer.

   X={-1,-2,-3,-4}

4. Find the solution set for x 5 when x is a whole number.

   X = {0,1,2,3,4,5}

5. Find the solution set for $-2<x<2$

   X ={-1,0,1}

6. Find the solution set for $-1 \leq x < 3$

   X = {-1,0,1,2}

7. Find the solution set for $-4 < x \leq 4$

   X ={-3,-2,1,0,1,2,3,4}

8. Find the solution set for $-3 \leq x \leq 3$

   X ={-3,-2,-1,0,1,2,3}

Ref: New MK pupils' book 7 Pages 444

Activity

If x is an integer, find the solution set for the following inequalities

a)$x>2$ b) $x>8$ c)$x<0$ d)$x<9$ e)$x \geq 0$ f) $x \leq -10$ g)$x \geq 5$ h)$x \geq 4$

i) $2 \geq x \geq -3$ j) $5 > x > 0$ k) $-3 \leq p \leq 4$ l) $-2 < y < 3$

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution for the following inequalities

a) $K- 9 <5$

K-9+9<5+9

k<14

k={13,12,11,10,9,8,7,6,5,4,3,2,1,0,-1…}

b) P+4 <15

P + 4 – 4 <15 – 4

P < 11

P= {…,-2,-1,0,1,2,3,4,5,6,7,8,9,10}

c) 2w -3 $\geq$ 15

2w – 3 + 3 $\geq$ 15+3

2w $\geq$18

$\frac{2w}{2} \geq \frac{18}{2}$

W$\geq$9

W={9,10,11,12,13,14,15,…}

d)$\frac{2x}{4}$ -3 $\leq$12

$\frac{2x}{4}$ -3+3 $\leq$ 12+3

$\frac{2x}{4} \times 4 \leq 15 \times 4$

$2x \leq 60$

$\frac{2x}{2} \leq \frac{60}{2}$

X$\leq$30

X = {…25, 26, 27, 28, 29, 30}

Activity

Solve and find the solution set for the following inequalities

a) a + 4 $>$ 8

b) y + 5 $\geq$ 7

c) a + 6$\leq$9

d) w – 6$\leq$3

e) p – 3 $\geq$2

f) 9k$\geq$45

g) 7x – 3$\leq$18

h) $\frac{n}{9} \leq 3$

i) $\frac{3t}{8} \geq 8$

SOLVING AND FINDING SOLUTION SETS

Examples

Solve and find the solution set for the following inequalities

a) $2(x+1) \geq 4$

$2x + 2 \geq 4$

$2x + 2 - 2 \geq 4 - 2$

$2x \geq 2$

$\frac{2x}{2} \geq \frac{2}{2}$

$X \geq 1$

$X = \{2,3,4,5,6,7,8\ldots\}$

b) $3(x-1) < 15$

$3x - 3 < 15$

$3x - 3 + 3 < 15 + 3$

$3x < 18$

$\frac{3x}{3} < \frac{18}{3}$

$X < 6$

$X = \{-2,-1, 0, 1, 2, 3, 4, 5\}$

c) $8 > 2x > 2$

$\frac{8}{2} > \frac{2x}{2} > \frac{2}{2}$

$4 > x > 1$

$X = \{2,3\}$

d) $3x-5 \leq 8x +10$

$3x-8x \leq 10 +5$

$-5x \leq 15$

$\frac{-5x}{-5} \geq \frac{15}{-5}$

$X \geq -3$

$X = \{-3,-2,-1, 0, 1, 2, 3, 4\ldots\}$

Activity

Solve and find the solution set for the following

a) $3(y+2) < 6$
b) $4(a+1) \geq 12$
c) $6(x-2) \geq 60$
d) $5(a-3) \geq 10$
e) $10 \geq 2x \geq -4$
f) $8 \leq 4x < 24$
g) $-15 \leq 3x \leq 24$

Ref: New MK pupils' book 7
Pages 447-449

APPLICATION OF INEQUALITIES

Examples

1. The head teacher's car can maximally accommodate maximally 6 people. a) Show this information in an inequality.
   Let k be the range of people it accommodates
   $K \leq 6$

b) Write a solution set for the inequality.
$K = \{1, 2, 3, 4, 5\}$

2. The interview panel can interview more than seven people but less than thirteen people a day. What possible number of people can the panel interview in a day?

$7 < y < 13$
$Y = \{8,9,10,11,12\}$

3. What number can be added to seven gives a number greater than 16?
   Let the number be k
$K + 7 > 16$
$K+7-7 > 16 - 7$
$K > 9$
$K = \{9,10,11,12,13,14,15\}$

Activity

1. Our room can accommodate people seated in sevens up to maximally 49 people.
   a) Write an inequality for the information
   b) What possible number of people can be seated there?
2. What counting number can be added to four to give a number less than 6?

3. Okocha is 8years, Martin is 6 years, and Nakito is 3 years old. A school admits pupils from the age of 5 to 11 years. Which number of the pupils will not be accepted?

4. A ticket states that for children 8 years and below enter freely. Which of the following pupils will gain the entry to the show?

Kato 7years, Sarah 8years, Okoth 10 years and Abby 4 years.

5. Matthew scored 98 marks, otto scored 75 marks, Lillian 98 marks. The pass mark is more than 50.

a) Which pupil passed the exams?
b) If p is the pass mark, then which children form the solution set $P \leqslant 50$?

6. The temperature of a patient was taken.Peter was 36.5^{0c}.Akello 36.2^{0c},Batte 37^{0c} and Mwesigye 38^{0c}.

a) Using T as the subject, write an inequality.

b) If the normal has a higher temperature possibly fever, which patient is normal?

7. A doctor prescribed a dosage for children. She said for children above 8 years but not less than 17 years take 2 spoonful a day. Write an inequality in which you express the age limit using D?

Ref: New MK pupils' book 7
Pages 450-4551

TOPIC: MONEY

Buying and selling

Example

Ofwono had sh. 6,000 and bought the following items.

- 3kg of sugar at sh. 1,000 per kg.
- 1 ½ kg of salt at sh. 600 per kg.
- 2 loaves of bread at sh. 1,400

(a)Find his total expenditure.

Ofwono's shopping bill

sugar	salt	bread	amount
1000 x 3 sh. 3000	600 x3 2 300 x3 = Sh. 900	Sh. 1400	3000 900 + 1400 Sh. 5300

(b) Calculate his balance.

Balance = sh 6000
- sh. 5300
sh. 700

Activity

1. Jane bought the following items from the market.
   - 3 kg of sugar at sh. 2,800 per kg
   - 1.5 kg of rice at sh. 3,200 per kg
   - 1.5 litres of paraffin at sh. 3000 per litre.
   - 8 oranges at sh. 200 per orange.

   If Jane remained with sh. 5,700, how much money did she go with?
2. Betty was given sh. 50,000 t0 buy things to take to school and she bought the following.
   - 3 dozens of exercise books at sh.6,000 per dozen.

- 4 tablets of bathing soap at sh. 2,500 per tablet.
- 2 tubes of tooth paste at sh. 3,500 per tube.

a) How much money did she spend altogether?

b) How much money did she remain with?

3. Apio bought the following items from the market.
   - 2kg of rice at sh. 4500 a kg
   - 1.5 kg of meat at sh. 1400 a kg
   - 500g of salt at sh.2000 a kg
   - A sachet of cooking oil at sh.2500

   How much money did she spend altogether?

New MK Primary Mathematics Pupil's Book 6 Page 213 - 214

Completing Bill Tables

Example

Study Mary's bill and fill in the missing information.

Item	**Quantity**	**Unit cost**	**Amount**
sugar	4kg	Sh.1,200	Sh.-------
Soap	2 bars	Sh. --------	Sh. 1,400
c.oil	----- litres	Sh.1,500	Sh. 4,500
Total			Sh.-------

Side work

Sugar	Soap	C.oil
1200	1400	4500
x 4	2	1500
sh.4800	= sh. 700	= 3 litres

New MK Primary Mathematics Pupil's Book 6 Page 215 – 216

Activity

The table below shows some of the items Mrs. Okurut bought for Christmas.

Items	Quantity	Unit cost	Total cost
Rice	3.5 kg	Sh. 3,000	Sh.-------
Meat	3kg	Sh. 12,000	Sh. 24,000
Sugar	2.5kg	Sh. ---------	Sh. 10,000
Tomatoes	--------	Sh. 400	Sh. 1400
Onions	2	Sh. 600	Sh. 1200
Total			Sh. --------

a) Complete the table below.

b) If she had sh. 50,000 and was given a discount of 10%, how much did she remain with?

1. Logose had sh. 60,500 and she went to the market and bought the following items shown on the table below.

Items	Quantity	Unit cost	Total cost
Meat	3 kg	Sh. 15,000	Sh.-------
Bread	2 loaves	Sh. -------	Sh. 4,000
Milk	------ litres	Sh. 2000	Sh. 3000
Soap	3 bars	Sh.------	Sh. 7,500
Charcoal	1 bag	Sh. 30,000	Sh. 30,000
Transport			
Total			Sh. --------

a) Complete the table below.

b) How much money was she left with?

2. A p.6 pupil was sent to the market with sh. 31,300 to buy the items shown on the table below.

Item	Price	Total cost
3 kg of beans	Sh. ------- per kg	Sh. 6,600
3 kg of sugar	Sh. 2,800 per kg	Sh. -------
4 kg of meat	Sh. ------- per kg	Sh. 13,000
----- loaves of bread	Sh. 2200 per loaf	Sh. 3,300
Total expenditure		Sh. 22,900

a) Complete the table

b) What change did the pupil get after buying the items if a discount of 10% was given?
Study and complete Mukasa,s shopping table below.

Items	Quantity	Unit cost	Total cost
Sugar	3 kg	Sh. ----per kg	Sh.14,000
Rice	---- kg	Sh. 5,000 per kg	Sh. 4,000
Milk	250 ml	Sh. 3000 per litre	Sh. -----
Biscuits	2 packets	Sh.------	Sh. ------
Total expenditure			Sh. 29,650

UGANDA CURRENCY

The Uganda currency consists of the coins and Bank notes.

(i)Coins are in denominations of;

Sh. 50, sh. 100, sh. 200, sh.500 and sh.1, 000

(ii) Bank notes are in denominations of;

Sh. 1,000, sh. 2,000, sh. 5,000, sh. 10,000, sh. 20,000 and sh. 50,000

Finding number of notes in a bundle

Example

1. Find the number of bank notes in a bundle numbered from AP003782 to AP003881.

No. of notes = AP003881
- AP003782
99 + 1
= 100 notes.

(ii) How much money is in the bundle if each note is worth sh. 5,000
=Sh. 5,000 x 100
=Sh. 500,000

Note: For water bills and electricity bills do not add one after subtracting.

2. The family's electric metre reading was 006771 at the beginning of the month and 006791 by the end of the month.
   a) How many units of electricity did the family use that month?
   b) If each unit costs sh. 550, how much did the family spend on electricity that month?

a) 006791
\- 006771
20 units

b) = Sh. 500 x 20
= sh. 10,000

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LESSON 22

ACTIVITY

1. James had a bundle of twenty thousand shilling notes numbered consecutively from XZ60048700 to XZ60048799.

(i) How many notes did he have in the bundle?

ii) If he bought a plot of land at sh. 1,500,000, how much money did he remain with?

2. Peter was given a bundle of one thousand shilling notes numbered consecutively from OR447500 to OR447699. How much money did Peter get?
3. Maria has a bundle of five thousand shillings numbered consecutively from AP534201 to AP5343300. How much money does she have?
4. Tr. Prim withdrew bank notes of sh. 10,000 each numbered consecutively from BW0302103 to BW0302144.
   a) How many bank notes did she withdraw?
   b) How much money did she withdraw?

5. The water metre reading of a family was 000346 at the beginning of the month and 000376 at the end of the month. If each unit costs sh. 400, how much money does the family spend on water bills?

Uganda and other currencies

Different countries use different types of money. The money used by a country is its currency.

Below are some of the countries and their currencies

Country	**Currency**
Uganda	Shilling (Ug.Sh)
Kenya	K. shilling (K.sh)
Rwanda	R. Franc (RWF)
U.S.A	US dollar ($)
South Africa	Rand (ZAB)
Britain	Poundsterling(£)
Europe	Euros (€)

Conversion of currencies

Example 1

A tourist arrived in Uganda with € 1650. He had to convert it to Uganda shillings. (Given that €1 = Ush.2,500) how much Uganda shillings did the tourist get?

€1 = Ush.2,500

€ 1650 = Ush. 2,500 x 1,650

= Ush. 4,125,000

Example 2

How many US dollars can you get from Ush.285,600 if 1 us dollar is worth Us 2,800?

1 US dollar = sh. 2,800

Ush.285,600 = US dollars $\frac{285600}{2800}$

= US dollars 102

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Activity

1. John and his young daughter travelled from Kampala to Nairobi by bus. John paid ksh.1500 and the daughter paid ksh.750. The exchange rate was ksh.1 = Ush.30.
   a) Work out the bus fair in Uganda shillings which each of them paid.
   b) John had Ush.300,000 at the beginning of the journey. What was his change in Kenya shillings after paying the bus fair for himself and the daughter?
2. The exchange rate for Kenya shillings to Uganda shillings and United States dollars to Uganda shillings are shown below.
   Ksh.1 =Ush.35
   USD1 = Ush.3600
   a) How many united states dollar will one get from USD3500?
   b) If the cost of a new bicycle is USD90, how much could this be in Uganda shillings?
3. The exchange rates in a bank are as follows.
   - 1 US dollar = Ush.3400
   - 1 British pound = Ush.4600
   - 1 Kenya shilling = Ush.35
   a) Convert Ush.1,840, 000 to British pound
   b) If a set of chairs cost 700 dollars, find the equivalent cost in Uganda shillings.

Exchange rates involving buying and selling

Example

1. The rates at which the bank buys and sells United States dollars and Kenya shillings are given in the table below.

Currency	Buying	Selling
1 US dollar	Ush.3500	Ush.3600
1 Kenya shilling	Ush.30	Ush.35

a) If a trader had 300 dollars and 500 Kenya shillings, how much money in Uganda shillings can he get from the bank?

Uganda shillings from Kenya shillings

= Ush.(500 x 30)

= Ush.15,000

Uganda shillings from United States dollars

= Ush. (300 x 3,500)

= Ush.1,050,000

Total money in Uganda shillings

= Ush.(1,050,000 + 15,000)

= Ush 1,065,000

b) Peter has 1050 united state dollars, how much can he exchange for Kenya shillings?

US dollars to Uganda shillings

= Ush.1050 x 3500

= Ush.3,675,000

Uganda shillings to Kenya shillings

$= \frac{\text{ush.}367500}{35}$

= ush.10,500

Activity

1. The table below shows the rate at which different currencies were bought and sold in a commercial bank.

Currency	Buying	Selling
1 US dollar	Ush.3600	Ush.3650
1 Euro	Ush.4000	Ush.4020
Rwandese Franc	Ush.4	Ush.5

   a) How many Euros did musa get from Uganda shillings 603,000?
   b) Amina came from Rwanda with 109,000rwandese franc and exchanged them for US dollars. How many US dollars did she get from the bank?

2.The table below shows the rate at which DFCU bank buys and sells different currencies

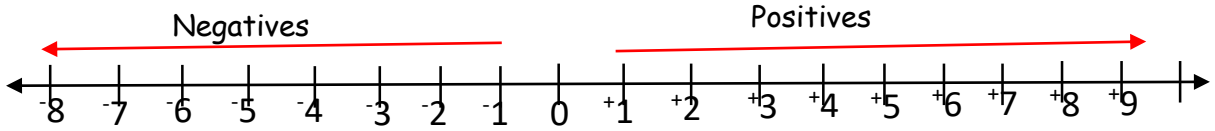
Currency	Buying	Selling
1 US dollar	Ush.3500	Ush.3600
1 British Pound	Ush.4000	Ush.4200
1Ksh	Ush.30	Ush35

   a) A tourist had 250 US dollars. How much money in Uganda shilling did he get from the bank?
   b) Musa had Ugsh1,680,000, how many British pounds did he get from the bank?
   c) A man bought a laptop for 700British pounds. Find the cost of the same laptop in Kenya shillings.

TOPIC: INTEGERS

CONTENT: Introduction and ordering integers

- An integer is a positive (+) or negative (-) number and zero.
- Examples of integers are {……$^{-}4,^{-}3,^{-}2,^{-}1,0,^{+}1,^{+}2,^{+}3,^{+}4$…….}
- Zero (0) is neither a negative (-) nor a positive integer.
- Integers can be represented on a number line.
- On a number line, positive (+) integers are put on the right hand side while negative (-) integers are put on the left as shown below



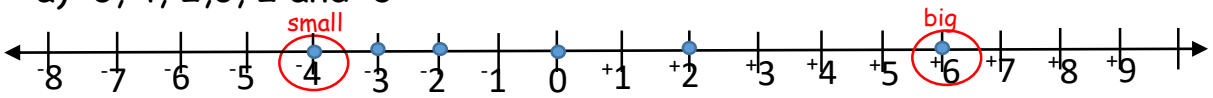
Ordering integers

Integers can be ordered in either ascending or descending order

Examples

1.Arrange the following integers in ascending order

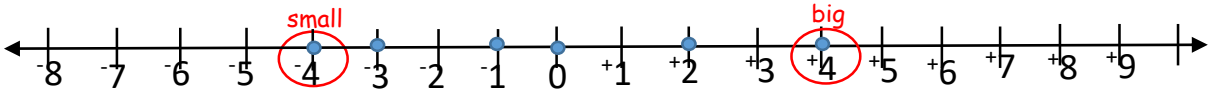
a) $^{+}6,^{-}4,^{+}2,0,^{-}2$ and $^{-}3$



Ascending order={$^{-}4,^{-}3,^{-}2,0,^{+}2,^{+}6$}

2.Arrange the following integers in descending order

a) $^{+}4,^{-}4,^{+}2,0,^{-}1$ and $^{-}3$



Descending order={$^{+}4,^{+}2,0,^{-}2,^{-}3,^{-}4$}

Activity

1.Arrange the following integers in ascending order

a) $^{+}5, ^{-}3, ^{+}3, 0, ^{-}1$ and $^{-}4$ b) $^{-}5, ^{-}2, ^{+}4, 0, ^{+}1$ and $^{-}6$

c) $^{+}6, ^{-}7, ^{+}5, 0, ^{-}4$ and $^{+}3$ d) $^{+}4, ^{-}4, ^{+}2, 0, ^{-}1$ and $^{-}3$

2.Arrange the following integers in descending order

a) $^{-}5, ^{-}3, ^{+}3, 0, ^{-}1$ and $^{+}4$ b) $^{+}7, ^{-}3, ^{+}3, 0, ^{-}1$ and $^{-}4$

c) $^{+}4, ^{-}2, ^{+}3, 0, ^{+}1$ and $^{-}1$ d) $^{+}6, ^{-}3, ^{+}3, 0, ^{-}1$ and $^{+}4$

Comparing integers using $< or > or =$

Examples

1.Compare the following integers using $< or > or =$

a) $^{-}100 < 0$ b) $^{+}67 > ^{-}67$ c) $^{-}10 > ^{-}50$

Activity

1.Compare the following integers using $< or > or =$

a) $^{-}10$... ... ...0 b) $^{+}60$... ... . $^{-}60$ c) $^{-}1$... ... ... $^{-}5$

d) $^{-}24$... ... ...$^{+}$ 24 e) $^{+}6$... ... . $^{-}30$ c) $^{-}15$ ... ... $^{-}5$

Additive inverse

Points to note

- An additive inverse is an integer which when added to another integer gives zero.
- The inverse property states that "any number added to its inverse or opposite, gives zero".
- For example; a) $^{+}4 + ^{-}4 = 0$ b) $^{-}9 + ^{+}9 = 0$

Finding additive integers

EXAMPLES

1. Find the additive inverse of $^{+}7$

   Let the inverse be k

   K+ $^{+}7=0$

   K+7-7=0-7

   K=$^{-}7$

b) Find the additive inverse of $^{-}10$

Let the inverse be r

r+ $^{-}10=0$

r-10+10=0+10

r=$^{+}10$

Activity

a) Find the additive inverse of $^{+}6$

b) Find the additive inverse of $^{-}4$

c) Find the additive inverse of $^{+}9$

d) Find the additive inverse of $^{-}5$

e)Find the additive inverse of $^{-}12$

f)Find the additive inverse of $^{+}8$

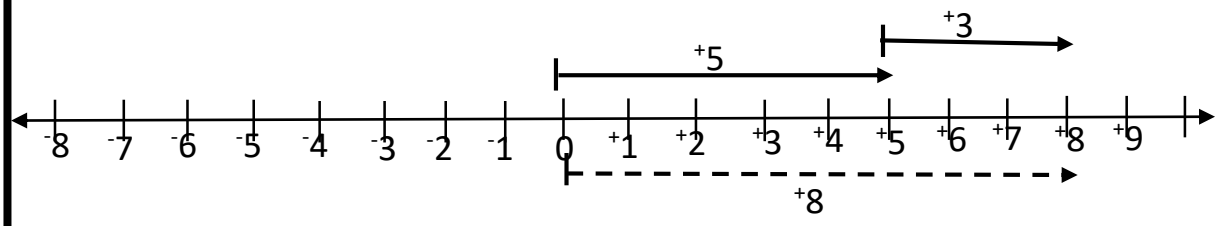
g)Find the additive inverse of $^{-}1$

h)Find the additive inverse of $^{+}11$

Addition of integers using a number line

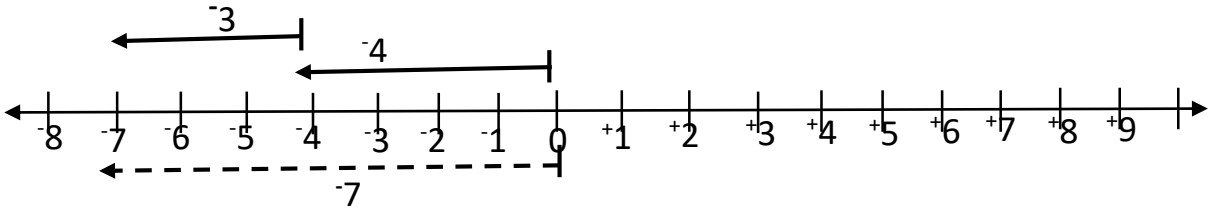
Examples

1.Add $^{+}5$ + $^{+}3$ using a number line



$^{+}5$ + $^{+}3$ =$^{+}8$

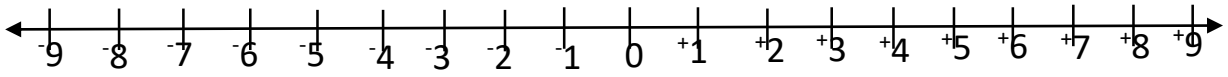
2.Add $^{-}4$ + $^{-}3$ using a number line



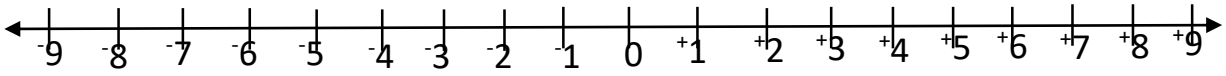
$^{-}4$ + $^{-}3$ =$^{-}7$

Activity

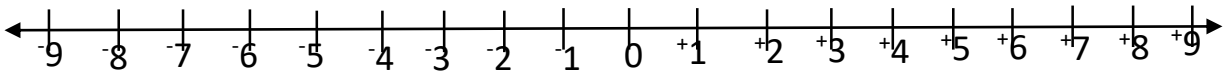
1.Add $^{-}5 + {}^{-}4$ using a number line



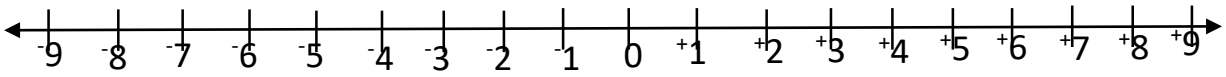
2.Add $^{+}6 + {}^{+}3$ using a number line



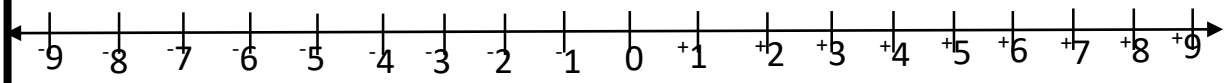
3.Add $^{-}6 + {}^{-}2$ using a number line



4.Add $^{-}3 + {}^{-}5$ using a number line



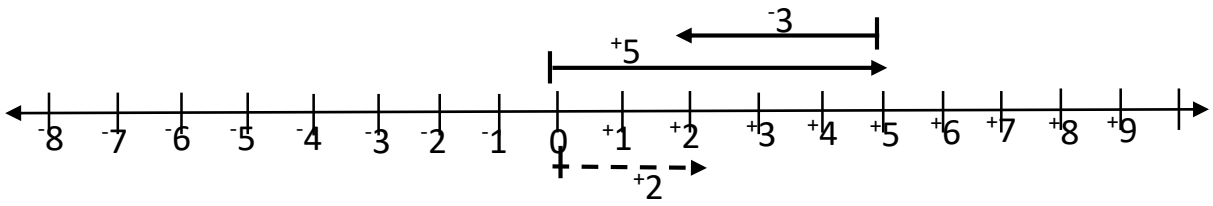
5.Add $^{+}4 + {}^{+}2$ using a number line



Addition of negative and positive integers using a number line

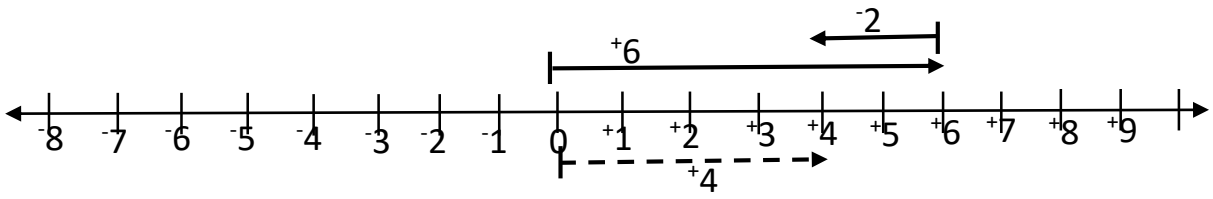
Examples

1.Add $^{+}5 + {}^{-}3$ using a number line



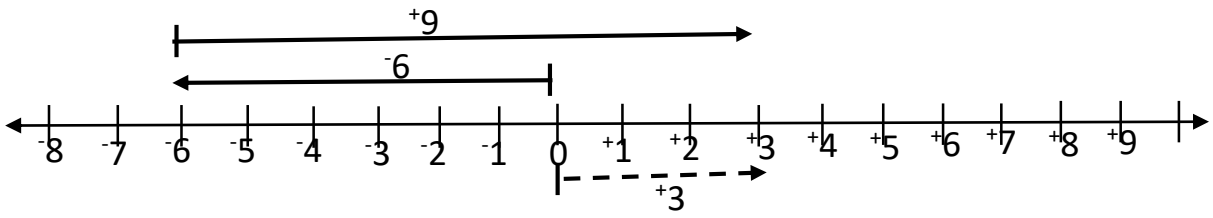
$^{+}5 + {}^{-}3 = {}^{+}2$

2.Add $^{+}6 + {}^{-}2$ using a number line



$^{+}6 + {}^{-}2 = {}^{+}4$

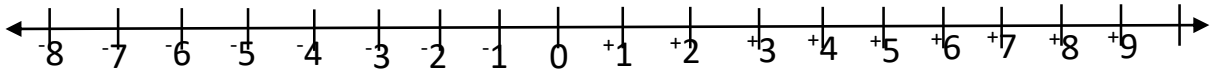
3.Add $^{-}6 + {}^{+}9$ using a number line



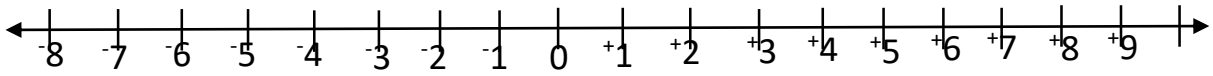
$^{-}6 + {}^{+}9 = {}^{+}3$

Activity

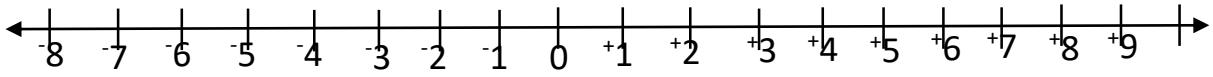
1.Add $^{+}7 + {}^{-}3$ using a number line



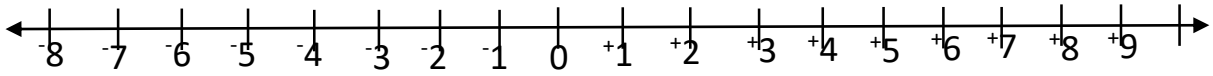
2.Add $^{+}9 + {}^{-}5$ using a number line



3.Add $^{-}8 + {}^{+}3$ using a number line



4.Add $^{-}4 + {}^{+}9$ using a number line



Addition of integers without using a number line

Points to note

- +(+)= +
- +(-)= -
- -(-)=+
- -(+)=-

Examples

1.Simplify: $^{+}6 + {}^{-}2$

$^{+}6 + (\,{}^{-}2)$

$^{+}6 - 2$

$^{+}4$

2.Simplify: $^{-}7 + {}^{+}2$

$^{-}7 + (^{+}2)$

$^{-}7 + 2$

$= {}^{-}5$

3.Simplify: $^{-}7 + {}^{-}2$

$^{-}7 + (^{-}2)$

$^{-}7 - 2$

$^{-}9$

Activity

1.Simplify: $^{+}9 + {}^{-}5$

2.Simplify: $^{+}7 + {}^{-}4$

3.Simplify: $^{+}5 + {}^{-}2$

4.Simplify: $^{-}6 + {}^{-}2$

5.Simplify: $^{-}9 + {}^{-}6$

6.Simplify: $^{+}11 + {}^{-}4$

7.Simplify: $^{+}8 + {}^{-}5$

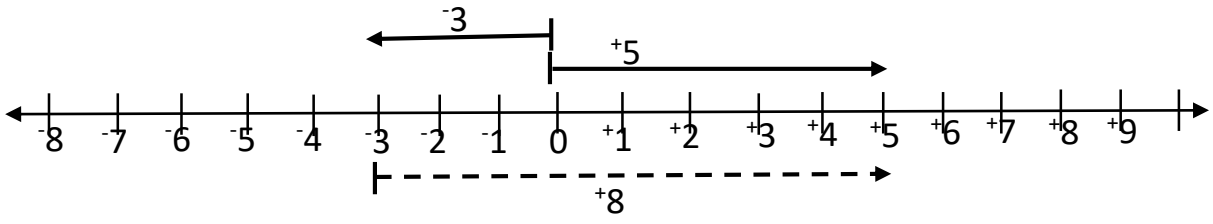
8.Simplify: $^{-}7 + {}^{-}5$

9.Simplify: $^{+}5 + {}^{-}3$

Subtraction of integers using a number line

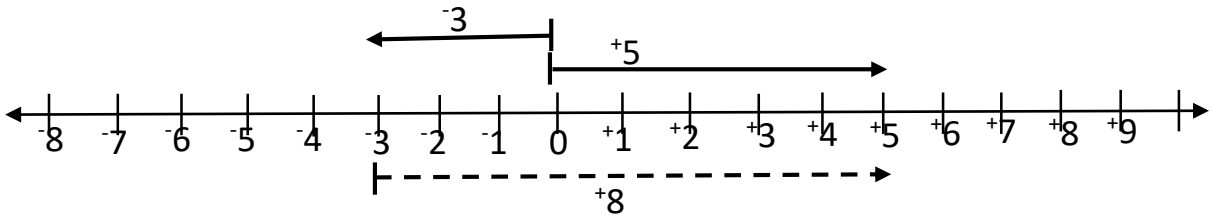
Examples

1.Subtract $^{+}5 - {}^{-}3$ using a number line



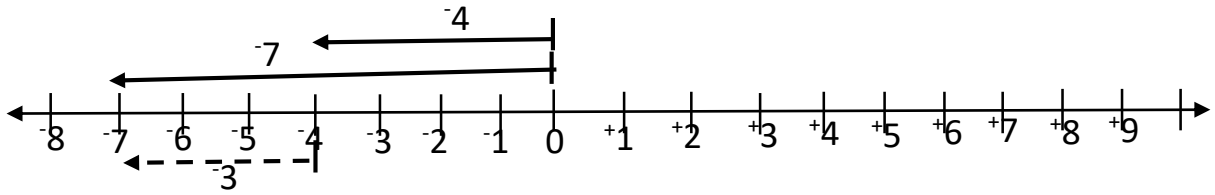
$^{+}5 - {}^{-}3 = {}^{+}8$

2. Subtract $^{+}8 - {}^{-}4$ using a number line



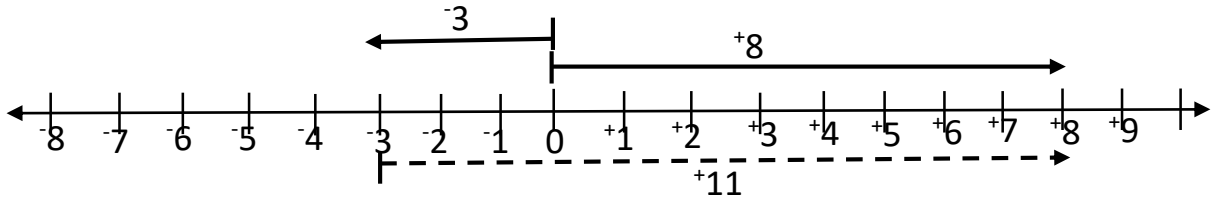
$^{+}5 - {}^{-}3 = 8$

3.Subtract $^{-}7 - {}^{-}4$ using a number line



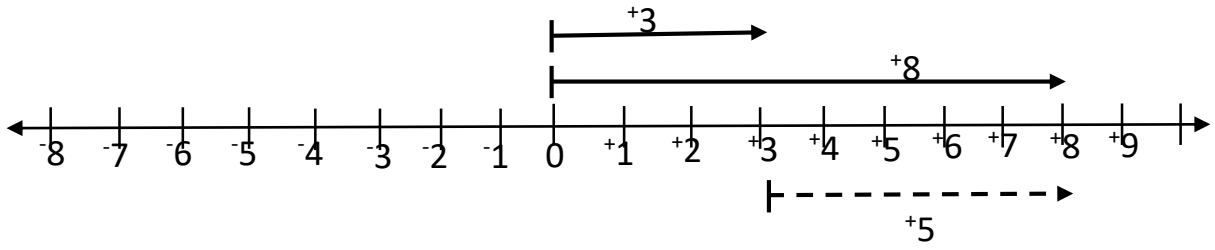
$^{-}7 - {}^{-}4 = {}^{-}3$

4.Subtract $^{+}8 - {}^{-}3$ using a number line



$^{+}8 - {}^{-}3 = {}^{+}11$

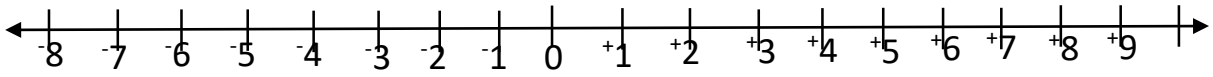
5.Subtract $^{+}8 - {}^{+}3$ using a number line



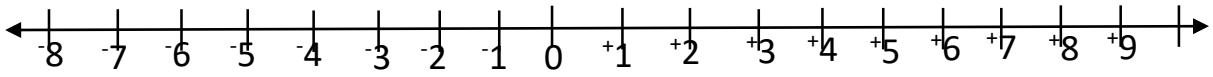
$^{+}8 - {}^{+}3 = {}^{+}5$

Activity

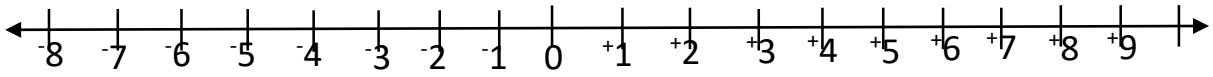
1.Subtract $^{+}5 - {}^{-}2$ using a number line



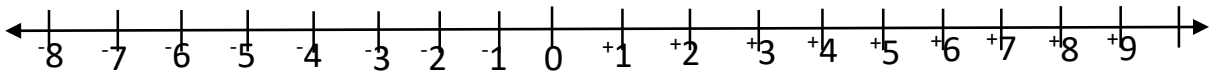
2.Subtract $^{+}7 - {}^{-}4$ using a number line



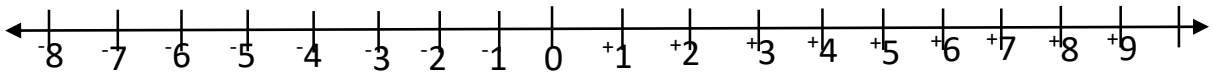
3.Subtract $^{+}5 - {}^{+}2$ using a number line



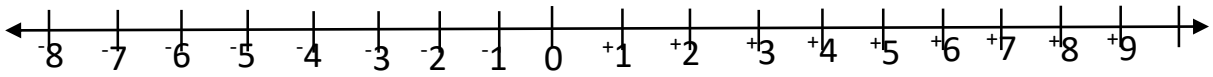
4.Subtract $^{+}7 - {}^{+}5$ using a number line



5.Subtract $^{-}6 - {}^{-}2$ using a number line



6.Subtract $^{-}8 - {}^{-}5$ using a number line



Subtraction of integers without using a number line

Points to note

- +(+)= +
- +(-)= -
- -(-)=+
- -(+)=-

Examples

1.Simplify: $^{+}6 - {}^{-}2$

$^{+}6 - (\,{}^{-}2)$

$^{+}6 + 2$

$^{+}8$

2.Simplify: $^{-}7 - {}^{+}2$

$^{-}7 - (^{+}2)$

$^{-}7 - 2$

$= {}^{-}9$

3.Simplify: $^{-}6 - {}^{-}2$

$^{-}6 - (^{-}2)$

$^{-}6 + 2$

$^{-}4$

Activity

1.Simplify: $^{+}9 - {}^{-}5$

2.Simplify: $^{+}7 - {}^{+}4$

3.Simplify: $^{+}5 - {}^{-}2$

4.Simplify: $^{-}6 - {}^{+}2$

5.Simplify: $^{-}9 - {}^{-}6$

6.Simplify: $^{+}11 - {}^{+}4$

7.Simplify: $^{+}8 - {}^{-}5$

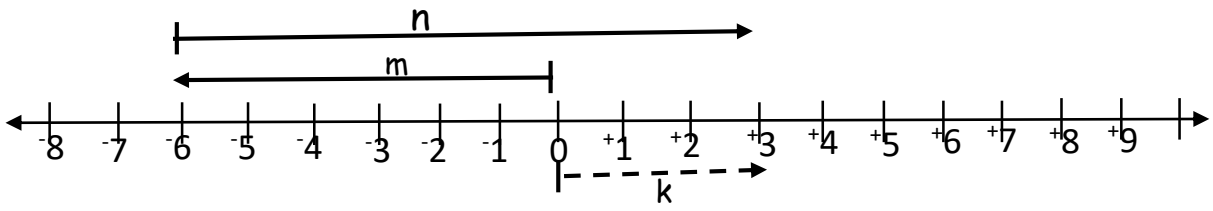
8.Simplify: $^{-}7 - {}^{+}5$

9.Simplify: $^{+}5 - {}^{-}3$

Forming addition mathematical statements from a number

EXAMPLES

Use the number line below to answer the questions that follow



a) Write down the integer represented by the arrows m,n and k

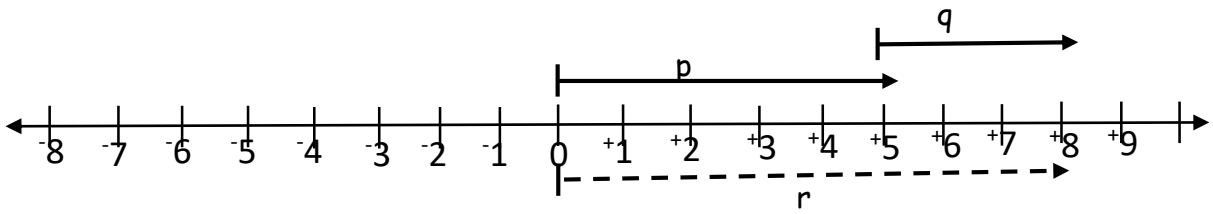
M= $^{-}6$ n= $^{+}9$ k=$^{+}3$

b)Write down the addition mathematical statement shown on the above number line

m + n = k

$^{-}6 + {}^{+}9 = {}^{+}3$

Use the number line below to answer the questions that follow



a) Write down the integer represented by the arrows p, q and r

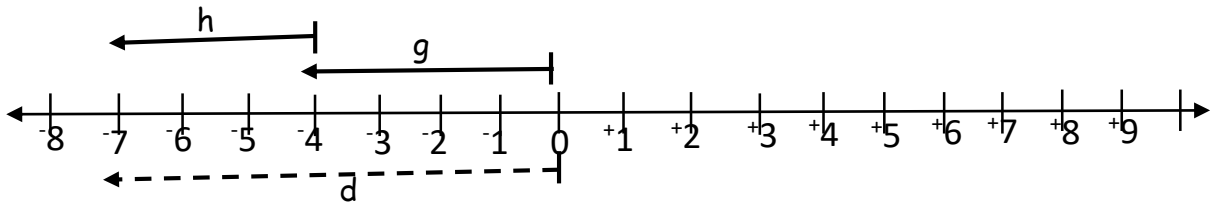
p= $^{+}5$ q= $^{+}3$ r=$^{+}8$

b) Write down the addition mathematical statement shown on the above number line

p + q = r

$^{+}5 + {}^{+}3 = {}^{+}8$

3.Use the number line below to answer the questions that follow



a) Write down the integer represented by the arrows g, h and d

g= -4 h= -3 d=-7

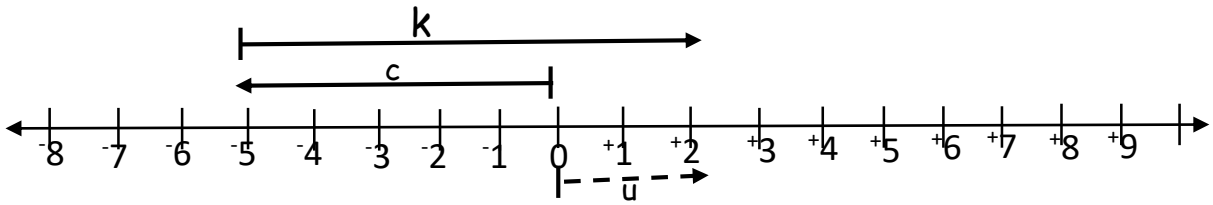
b)Write down the addition mathematical statement shown on the above number line

g + h = d

-4 + -3=-7

Activity

1. Use the number line below to answer the questions that follow

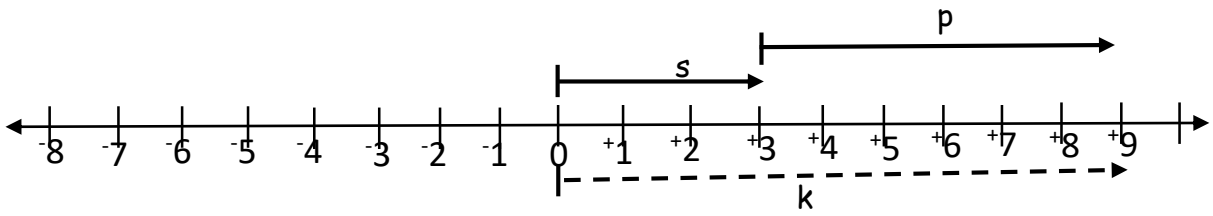


a) Write down the integer represented by the arrows c, k and u

c=…… k=…… u=……

b) Write down the addition mathematical statement shown on the above number line

Use the number line below to answer the questions that follow

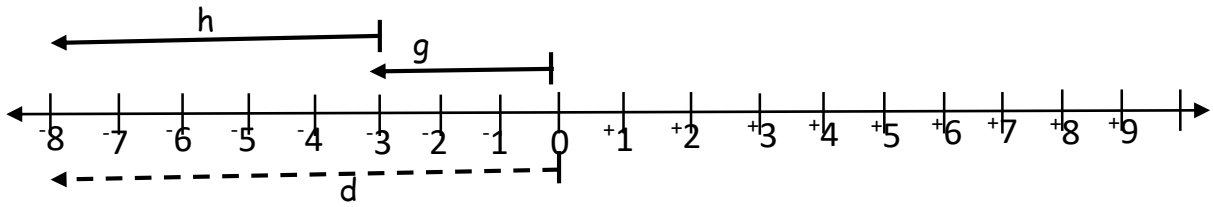


a) Write down the integer represented by the arrows p, q and r

s=…… p=…… K=……

b) Write down the addition mathematical statement shown on the above number line

3. Use the number line below to answer the questions that follow

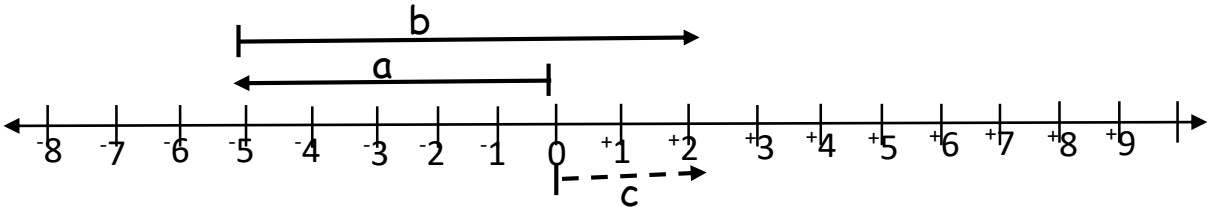


a) Write down the integer represented by the arrows g, h and d

g=…… h=…… D=……

b) Write down the addition mathematical statement shown on the above number line.

4. Use the number line below to answer the questions that follow



a) Write down the integer represented by the arrows a, b and c

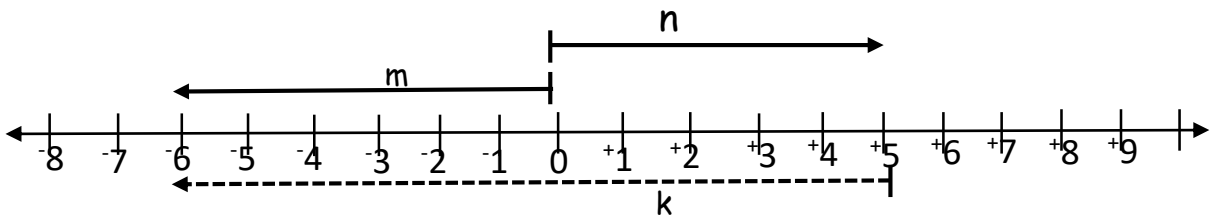
a=…… b=…… c=……

b) Write down the addition mathematical statement shown on the above number line

Forming subtraction mathematical statements from a number

EXAMPLES

Use the number line below to answer the questions that follow



b) Write down the integer represented by the arrows m,n and k

M= $^{-}6$ n= $^{+}5$ k=$^{-}11$

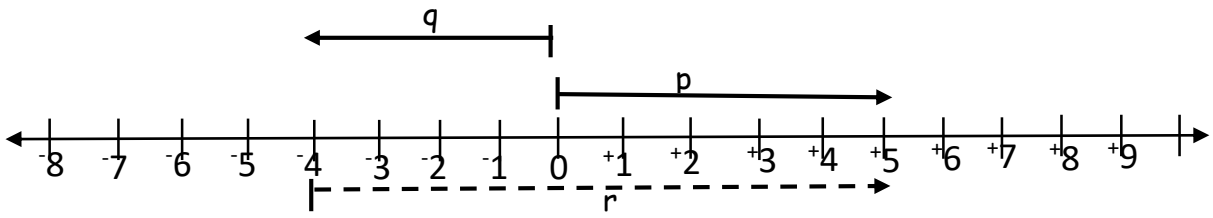
---

b)Write down the subtraction mathematical statement shown on the above number line

m - n = k

$^{-}6 - {}^{+}5 = {}^{-}11$

Use the number line below to answer the questions that follow



c) Write down the integer represented by the arrows p, q and r

p= $^{+}5$ q= $^{-}4$ r=$^{+}9$

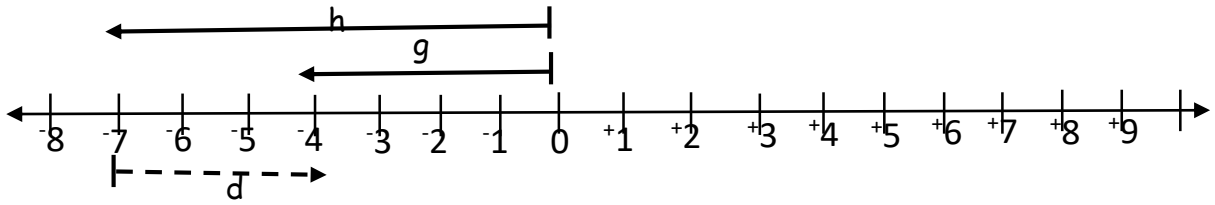
---

d) Write down the subtraction mathematical statement shown on the above number line

p - q = r

$^{+}5 - {}^{-}4 = {}^{+}9$

3.Use the number line below to answer the questions that follow



c) Write down the integer represented by the arrows g, h and d

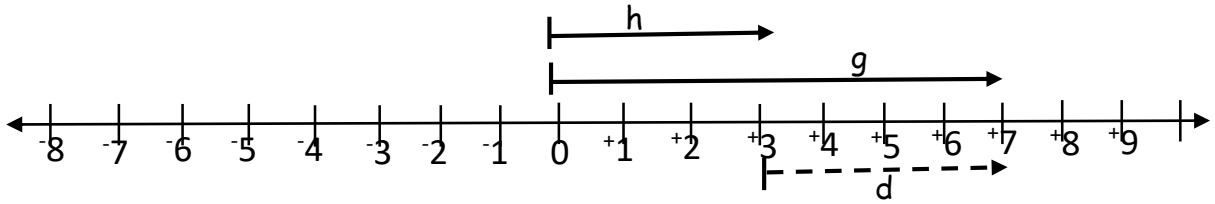
g= $^{-}$4 h= $^{-}$7 d=$^{+}$3

b)Write down the subtraction mathematical statement shown on the above number line

g - h = d

$^{-}$4 - $^{-}$7=$^{+}$3

3.Use the number line below to answer the questions that follow



d) Write down the integer represented by the arrows g, h and d

g= $^{+}$7 h= $^{+}$3 d=$^{+}$4

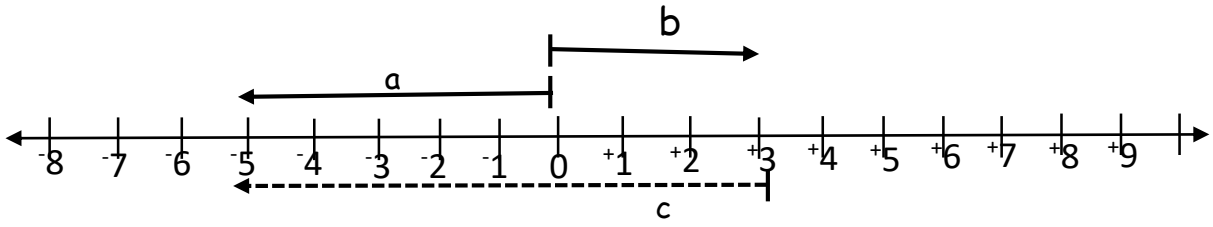
b)Write down the subtraction mathematical statement shown on the above number line

g - h = d

$^{+}$7 - $^{+}$3=$^{+}$4

Activity

1.Use the number line below to answer the questions that follow

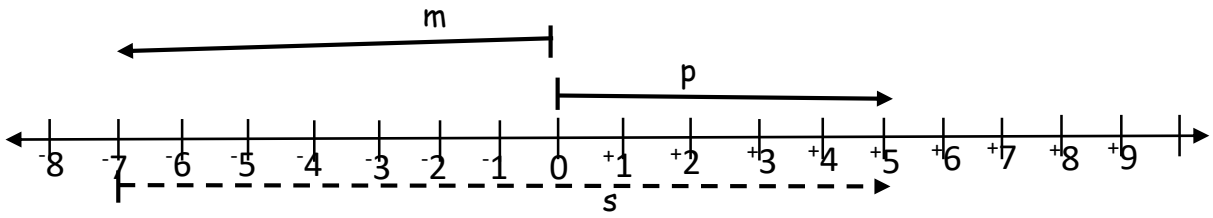


c) Write down the integer represented by the arrows a,b and c

a=---------- b=---------- c=----------

b)Write down the subtraction mathematical statement shown on the above number line

Use the number line below to answer the questions that follow

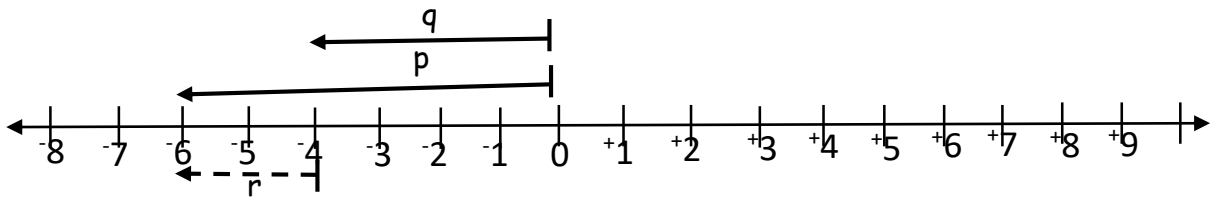


e) Write down the integer represented by the arrows m, p and s

m=---------- p=---------- s=----------

f) Write down the subtraction mathematical statement shown on the above number line

3.Use the number line below to answer the questions that follow

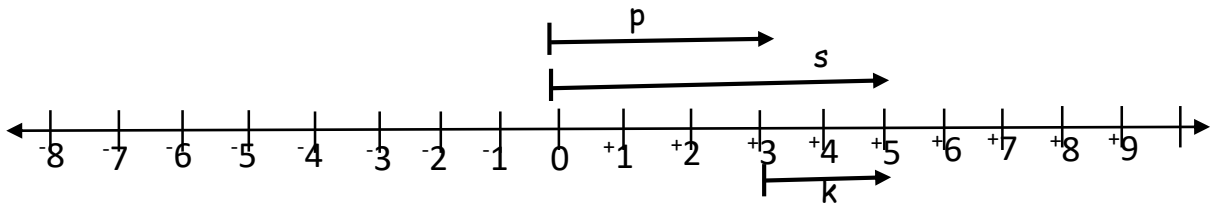


e) Write down the integer represented by the arrows p, q and r

p=---------- q=---------- r=----------

b)Write down the subtraction mathematical statement shown on the above number line

3.Use the number line below to answer the questions that follow



f) Write down the integer represented by the arrows p, s and k

p=---------- s=---------- k=----------

b)Write down the subtraction mathematical statement shown on the above number line

Multiplication of integers without using a number line

Points to note

- + x + or +(+)= +
- + x – or +(-)= -
- - x – or -(-)=+
- - x + or -(+)=-

Examples

1.Simplify: $^{+}6 \times {}^{-}2$

$^{+}6 \times {}^{-}2$

$^{-}12$

2.Simplify: $^{-}7 \times {}^{+}2$

$^{-}7x\ {}^{+}2$

$^{-}14$

3.Simplify: $^{-}6 \times {}^{-}2$

$^{-}6 \times {}^{-}2$

$^{+}12$

Activity

1.Simplify: $^{+}9 \times {}^{-}5$

2.Simplify: $^{+}7 \times {}^{+}4$

3.Simplify: $^{+}5 \times {}^{-}2$

4.Simplify: $^{-}6 \times {}^{+}2$

5.Simplify: $^{-}9 \times {}^{-}6$

6.Simplify: $^{+}11 \times {}^{+}4$

7.Simplify: $^{+}8 \times {}^{-}5$

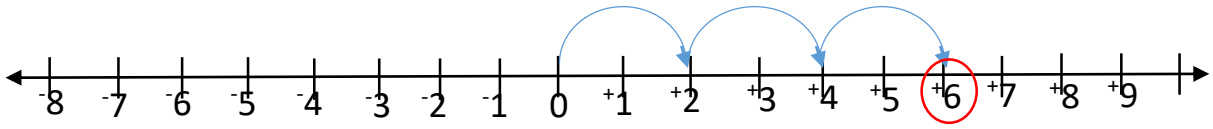
8.Simplify: $^{-}7 \times {}^{+}5$

9.Simplify: $^{-}5 \times {}^{-}3$

Multiplication of integers using a number line

Examples

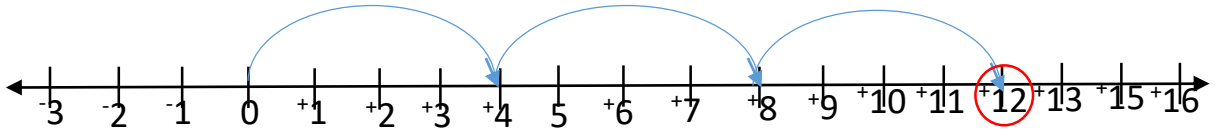
1. Workout: $3 \times {}^{+}2$ using a number line
   (${}^{+}3 \times {}^{+}2$ means three groups of twos)



$3 \times {}^{+}2 = {}^{+}6$

---

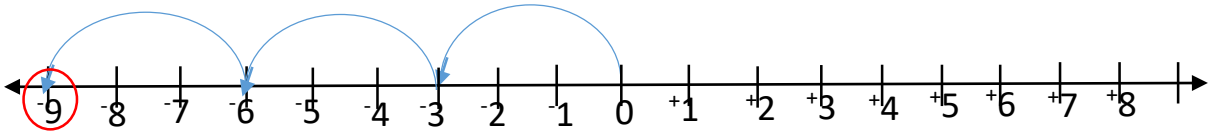
2. Workout: $3 \times {}^{+}4$ using a number line



$3 \times {}^{+}4 = {}^{+}12$

---

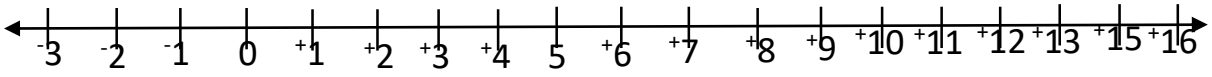
3. Workout: $3 \times {}^{-}3$ using a number line



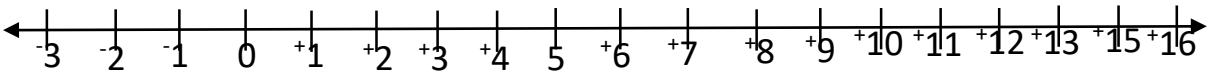
$3 \times {}^{-}3 = {}^{-}9$

Activity

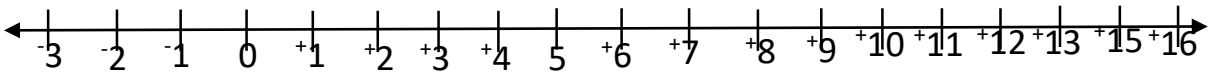
1. Workout: $2 \times {}^{+}3$ using a number line



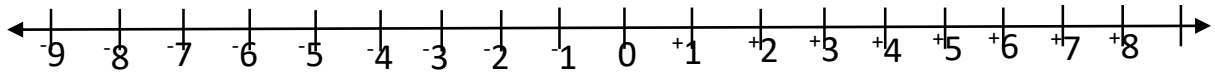
2. Workout: $3 \times {}^{+}3$ using a number line



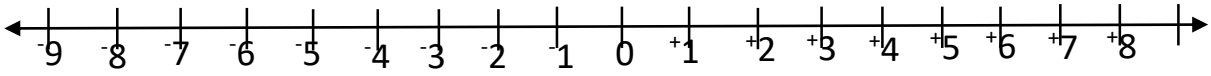
3. Workout: $4 \times {}^{+}2$ using a number line



4.Workout: $3 \times {}^{-}2$ using a number line



5.Workout: $4 \times {}^{-}2$ using a number line



Division of integers without using a number line

Points to note

- + ÷ + = +
- + ÷ − = −
- − ÷ − =+
- − ÷ + =−

Examples

1.Simplify: ${}^{+}6 \div {}^{-}2$

${}^{+}6 \div {}^{-}2$

${}^{-}3$

2.Simplify: ${}^{-}32 \div {}^{+}8$

${}^{-}32 \div {}^{+}8$

${}^{-}4$

3.Simplify: ${}^{-}16 \div {}^{-}4$

${}^{-}16 \div {}^{-}4$

${}^{+}12$

Activity

1.Simplify: ${}^{+}9 \div {}^{-}3$

2.Simplify: ${}^{+}36 \div {}^{+}4$

3.Simplify: ${}^{+}24 \div {}^{-}4$

4.Simplify: ${}^{-}6 \div {}^{+}2$

5.Simplify: ${}^{-}42 \div {}^{-}6$

6.Simplify: ${}^{+}18 \div {}^{+}2$

7.Simplify: ${}^{-}28 \div {}^{-}4$

8.Simplify: ${}^{-}35 \div {}^{+}5$

9.Simplify: ${}^{-}15 \div {}^{-}3$

Application of integers

Terms used and their meanings

- Before----------negative
- After----------positive
- Dropped----------negative
- Rise/Rose----------positive
- Loss----------positive
- Gain----------positive
- Increased----------positive
- Decreased ----------negative
- Lower----------negative

Examples

1.The temperature of a place was 20^0F in the morning and later it dropped by 23^0F. Find the new temperature of the place.

$20^0F - 23^0F = {}^-3^0F$

2.The temperature on the top of a mountain was $^-14^0C$ at might but by morning, it had increased to 10^0C. Find the rise in the temperature.

$= 10^0C - {}^-12^0C$

$= 10^0C - (^-12^0C)$

$= 10^0C + 12^0C$

$= {}^+12^0C$

3.The temperature of a pawpaw dropped by $^-5^0C$. If the new temperature is 15^0C. What was the initial temperature?

Let the initial temperature be h

$h - {}^-5^0C = 15^0C$

$h - (^-5^0C) = 15^0C$

$h + 5^0C - 5^0C = 15^0C - 5^0C$

$h = 10^0C$

Alternatively,

Initial $temp^0$ = New + Drop

Initial $temp^0 = 15^0c + {}^-5^0c$

Initial $temp^0 = 15^0c + (^-5^0c)$

Initial $temp^0 = 15^0c - 5^0c$

Initial $temp^0 = 10^0c$

Activity

1.The temperature of a place was 30^0F in the morning and later it dropped by 33^0F. Find the new temperature of the place.

2.The temperature on the top of a mountain was $^-14^0C$ at might but by morning, it had increased to 10^0C. Find the rise in the temperature.

3.The temperature of a pawpaw dropped by $^-3^0C$. If the new temperature is 12^0C. What was the initial temperature?

4.A girl moved 4metres backwards and 4 more metres backwards. Write the final position of the girl.

5.John climbed 9 steps from his flat upwards and later descended 16 steps to the ground floor. What was John's final position from the flat?

TOPIC: **INTEGERS**

SUBTOPIC: **THE FINITE SYSTEM / CLOCK ARITHEMATIC**

Definition:

- Finite system is a way of counting numerals in a specified group of number numerals.
- Finite system may also be called the modular (mod). In a special way, finite system sticks only on the remainders after grouping and regrouping a certain numeral.

Expressing numbers in finite system

Examples:

1. Express 23 in finite 5

23÷5=4 remainder 3

23= 4(finite5)

2.Express 45 in finite 7

45÷7=6 remainder 3

45= 3(finite7)

Activity

1.Express 24 in finite 3

2.Express 59 in finite 5

3.Express 54 in finite 6

4.Express 46 in finite 5

5.Express 34 in finite 7

6.Express 73 in finite 5

Addition and subtraction of numbers in finite system

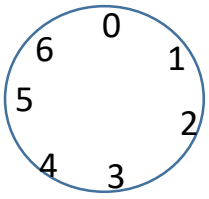
1.Work out: 2 + 5 =------ (finite 7)

(2+5)÷7 (finite 7)

7÷7=1 remainder 0

2 + 5 = 0 (finite 7)

Alternatively, you can use a dial



2. Work out: 3 + 4 = ------ (finite 5)

(3+4)÷5 (finite 5)

7÷5=1 remainder 2

3 + 4 = 2 (finite 7)

3 .Work out: 2 – 4 = -------- (finite 5)

(2 + 5) – 4 = 3 (finite 5)

7 – 4 = 3 (finite 5)

2 – 4 = 3 (finite 5)

4. Work out: 0 – 5 = -------- (mod 7)

(0 + 7) – 5 = 2(mod 7)

7 – 5 = 2 (mod 7)

0 – 5 = 2 (mod 7)

Activity:

1. Work out the following finite systems.

a) 4 + 3 = _____ (Finite 5)

b) 3 + 3 + 2 = _____ (Finite 5)

c) 2 + 2 + 2 = _____ (Finite 3)

d) 4 + 4 + 4 = _____ (finite 7)

e) 6 + 4 + 5 = _____ (Finite 7)

f) 3 + 3 + 3 = _____ (Finite 4)

Complete the table below in finite 5

+	2	3	4
1			
2			1
3		1	
4			3

2. Work out these finite systems.

a) 1 – 4 = _____ (mod 5)

b) 3 – 5 = _____ (mod 7)

c) 4 – 3 = _____ (mod 5)

d) 5 – 2 = _____ (mod 7)

e) 0 – 4 = _____ (finite 7)

f) 2 – 3 = _____ (finite 5)

SUBTOPIC: Multiplication of numbers in finite system

Examples

1) 2 x 3 = ------- (mod 5)

(2x3)÷5 (mod 5)

6÷5=1 remainder 1

2 x 3 = 1 (mod 5)

2) 3×2^2 (finite 5)

3 x 2x 2 (finite 5)

12 (finite 5)

12÷ 5 =2 remainder 2(finite 5)

2 (finite 5)

ACTIVITY:

Multiply:

a) 4 x 5= _____ (finite 7)

b) 2×4^2 = _____(mod 9)

c) 23x3 = _____ (finite 7)

d) 2 x 32 = _____ (finite 6)

f) 4 (5 x 2) = _____ (mod 6)

Complete the table below in finite 5

x	2	4	5
1		4	
2			
3			0
4		1	

Ref: MK Mathematics pupils bk 7 pg 332.

SUBTOPIC: Division of numbers in finite system

1. Workout 2÷3=------(finite 5)

(2+5)÷3=------(finite 5)

(7+5)÷3=------(finite 5)

12÷3=4(finite 5)

=4(finite 5)

2.Workout 5÷3=------(finite 7)

(5+7)÷3=------(finite 7)

12÷3=------(finite 7)

12÷3=4(finite 7)

=4(finite 7)

Activity

1.Workout the following

1. $3 \div 2 = - - - - (finite\ 5)$
2. $3 \div 4 = - - - - (finite\ 5)$
3. $5 \div 4 = - - - - (finite\ 7)$
4. $1 \div 4 = - - - - (mod\ 5)$
5. $3 \div 2 = - - - - (mod\ 7)$
6. $3 \div 5 = - - - - finite\ 12)$

Application of finite 7

Examples

1. If today is Wednesday, what day of the week after 25 days?

Sun	Mon	Tue	Wed	Thur	Fri	Sat
0	1	2	3	4	5	6

3+25=---- (finite 7)

(28÷7)=4 rem 0

Since 0 represents Sunday on the table, the day will be Sunday

---

If today is Friday, what day of the week was it 24 days ago?

Sun	Mon	Tue	Wed	Thurs.	Fri	Sat
0	1	2	3	4	5	6

5-24=---- (finite 7)

(5+7)-24=(finite 7)

(12+7)-24=(finite7)

(19+7)-24=(finite 7)

26-24=2 (finite 7)

Since 2 represents Tuesday on the table, the day was Tuesday

Activity

1.If today is Thursday, what day of the week will it be after 27days?

2.If today is Wednesday, what day of the week will it be after 52days?

3.If yesterday was Friday, what day of the week will it be after 20days from today?

4.If today is Monday, what day of the week was it 38 days ago?

5.If today is Tuesday, what day of the week was it 20 days ago?

6.If today is Friday, what day of the week was it 22 days ago?