P.6 TOPICAL BREAK DOWN

TERM ONE TOPICS

1. Set concepts
2. Whole numbers
3. Operation on whole numbers
4. Number patterns and sequence
5. Fractions

TERM II & III TOPICS

1. Data handling (Graphs and interpretation of information)
2. Money
3. Distance, Speed and Time
   Length, Mass and Capacity
4. Lines, angles and geometrical figures
5. Integers
6. Algebra

TOPICAL ANALYSIS

1. SET CONCEPTS
   <u>Types of sets</u>
   - ✓ Equal sets /un equal sets
   - ✓ Equivalent sets/Non Equivalent sets
   - ✓ Intersection of sets / union sets
   - ✓ Universal sets, Difference of sets, complements
   - ✓ Describing parts of a venn diagram
   - ✓ Application (interpreting set statements, probability)

- ✓ Sub sets
- ✓ Listing and forming subsets
- ✓ Finding number of subsets and proper subsets
- ✓ Application of proper subsets
- ✓ Representing information on the venn diagram

2. <u>Whole numbers (Numeration systems and place values)</u>
   - ✓ Place values and values of numbers
   - ✓ Expanded forms
   - ✓ Writing numbers in figures/in words
   - ✓ Rounding off whole numbers
   - ✓ Roman numerals and Hindu-Arabic numerals
   - ✓ Bases (Grouping in Base five) – place values & values
   - ✓ Naming non decimals to decimals and vice versa

3. <u>OPERATIONS ON WHOLE NUMBERS</u>
   - ✓ Addition/ its application
   - ✓ Subtraction and its application
   - ✓ Multiplication and its application
   - ✓ Division and its application
   - ✓ Mixed operation on whole numbers (BODMAS)

4. <u>NUMBER PATTERNS AND SEQUENCES</u>
   - ✓ Divisibility tests of 2,3 and 5
   - ✓ Number patterns and sequences (developing number pattern) Number systems
   - ✓ Whole numbers, counting numbers, Even, Odd, Triangular, Square, Composite, Cube numbers
   - ✓ Consecutive numbers
   - ✓ Prime factors and its application
   - ✓ Application of L.C.M and G.C.F (bells, number with or without a remainder)
   - ✓ Comparison (product) L.C.M and G.C.F)
   - ✓ Factorizing using powers of whole numbers and its applications
   - ✓ Squares and square roots of numbers
   - ✓ Cubes and cube roots of numbers

- ✓ Magic squares (Revision)

5. <u>FRACTIONS</u>
   - ✓ Definition (meaning of fractions)
   - ✓ Types of fractions (proper/common/vulgar fractions, Improper, Mixed number/fraction, Decimals)
   - ✓ Operations and fractions (BODMAS)
   - ✓ Application fractions
   - ✓ Converting from common fractions to decimals and vice versa
     - Place values and values of decimals
     - Expansion of decimals
   - ✓ Writing decimals in words and figures
   - ✓ Rounding off decimals
   - ✓ Operations on decimals (Reciprocals)

6. <u>Ratios and Proportions</u>

   a) <u>Ratios</u>
      - Forming Ratios (Expressing quantities as Ratios)
      - Expressing fractions as Ratios and vice versa
      - Comparing ratios (Comparison of ratios)
      - Increasing and decreasing quantities using the given Ratios
      - Finding the Ratio of increase or decrease
      - Sharing quantities using ratios
      - Finding shared quantities
      - Application of rations

   b) <u>Proportions</u>
      - Direct proportions
      - Inverse (Indirect) proportion)
      - Constant proportion

   c) <u>Percentages</u>
      - Definition
      - Percentages as fractions and vice-versa
      - Percentages as decimals and vice-versa
      - Expressing ratios as percentages and vice-versa
      - Percentage increase and decrease
      - Percentage profit and loss

- Application of percentages
- Simple interest/amount

<u>TERM II AND III</u>

1. <u>DATA HANDLING</u>
   - ✓ Collection and organization of data
   - ✓ Line graphs
   - ✓ Finding mean; median, mode and Range
   - ✓ Grouped data
   - ✓ Application of mean
   - ✓ Pie charts (circle graphs)
   - ✓ Drawing/constructing pie charts
   - ✓ More about pie charts
   - ✓ Co-ordinate graphs (plotting, drawing, forming shapes and naming shapes)
   - ✓ Bar graphs
   - ✓ Simple statistics
   - ✓ Probability

2. <u>MONEY</u>
   - ✓ Identifying different currencies
   - ✓ Finding number of notes
   - ✓ Local and foreign currencies (Exchange rates)

3. <u>DISTANCE, SPEED & TIME</u>
   - ✓ Conversion of time
   - ✓ Finding duration
   - ✓ Finding Speed, Distance and Time
   - ✓ Conversion of speed
   - ✓ Average speed
   - ✓ Travel graph
   - ✓ Drawing/plotting travel graphs

4. LENGTH, MASS AND CAPACITY

- ✓ Conversion of metric units
- ✓ Perimeter of polygons
- ✓ Difference of areas
- ✓ Comparing areas of shapes
- ✓ Area of combined shapes
- ✓ Circumference of a circle and its sectors
- ✓ Area of a circle and its sectors
- ✓ Total surface area, prisms (cube, cuboid)
- ✓ Volume of cuboids, cubes and cylinders

Capacity

- ✓ Conversion of capacity
- ✓ Finding capacities of different containers (tanks)

5. GEOMETRY
   - ✓ Complementary and supplementary angles
   - ✓ Construction of angles
   - ✓ Bisecting of angles and lines
   - ✓ Constructing of parallel lines
   - ✓ Angles formed on parallel lines
   - ✓ Construction of regular polygons
   - ✓ Pythagoras's Theorem and its application
   - ✓ Properties of prisms and pyramids
   - ✓ Nets of cubes, cuboids and other prisms
   - ✓ Net of pyramids
6. INTEGERS
   - ✓ Plotting integers on Number lines
   - ✓ Addition, subtraction and multiplication of integers on number line
   - ✓ Application of integers
   - ✓ Solution sets
   - ✓ Inequalities
7. ALGEBRA
   - ✓ Algebric expressions and phrases (statements)
   - ✓ Simplification in algebra
   - ✓ Solving simple equations

- ✓ Forming and solving simple equations
- ✓ Substitution
- ✓ Word question statements involving algebra

e) $\begin{array}{r} 2\ \ 3_{four} \\ -\ 2\ \ 2_{four} \\ \hline \\ \hline \end{array}$

f) $\begin{array}{r} 6\ \ 5_{seven} \\ -\ 4\ \ 6_{seven} \\ \hline \\ \hline \end{array}$

g) $464_{eight} - 237_{eight}$

h) $463_{nine} - 155_{nine}$

i) $354_{six} - 245_{six}$

LESSON TWO

CHANGING DECIMAL TO NON DECIMAL BASE

Changing from decimal to non-decimal bases

1. Change 25 to base seven.

Base	No.	Rem
7	25	4
	3	

Therefore: $25 = 34_{seven}$

2. Change 38 to base eight.

Base	No.	Rem
8	38	6
	4	

Therefore: $38 = 46_{eight}$

LESSON THREE
MULTIPLICATION OF BASES
Example:

1. Multiply: $232_{five} \times 3$

1 1 1

6÷5 = 1 rem 1
10÷5 = 2 rem 0
7÷5 = 1 rem 2

For

$$\begin{array}{r} 2\ 3\ 2_{five} \\ \underline{\times\quad 3} \\ \underline{1201_{five}} \end{array}$$

2. Multiply: $214_{four} \times 3$

$$\begin{array}{r} 1\ \ 1\ \ 3\ \ \\ 2\ 1\ 4_{four} \\ \underline{\times\quad 3} \\ \underline{1320_{four}} \end{array}$$

12÷4 = 3 rem 0
6÷4 = 1 rem 2
7÷4 = 1 rem 3

Activity

Multiply the following bases

1. 214_{five} by 3
2. $432_{four} \times 4$
3. $320_{five} \times 4$
4. $354_{six} \times 5$
5. $122_{three} \times 3$
6. $464_{eight} \times 5$

ACTIVITY

1. Change the following to base three.

   a) 19_{ten} b) 31_{ten} c) 26_{ten}

2. Convert the following to base four.

   a) 34_{ten} b) 42_{ten} c) 75_{ten}

3. Change the following to base six.

   a) 31_{ten} b) 46_{ten} c) 94_{ten}

4. Convert the following to base seven.

   a) 96_{ten} b) 68_{ten} c) 536_{ten}

5. Change the following to base eight.

   a) 73_{ten} b) 26_{ten} c) 431_{ten}

LESSON FOUR

CHANGING FROM A NON DECIMAL BASE TEN.

1. Change 234six to base ten.

   2 3 4six

   $(2x6^2) + (3x6^1) + (4x6^0)$
   2x6x6 + 3x6 + 4x1
   72 + 18 + 4
   = $\underline{\underline{94_{ten}}}$

2. Change 41_{five} to base ten

   $\overset{1}{4}\ \overset{0}{5}_{five}$
   $4\ 1_{five}$

   41 five = (4x51) + (1x50)

   = (4x5) + (1x1)

   = 20 + 1

   = 21_{ten}

Change the following to base ten.

a) 23_{four}
b) 131_{four}
c) 55_{eight}
d) 413_{five}
e) 122_{three}
f) 214_{six}
g) 63_{seven}
h) 62_{seven}
i) 1011_{two}
j) 144_{five}

LESSON FIVE

CHANGING FROM NON DECIMAL TO A NON DECIMAL BASE

Examples

1. Change 413five to base two

   2 1 0
   5 5 5
   4 1 3 five

   $(4x5^2) + (1x5^1) + (3x5^0)$

   $4x5x5 + (1x5) + (3x1)$

   $(4x25) + 5 + 3$

   $100 + 8$

   108_{ten}

B	N	R
2	108	0
2	54	0
2	27	1
2	13	1
2	6	1
2	3	1
2	1	1
	0	

1101100

2. Change 43_{five} to base six

   4 3 five
   5 5

   $(4x5^1) + (3x5^0)$

   $4x5 + 3x1$

   $20 + 3$

   Therefore $43_{five} = 35_{six}$

B	N	R
6	23	5
6	3	3
	0	

$= 35_{six}$

ACTIVITY

Change the following as instructed.

a) 413_{five} to base three
b) 101_{two} to base five
c) 203_{five} to base six
d) 144_{five} to base two
e) 341_{six} to base five
f) 1110_{two} to base four

LESSON SIX

THE UNKNOWN BASES

1. If 17y = 15ten, find base y

   17y = 15ten

   $(1xy^1) + (7xy^0) + 15$

   $1xy + 7x1 = 15$

   $y + 7 = 15$

   $y + 7-7 = 15-7$

   $y = 8$

= $\underline{y \text{ is eight}}$

2. If $24_z = 42_{five}$

Find base z

24z	=	42five
$(2xz^1) + (4xz^0)$	=	(4x51) + (2x50)
2xz + 4x1	=	4x5 + 2x1
2z + 4	=	20 + 2
2z + 4	=	22
2z+4 – 4	=	22 - 4
2z	=	18
$\frac{\cancel{2}z}{\cancel{2}}$	=	$\frac{\cancel{18}}{2}$

$\underline{z \quad = \quad 9}$

LESSON SEVEN

Addition of bases in table from

Completion of bases in table form.

Base five

+	1	2	3	4	10
1	2	3	4	10	11
2	3	4	10	11	12
3	4	10	11	12	13
4	10	11	12	13	14
10	11	12	13	14	20

1 + 1 = 2	3 + 4 = 7
1 + 2 = 3	7÷5 = 1 rem 2
1 + 3 = 4	
1 + 4 = 5	4 ÷ 4 = 8
5÷5 = 1 rem 0	8÷5 = 1 rem 3

Activity:

1. Complete the base six additions in the table below.

+	1	2	3	4	5	10
1						
2						
3						
4						
5						
10						

MULTIPLICATION OF BASES IN TABLE FORM

x	1	2	3	4	10
1	1	2	3	4	10
2	2	4	11	13	20
3	3	11	14	22	30
4	4	13	22	31	40
10	10	20	30	40	100

TOPIC: OPERATIONS ON WHOLE NUMBERS

Examples

1. Add

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

2. Add

$$\begin{array}{r} 1\,8\,4\,8\,6\,9\,4 \\ +\,3\,3\,0\,2\,5\,2\,0 \\ \hline 5\,1\,5\,1\,2\,1\,4 \end{array}$$

3. Subtract

$$\begin{array}{r} \overset{4}{\cancel{5}}\,\overset{11}{\cancel{2}}\,\overset{12}{\cancel{3}}\,\overset{13}{3}\,1\,8\,6 \\ -\,1\,3\,4\,5\,1\,0\,2 \\ \hline 3\,8\,8\,8\,0\,8\,4 \end{array}$$

4. Subtract

$$\begin{array}{r} 8\,4\,0\,0\,0\,7 \\ -\ \ \ 3\,4\,6\,5\,2 \\ \hline 8\,0\,5\,3\,5\,5 \end{array}$$

Activity:

Ref. to MK bk 6 pg 55-57

Ref to fountain bk 6 pg 32-34

Solving word problems involving addition and subtraction of whole

Examples

1. Find the sum of 67802 and 14007

Soln

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

2. A diary processed 6500 litres of milk, if 5650 litres of milk of milk were sold, how many litres remained?

$\overset{5}{\cancel{6}}\ \overset{14}{\cancel{5}}\ \overset{10}{\cancel{0}}\ 0$ litres
- 5 6 5 0 litres
8 5 0 litres of milk

Note:
Sum is the result of adding any given numbers.
Difference: Is the result got after subtracting numbers

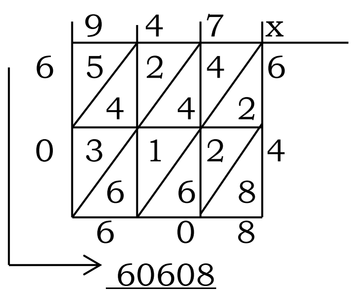
Activity: Ref. to Mk bk6 pg 58-60
Ref. to fountain maths bk6 pg 32-34

3. Multiplication of whole numbers

Examples

1. Multiply 3 2 4
x 1 8

2. Multiply 465 by 472
3. Use lattice method of multiplication to work out
9 4 7
x 6 5



Activity
Ref. to Mk bk6 pg 59-60
Ref. to fountain bk6 pg 35-36

Division of whole numbers using long division
Examples
1. Divide

```
      152
   ┌─────
   │ 1976
13 │-13↓
   │  67
   - 65 ↓
      26
    - 26
     - -
```

Activity:

Ref to Mk bk6 pg 62

Ref to fountain bk6 pg 37

Solving word problems involving division

Examples

1. A petrol station manager bought 22,000 litres of petrol. If she put equal amount of oil in 440 drums. How many litres of oil were in each drum?

   Soln:

   22,000 ÷ 440 = 50

```
              50
       440 │ 22000
     5x440 │ 2200↓
                0
 0x440       -  0
                -
```

   There were 50 litres of oil in each drum.

Activity:

Ref to Mk bk6 pg 62-63

Mixed operations (BODMAS)

Examples

1. Simplify 3x4+5
2. Workout 5-2+6
3. Work out 3+9÷3-1
4. Workout 4x7+9x3

Activity:

Ref to Mk bk6 pg 61

Ref to fountain bk6 pg 38-39

TOPIC: **<u>PATTERNS AND SEQ</u>**

LESSON I

Sub topic: Divisibility tests

Content: Divisibility tests of 2, 3 and 5

Examples

(a) **By 2**

A number is divisible by 2 when it is an even number e.g 2, 4, 6, 8, 10, 12, 14

b) **By 3**

A number is divisible by 3 when the sum of its digits are a multiple of 3 e.g. 612

= 6+1+2

= $9 \div 3 = 3$

Therefore 612 is divisible by 3

c) **By 5**

A number is divisible by 5 when the last digit is either 0 or 5. e.g 10, 15, 20, 770, 405 etc

Activity

Mk new edition pg 34-36

Fountain pg 41-42

Understanding pg 60-61

LESSON II

Sub topic: <u>Developing number patterns</u>

Content: Odd numbers, even numbers, Triangular numbers, Square, numbers, cube numbers, composite numbers, counting numbers, whole numbers

Examples

i) List down the following
   a) Counting numbers/natural numbers less than 15
   b) Whole numbers lessthan 10
   c) Even numbers between 10 and 20
   d) Odd numbers lessthan 20
   e) Triangular numbers lessthan 36
   f) Square numbers lessthan 49

NB:

- Triangular numbers are obtained by adding consecutive counting numbers.
- Square numbers are obtained by adding the consecutive odd numbers starting with one as the first square number

Or by squaring natural numbers

Activity:
Fountain pg 43-48
Mk new edition pg 37
Understanding pg 62-65

LESSON III
Subtopic: Prime numbers and composite
Content: - List prime numbers
- List composite numbers

Examples

1. What is the sum of the 3rd and the 7th prime numbers?
2, 3, 7, 11, 13, 17, 19, 23
sum = 5 + 17
= 22

2. Workout the sum of the first five composite numbers.
4, 6, 8, 9, 10, 12, 14, 15
sum = 4+6+8+9+10
= 37

Activity: New Mk bk6

LESSON IV
Subtopic: Consecutive counting numbers, odd and even numbers
Content: Finding consecutive counting, odd and even numbers
Examples:
The sum of 3 consecutive whole numbers is 36. What are these numbers?
Let the 1st number be n.
2nd number n+1
3rd number n+2

$n+n+1+n+2 = 36$
$3n + 3 = 36$
$3n + 3 - 3 = 36$
$\frac{\cancel{3}n}{\cancel{3}} = \frac{\cancel{33}^{11}}{\cancel{3}}$
$\underline{n = 11}$

1st number = n

2nd number = n+1
= n+1
= 12

3rd number = n+2
= 11+2
= 13

Even and odd numbers increase in intervals of 2
The sum of three consecutive even numbers is 24.
List down the 3 numbers.

Let the 1^{st} number be x

2^{nd} number $x+2$

3^{rd} number $x+4$

$x+x+2+x4 = 24$

$3x+6 = 24$

$3x+6-6 = 24$

$3x = 24-6$

$\frac{\cancel{3}x}{\cancel{3}} = \frac{\cancel{18}}{\cancel{3}}$

$\underline{x = 6}$

1^{st} number = x

= 6

2^{nd} number = x+2

= 6+2

= 8

3^{rd} number = x+4

= 6+4

= $\underline{10}$

Activity:
Mk old edition pg 77-78
Mk new edition 43

LESSON V

Subtopic: Prime factorization

Content: Methods used in prime factorization

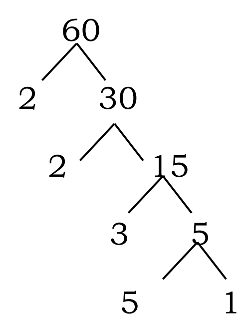
- Multiplication, Subscript method/set notation
- Powers of ten/exponents

Examples

a) Find the prime factors of 60

2	60	= 2x2x3x5 (multiplication)
2	30	
3	15	= $2^2 x 3^1 x 5^1$ (powers/exponents)
5	1	= $2_1, 2_2, 3_1, 5_1$ (subscript form)

b)



Activity:
Mk old edition pg 82

LESSON VI

Content:
- Finding prime factorized number
- Finding the missing prime factors

Examples:

i) What number has been prime factorized

ii) Prime factorise and find missing factors

The prime factorization of 30 is 2xyx5, find y

$2xyx5_1 = 30$

$\cancel{10}y = \cancel{30}$

$\cancel{10}$ $\quad$ $\cancel{10}$

$\underline{y = 3_1}$

If 144 = a^4 x b^2 find "a" and "b"

2	144
2	72
2	36
2	18
3	9
3	3
	1

= 2^4 x 3^2

= a^4 x b^2

÷ a = 2

b = 3

Given that 2^{2x} x 2 = 32 find the value of x

$2^{2x} \text{x} 2 = 2^5$

2x+1 = 5

2x+1-1 = 5-1

2x = 4

2 $\quad$ 2

$\underline{x = 2}$

2	32
2	16
2	8
2	4
2	1

Activity:

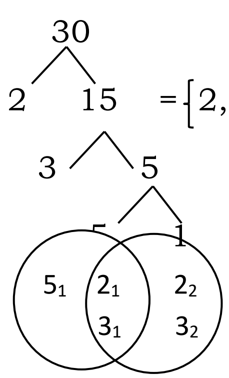
Mk old edition pg 83

LESSON VII

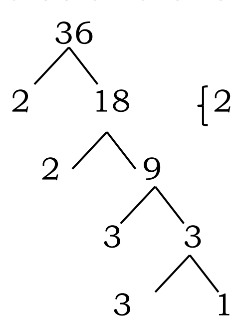
Content: Finding L.C.M and G.C.F using venn diagram

Examples

Show the prime factors of 30 and 36 on the venn diagram



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



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

GCF = F30 ∩ F36

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

= $\underline{6}$

L.C.M = F30 U F36

= $\{2_1, 2_2, 3_1, 3_2, 5_1\}$

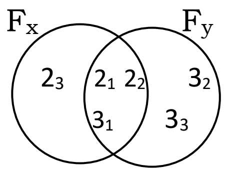
= 2X2X3X3X5

= 12X3X5

= $\underline{180}$

Activity
Mk old edition pg 86-87

LESSON VIII
Subtopic: Unknown values/prime factors
Content: 1) Find the missing numbers
2) Find the unknown factors
3) Workout the H.C.F and L.C.M
Example:
Find x and y

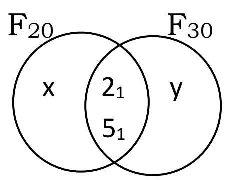


$F_x = \{2_1, 2_2, 2_3, 3_1\}$
$= 2x2x2x3$
$= \underline{24}$
$F_y = \{2_1, 2_2, 3_1, 3_2, 3_3\}$
$= 2x2x3x3x3$
$= \underline{108}$

G.C.F = $F_x \cap F_y$
$= \{2_1, 2_2, 3_1\}$
$=$ 2X2X3
$=$ 12

L.C.M $= \{2_1, 2_2, 2_3, 3_1, 3_2, 3_3\}$
$= 2x2x2x3x3x3$
$= 216$

Find the unknowns



i) $\{2_1, 5_1\ x\} = F_{20}$
$= x+2x5 = 20$
$\frac{\cancel{10}x}{\cancel{10}} = \frac{\cancel{20}\ 2}{\cancel{10}\ 1}$
$\underline{X = 2_2}$

ii) = 21, 51, y = F30
= 2x5xy = 30
$= \frac{\cancel{10}y}{\cancel{10}} = \frac{\cancel{30}}{\cancel{10}}$
$\underline{y = 3_1}$

Activity:
Mk old edition pg 88-89

LESSON IX
Sub-topic: <u>Application of G.C.F/L.C.M</u>
Content: - Relationship between G.C.F and L.C.M
- Other problem related to H.C.F/G.C.F

Examples

1. The LCM of two numbers is 144 their GCF is 12 and one of these numbers is 48. Find the other number.

   Solution

   $$2^{nd}\text{ no.} = \frac{\text{LCM x GCF}}{1^{st}\text{ no.}}$$

   $$= \frac{\overset{36}{\cancel{144}} \times \cancel{12}^{1}}{\underset{\cancel{4}_{1}}{\cancel{48}}}$$

   What is the largest possible divisor of 24 and 36?

2	24	36
2	12	18
2	6	9
3	3	9
3	1	3
	1	1

= 2x2x3

= <u>12</u>

Activity

- Oxford primary MTC bk6 pg 34-41

LESSON X

Subtopic: <u>Application of LCM</u>

Content: Find the smallest number which when divided by 9 and 12 leaves

a) no remainder?

b) Remainder of 1?

c) Remainder of 5?

2	9	12
2	9	6
3	9	3
3	3	1
	1	1

<u>Solution</u>

a) = 2x2x3x3

= <u>36</u>

b) (2x2x3x3)+1

36+1

<u>37</u>

c) (2x2x3x3)+5

36+5

<u>41</u>

ii) Kelvin has an article of 40cm and his father has a stride of 60cm. What is the width of the narrowest path and they both cross in a whole number of strides.

$M_{40} = \{40, 80, 120, 160 \ldots\}$

$M_{60} = \{60, 120, 180, \ldots\}$

L.C.M = 120

Therefore: The width is 120cm

Activity:

Oxford primary MTC pupils bk 6 pg 34-36

LESSON XI

Subtopic: Working with powers of whole number

Content:
- Find a number from powers
- Express numbers as a product of powers of a given numbers
- Operation on powers

Example i) What is 7^3

$= 7 \times 7 \times 7$

$= 343$

ii) Express 64 using powers of 4.

4	64
4	16
4	4
	1

Therefore $64 = 4 \times 4 \times 4$

$= 4^3$

Activity

A new Mk pupils bk 6 pg 86 and 85

LESSON XII

Subtopic = Square numbers and square roots

- Square of :-

a) Whole numbers
b) Fractions
c) Mixed fractions
d) Decimals

Example

1. What is the square of 12?

$12^2 = 12 \times 12$

$= 144$

2. Workout the square of ¾

$(\frac{3}{4})^2 = \frac{3}{4} \times \frac{3}{4}$

$= \frac{9}{16}$

3. What is the square of 0.6?

   $(0.6)^2 = \frac{0.6}{10} \times \frac{6}{10} \;/\; \frac{36}{100} = 0.36$

4. Find the square root of?

   a) 144

$\sqrt{144}$

$\sqrt{144 = 2x2x3}$

$\sqrt{144 = 12}$

2	2	144
	2	72
2	2	36
	2	18
3	3	9
	3	3
		1

b) $\sqrt{\frac{9}{16}}$

3	9
3	3
	1

$\sqrt{\frac{9}{16}} = \frac{3}{2x2}$

$\sqrt{\frac{9}{16}} = \frac{3}{4}$

2	2	16
	2	8
2	2	4
	2	2
		1

Activity

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LESSON XIII

Subtopic : Cubes and cube roots

Content: Finding cube numbers and cube roots

Examples

1. What are the cubes of the following

   a) $2 = 2^3$

   $= 2x2x2$

   $= 8$

   b) $\underline{2} = (\underline{2})^3$

3   3

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

$= \frac{8}{27}$

Find the cube root of 8.

$$\begin{array}{r|r} 2 & 8 \\ \hline 2 & 4 \\ 2 & 2 \\ & 1 \end{array}$$

$$\sqrt[3]{8} = \sqrt[3]{(2x2x2)}$$

$$\sqrt[3]{8} = \sqrt[\cancel{3}]{2^{\cancel{3}}}$$

$$\sqrt[3]{8} = 2$$

Activity

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THEME: **NUMERACY**

TOPIC: **FRACTIONS**

Review on addition and subtraction of fractions.

Examples

1. Add: $^3/_5 + ^1/_3$

   Solution

   $^3/_5 + ^1/_3 = \frac{(3 \times 3) + (5 \times 1)}{15}$

   $= \frac{9 + 5}{15}$

   $= \frac{14}{15}$

2. Subtract $^5/_7 - ^1/_4$

   Solution

$^{5}/_{7} - {}^{1}/_{4} = \frac{(4 \times 5) - (7 \times 1)}{28}$

$= \frac{20 - 7}{28}$

$= \frac{13}{28}$

Activity 1:1

1. Add the following
   a) ¾ + ½   b) $^{1}/_{3} + {}^{1}/_{5}$ c) $^{2}/_{3} + {}^{3}/_{5}$

   d) 1 ½ + 2 ¼   e) $3\ {}^{1}/_{5} + {}^{1}/_{3}$

2. A boy was given $^{5}/_{12}$ of the bread in the morning and ½ of the remainder in the evening. What fraction of the bread did he get altogether?
3. Mugisha divided his land as follows:

   ¼ occupied by cows $^{1}/_{3}$ occupied by crops and $^{1}/_{8}$ is occupied by goats while the rest of the land is occupied by cash crops.

   Find the piece of land occupied by animals.

Activity 1:2

1. Subtract the following:
   a) ½ - $^{1}/_{3}$ b) ¼ – $^{1}/_{6}$ c) $^{1}/_{3} - {}^{1}/_{5}$ d) $^{5}/_{7} - {}^{2}/_{5}$

2. Natasha had $^{7}/_{10}$ of the bread. She gave out $^{2}/_{5}$, what fraction of the bread remained?

3. I ate ¾ of the chapatti, what fraction of the chapatti remained?
4. The teacher instructed pupils to read $^{4}/_{20}$ pages of the book. What fraction of pages remained un-read?
5. A bus covered $^{7}/_{15}$ of the journey before breaking down. Find the part of the journey it had remained with.

Multiplication of fractions:

Finding reciprocal:

Reciprocal is also known as multiplicative inverse. This is because, a number multiplied by its reciprocal, the result is 1.

Example 1

Find the reciprocal of 3.
Number x reciprocal = 1
3 x reciprocal = 1
$\frac{3 \times r}{3} = \frac{1}{3}$
∴ Reciprocal of 3 = $^1/_3$

Example 2

Find the reciprocal of 2/5
Number x Recip = 1
$^2/_5$ x Recip =1
$5 \times \frac{2}{5} \times R = 1 \times 5$ $\frac{2 \times R}{2} = \frac{5}{2}$
∴ Recip of $^2/_5 = {^5/_2}$

Activity 1:3

Find the reciprocal or multiplicative inverse of the following:

a) $^3/_3$	d) 10	g) 2 ½	j) 0.2
b) ¼	e) 5	h) 1 $^1/_3$	k) 4.5
c) $^4/_5$	f) 4	i) 3 ¼	l) 3.2

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Multiplying fractions

It should be noted that, it is only in multiplication of fractions where L.C.M is not applied.

Examples;

1. $\frac{2}{3} \times \frac{1}{4}$

   $= \frac{2 \times 1}{3 \times 4}$

   $= \frac{2}{12}$ (by reducing)

   $\frac{1}{6}$

2. $1\frac{1}{2} \times \frac{1}{3}$

   $\frac{3}{2} \times \frac{1}{3}$

   $\frac{3 \times 1}{2 \times 3}$

   $\frac{3}{6}$ (by reducing)

   $= \frac{1}{2}$

Activity 1:4

Simplify the following.

1. $\frac{1}{3} \times \frac{1}{2}$
2. $\frac{1}{3} \times \frac{1}{4}$
3. $\frac{2}{3} \times \frac{1}{4}$
4. $\frac{2}{5} \times \frac{3}{4}$
5. $\frac{3}{8} \times \frac{1}{3}$
6. $\frac{1}{10} \times \frac{2}{5}$
7. $\frac{2}{9} \times \frac{4}{10}$
8. $\frac{3}{7} \times \frac{4}{8}$
9. $\frac{3}{8} \times \frac{4}{5}$

Simplify:

a) $1\frac{1}{5} \times \frac{1}{3}$

b) $1\frac{1}{4} \times \frac{1}{5}$

c) $2\,\underline{1} \times \underline{1}$

d) $2\frac{1}{10} \times \frac{3}{9}$

e) $4\frac{1}{2} \times \frac{4}{9}$

f) $9\,\underline{1} \times 10\,\underline{1}$

3   14   7   5

Division of fractions:

Division is always done in two ways;

i) Use of reciprocal
ii) Use of L.C.M

Examples;

1. Workout

$8 \div 2$

$\frac{8}{1} \times \frac{1}{2}$

$\frac{8 \times 1}{1 \times 2}$

$\frac{8}{2}$

$= 4$

2. Simplify

$\frac{2}{3} \div 2$

$\frac{2}{3} \div \frac{2}{1}$

$\frac{2}{3} \times \frac{1}{2}$

$\frac{2}{6}$

$= \frac{1}{3}$

3. Divide

$\frac{1}{4} \div \frac{2}{3}$ (len =12)

$^{3}\cancel{12} \times \frac{1}{4} \div \frac{2}{3} \times \cancel{12}^{4}$

$(3 \times 1) \div (2 \times 4)$

$3 \div 8$

$\frac{3}{8}$

4. How many small bottles of ¼ litre can be obtained from a 20litre jerrican

Soln

we divide 20 ÷ ¼

$20 \div \frac{1}{4}$

$20 \times \frac{4}{1}$

80 quarter litre bottle

Activity 1:5

1. Workout the following.

   a) $20 \div 4$ b) $\frac{3}{10} \div 6$ c) $\frac{1}{4} \div \frac{2}{3}$ d) $9\frac{1}{5} \div \frac{2}{10}$

2. Simplify

   a) $\frac{2}{3} \div \frac{1}{12}$ b) $\frac{4}{9} \div 3\frac{3}{4}$ c) $\frac{5}{9} \div 3\frac{1}{3}$

3. Divide the following

   a) $\frac{3}{4} \div 7/8$ b) $\frac{2}{3} \div \frac{7}{9}$ c) $2\frac{4}{5} \div 1\frac{1}{3}$ d) $\frac{8}{9} \div \frac{2}{3}$

Activity 1:6

1. How many ½ liter cups of water can be got from a 5 litre container?
2. How many small spoons of 1 ½ ltr can be obtained from 2 ¼ ml?
3. By what fraction can 6 ½ be divided to get 2 ½?
4. How many pieces of ¾ m of cloth can be cut from a long piece of 9m?
5. A bag contains 5 ¼ kg of posho. How many ¼ kg packets can be got from the bag?

Mixed operations of fractions:

Examples;

$\frac{2}{3} \times \frac{4}{9} \div \frac{1}{3}$

$\frac{2}{3} \times \frac{4}{9} \times \frac{3}{1}$

$\frac{2 \times 4 \times 1}{3 \times 3 \times 1}$

$\frac{8}{9}$

$\frac{1}{3} \times \frac{1}{4} + \frac{1}{2}$

Using Bodmas,
Multiplication comes first.

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

$\frac{1 \times 1}{12} + \frac{1}{2}$

$1/12 + \frac{1}{2}$

$\frac{(1 \times 1) + (6 \times 1)}{12}$

$\frac{1 + 6}{12}$

$\frac{7}{12}$

Activity 1:7

Workout the following:

$\frac{1}{2} \times \frac{3}{5} \div \frac{3}{4}$	$1\frac{2}{3} \times 3\frac{1}{2} \div \frac{1}{5}$	$\frac{5}{6} \div (\frac{5}{4}$ of $3)$
$\frac{4}{9} \times \frac{2}{3} \div \frac{1}{3}$	$(\frac{1}{3} \times \frac{1}{4}) + \frac{1}{2}$	$\frac{1}{3} \times \frac{1}{8} + \frac{1}{4} \div \frac{1}{7}$
$\frac{3}{8} \times \frac{1}{9} \div \frac{2}{3}$	$\frac{3}{4} \times \frac{2}{3} - \frac{1}{2}$	$\frac{1}{3} + \frac{1}{2}$ of $\frac{1}{7} \times \frac{1}{5}$

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Converting fractions to decimals

Rational fractions

Examples;

Convert $\frac{2}{5}$ to a decimal

$$\frac{2}{5} = 5\overline{\smash{)}\,2\,}\quad \begin{array}{r} 0.4 \\ -\underline{0} \\ 20 \\ -\underline{20} \\ \bullet\bullet \end{array}$$

$\frac{2}{5} = 0.4$

Change ¼ to a decimal

$$\frac{1}{4} = 4\overline{\smash{)}\,1\,}\quad \begin{array}{r} 0.25 \\ -\underline{0} \\ 10 \\ -\underline{8} \\ 20 \\ -\underline{20} \\ \bullet\bullet \end{array}$$

$\frac{1}{4} = 0.25$

Activity 1:8

Convert the following fractions to decimals.

a) $\frac{1}{2}$ b) $\frac{1}{5}$ c) $\frac{4}{5}$ d) $\frac{2}{8}$

e) ¼ f) $^{2}/_{5}$ g) $^{3}/_{5}$ h) ¾

Operation on decimals

Addition and subtraction

Addition and subtraction is done after arranging digits vertically in their correct place values.

Examples:

a) Add: 0.23 + 2.3

Soln

$$\begin{array}{r} 2.3 \\ +\ 0.23 \\ \hline 2.53 \\ \hline \end{array}$$

b) Subtract: 7 – 0.34

Soln

$$\begin{array}{r} 7.00 \\ -\ 0.34 \\ \hline 6.66 \\ \hline \end{array}$$

Activity 1:9

1. Add the following.
   a) 8 . 24 + 0 . 16
   b) 0 . 25 + 2.5
   c) 8 + 2.3 + 1 .54
   d) 0 . 11 + 1.1 + 11
   e) 17.04 + 1.3

2. Subtract the following.
   a) 8 – 0. 94
   b) 7 . 00 – 2 . 34
   c) 0 . 23 – 0 . 13
   d) 2 . 5 – 0 . 25
   e) 48.6 – 0.057

Activity 1 :10

Simplify the following.

a) 1.64 + 5 – 4.42
b) 9 – (2.31 + 1.69)
c) 2.71 – 1.88 + 7.24
d) 3.82 – 7.34 + 9.68
e) 2.78 – 6.06 + 10.77

Multiplication of decimals

Note: The product of decimals must reflect the number of decimal places in the question.

a) 0 . 4 x 0 . 3

$$
\begin{array}{r}
0.4 \\
\times\ 0.3 \\
\hline
1.2 \\
+\ 0\ 0 \\
\hline
0.12
\end{array}
$$

= 0.12

OR 0 . 4 x 0 . 3

$\frac{4}{10} \times \frac{3}{10}$

$= \frac{12}{100}$

= 0.12

Activity 1 : 11

Work out the following.

a) 0 . 17 x 0.3 b) 9.6 x 0.2

c) 0.36 x 0.4 d) 7.5 x 0.5

e) 1.2 x 0.5 f) 4.5 x 3.2

g) 3.21 x 0.4 h) 0.45 x 0.12

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Division of decimals

(Decimals by whole numbers and whole numbers by decimals)

Examples:

a) Divide: 8 ÷ 0.2

$\frac{8}{1} \div \frac{2}{10}$

$\frac{{}^{4}\cancel{8}}{1} \times \frac{10}{\cancel{2}_{1}}$

4 x 10

= 40

b) Work out: 0.32 ÷ 8

$\frac{32}{100} \div \frac{8}{1}$

$\frac{{}^{4}\cancel{32}}{100} \times \frac{1}{\cancel{8}_{1}}$

$\frac{4 \times 1}{\mathbf{100}}$

= $^{4}/_{100}$

= 0.04

Activity 1:12

Work out the following.

a) 10 ÷ 0.2 b) 0.24 ÷ 8 c) 5.6 ÷ 0.07

d) 56 ÷ 0.7 e) 0.3 ÷ 9 f) 8.1 ÷ 0.027

g) 27 ÷ 0.3 h) 1.2 ÷ 48 i) 9.6 ÷ 0.08

j) 36 ÷ 0.12 k) 0.06 ÷ 36 l) 1.44 ÷ 0.12

m) 55 ÷ 0.11 n) 1.2 ÷ 0.6 o) 19.6 ÷ 0.07

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Division and multiplication

Examples:

a) Simplify: $\frac{0.24 \times 0.2}{0.08}$

Soln

$\frac{0.24 \times 0.2}{0.08}$

$^{24}/_{100} \times {}^{2}/_{10} \div {}^{8}/_{100}$

$^{24}/_{100} \times {}^{2}/_{10} \times {}^{100}/_{8}$

$\frac{24 \times 2}{10}$

$\frac{3 \times 2}{10}$

= 0.6

b) Work out: $\frac{1.44 \times 3.6}{0.12 \times 0.4}$

Soln

$\frac{1.44 \times 3.6}{0.12 \times 0.4}$

$\frac{1.44 \times 3.6 \times 1000}{0.12 \times 0.4 \times 1000}$

$\frac{144 \times 36}{12 \times 4}$

12×9

= 108

Activity 1:13

Work out the following.

a) $\frac{0.9 \times 0.8}{0.3}$

b) $\frac{0.72 \times 0.2}{0.036}$

c) $\frac{0.09 \times 0.6}{0.18}$

d) $\frac{0.72 \times 0.96}{0.014}$

e) $\frac{0.36 \times 0.4}{0.018}$

f) $\frac{4.5 \times 1.6}{4.8 \times 1.5}$

g) $\frac{9.6 \times 1.25}{4.8 \times 0.5}$

h) $\frac{2.4 \times 0.54}{0.36}$

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Rounding off decimals

To round off is to estimate a number to the nearest value.

Note: In rounding off decimals, the decimal digits cancelled are not replaces with zeros.

Examples:

a) Round off 5.72 to the nearest whole number.

$$\begin{array}{cccc} & O & Tth & Hth \\ & 5 & . \cancel{7} & \cancel{2} \\ + & 1 & & \\ \hline & 6 & . & \end{array}$$

Therefore; 5.72 ≈ 6

b) Round off 29 . 97 to the nearest tenths.

$$\begin{array}{ccccc} & T & O & Tth & Hth \\ & 2 & 9 & .\ 9 & \cancel{7} \\ + & & & 1 & \\ \hline & 3 & 0 & .\ 0 & \end{array}$$

Therefore; 29.97 = 30.0

Zero after the decimal point represents the tenths place value required.

Activity 1:14

1. Round off the following to the nearest tenths.

a) 1.32	b) 6.85	c) 2.41
d) 7.96	e) 3.93	f) 5.49
g) 8.54	h) 8.985	

2. Round off to the nearest hundredths.

a) 12.623	b) 20.841	c) 6.829
d) 8.728	e) 7.936	f) 0.483
g) 12.998	h) 3.452	

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3. Round off the following to the nearest whole number,

a) 36.7	b) 0.736	c) 9.39
d) 6.94	e) 142.83	f) 11.52
g) 68.77	h) 68.259	i) 4.930

Square and square root of fractions and decimals

Square and square roots of fractions.

Examples:

1. Find the square of;

a) $^2/_9$

Square of $^2/_9$

$= {}^2/_9 \times {}^2/_9$

$\mathbf{= {}^4/_{81}}$

b) $1\,^1/_5$

$^6/_5$

square $= {}^6/_5 \times {}^6/_5$

$\mathbf{= {}^{36}/_{25}}$

2. Find the square root of $^1/_9$

$\sqrt{^1/_9}$

$= \sqrt{\frac{1 \times 1}{3 \times 3}}$

$\mathbf{= \frac{1}{3}}$

b) $\sqrt{^{36}/_{81}}$

$= \frac{\sqrt{36}}{\sqrt{81}}$

$= \frac{6}{9}$

3	81
3	27
3	9
3	3
	1

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

3×3

$\underline{9}$

2	36
2	18
3	9
3	3
	1

$\cancel{2} \times 2 \times \cancel{3} \times 3$

2×3

$\underline{6}$

Activity 1:15

1. Find the square of the following.

a) $^1/_6$ b) ¾ c) $^3/_8$ d) 1 ½

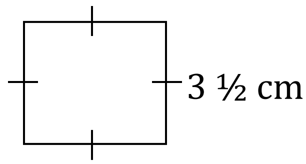
e) ½ f) 4 ½ g) $^2/_3$ h) $^4/_5$

i) $^1/_5$ j) $1\,^2/_3$ k) $3\,^2/_3$ l) $5\,^2/_3$

2. Find the square root of the following.

a) $\frac{1}{4}$	b) $\frac{9}{16}$	c) $\frac{4}{25}$	d) $6\frac{1}{4}$
e) $7\frac{1}{9}$	f) $5\frac{1}{16}$	g) $\frac{4}{9}$	h) $\frac{9}{25}$
i) $\frac{36}{49}$	j) $1\frac{9}{16}$	k) $1\frac{11}{25}$	l) $5\frac{4}{9}$

3. Find the area of the figure.



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4. Find the area if a square land whose side is $4\frac{1}{4}$ km.
5. The area of a square is $144cm^2$. Find one side of that square.
6. A square land has an area of $3\frac{6}{25}$ m^2. How long is one side of that land?

Square and square roots of decimals

Examples

1. Find the square of 0.3

Soln

Sq. of 0.3 = $(0.3)^2$

$= 0.3 \times 0.3$

$= \frac{3}{10} \times \frac{3}{10}$

$= \frac{9}{100}$

= 0.09

2. Find the square root of 0.25

Soln

$\sqrt{0.25} = \sqrt{\frac{25}{100}}$

$\frac{\sqrt{25}}{100}$

$= \frac{5}{10}$

= 0.5

Activity 1 :16

1. Find the square of the following.

a) 01	b) 1.10	c) 0.18	d) 0.72
e) 0.5	f) 0.12	g) 0.34	h) 1.2
i) 0.7	j) 0.16	k) 0.42	l) 2.5

2. Calculate the square root of the following.

a) 0.09	b) 0.81	c) 2.25	d) 0.0025
e) 0.49	f) 1.44	g) 0.04	h) 0.0064
i) 0.64	j) 3.24	k) 0.0016	l) 0.0169

Converting fractions to recurring decimals

Note: Fractions are easily changed to decimals by use of long division.

Examples:

1. Change $^5/_9$ to a decimal.

   Soln:

$$\begin{array}{r|l} & \;\;0.55 \\ \hline 9 & 5 \\ & \underline{-\,0} \\ & \;50 \\ & \underline{-\,45} \\ & \;\;\;50 \\ & \;\;\underline{-\,45} \\ & \;\;\;\;\;5 \end{array}$$

Therefore; $^5/_9$ = 0.55 ...

2. Convert $^{1}/_{6}$ to a decimal

$$\begin{array}{r|l} & 0.166 \\ \hline 6 & 1 \\ & \underline{-0} \\ & 10 \\ & \underline{-6} \\ & 40 \\ & \underline{-36} \\ & 40 \\ & \underline{-36} \\ & 4 \end{array}$$

Therefore $\frac{\mathbf{1}}{\mathbf{6}}$ = 0.166 ….

Activity 1:17

Express each of the following fractions as a decimal.

a) $^{1}/_{3}$	b) $^{3}/_{11}$	c) $^{4}/_{11}$	d) $^{5}/_{7}$
e) $^{2}/_{3}$	f) $^{2}/_{9}$	g) $^{1}/_{11}$	h) $^{1}/_{7}$
i) $^{1}/_{9}$	j) $^{5}/_{11}$		

<u>Converting recurring decimals to fractions</u>

<u>**Note:**</u>

- Recurring decimals are of two types.
- Pure recurring decimals whose digits all repeat. E.g:0.22…
- Mixed recurring decimals whose digits don't all repeat. E.g: 0.122…

Examples:

a) 0.77…

Let p be the fraction be p

$p = 0.77\ldots$

$10p = 7.7\ldots$

We subtract

$10p = 7.7$

$- p = 0.7$

$9p = 7.0$

$\frac{\cancel{9}p}{\cancel{9}} = \frac{7}{9}$

$\mathbf{p = {}^{7}/_{9}}$

b) 0.1515…

Let the fraction be y

$y = 0.1515\ldots$

$10y = 1.515\ldots$

$100y = 15.15$

$100y = 15.\cancel{15}$

$- y = 0.\cancel{15}$

$99y = 15$

$\frac{\cancel{99}y}{\cancel{99}} = \frac{15}{99}$

$\mathbf{y = {}^{5}/_{33}}$

c) 0.233…

Let the fraction

$x = 0.233\ldots$ ___1

$10x = 2.33\ldots$ ___2

$100x = 23.3\ldots$ ___$\cancel{3}$

$100x = 23.\cancel{3}$

$- 10x \quad 2.3$

$90x = 21$

$\frac{\cancel{90}x}{\cancel{90}} = \frac{\cancel{21}^{7}}{\cancel{90}_{30}}$

$\mathbf{x = {}^{7}/_{30}}$

Activity 1:18

Convert the following fractions as common fractions

a) 0.33… b) 0.1212… c) 0.7272…

d) 0.153153… e) 0.55… f) 0.2424…

g) 0.3636… h) 0.133… i) 0.255…

j) 0.66… i) 0.1010… j) 0.123123…

k) 0.255… l) 0.11… m) 0.2121…

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Application of fractions

Examples:

1. ¾ of my father's age is 36 years. How old is my father?

Let the father's age be y

¾ of y = 36 yrs

¾ x y = 36yrs

$4 \times \frac{3y}{4} = 36 \text{ yrs} \times 4$

$\frac{\cancel{3}y}{\cancel{3}y} = \frac{^{12}\cancel{36} \text{ yrs} \times 4}{3}$

$y = 12\text{yrs} \times 4$

$y = 48$yrs

<u>Therefore father's age is 48years</u>

2. $^1/_3$ of my age is equal to ½ of John's age. If John is 24 yrs old. How old am I?

   Let my age be m.

   $^1/3$ of m = ½ of 24

   $^1/_3 m = (\cancel{½} \times 2\cancel{4})$

   $^1/_3 m = 12$

   $\cancel{3} \times {}^1/_{\cancel{3}} m = 12 \times 3$

   $m = 12 \times 3$

   <u>m = 36yrs</u>

3. On Kahima's farm, ½ of the animals are cows, $^1/_3$ of the remaining animals are goats. If the rest 12 animals are pigs, how many animals are on the farm?

   <u>Soln</u>

   Whole farm = 1

   Cows = ½

   Remaining animals = 1 – ½

   = ½

   Goats = $^1/_3$ of rem

   = $^1/_3$ of ½

   = $^1/_3 \times ½$

   = $^1/_6$

   Total (cows + goats)

   ½ + $^1/_6$

   $\frac{3 + 1}{6}$

   $^4/_6$

   Fraction for pigs = $^6/_6 - {}^4/_6$

$= {}^{2}/_{6}$

Or ${}^{1}/_{3}$

${}^{1}/_{3}$ is equivalent to 12 pigs

Let the total be y.

${}^{1}/_{3}$ of y	= 12 animals
$\cancel{3} \times {}^{1}/_{\cancel{3}}$ y	= (12 x 3) animals
y	= (12 x 3) animals
y	= 36 animals

Therefore; there are 36 animals on Kahima's farm.

Activity 1:19

a) ${}^{2}/_{3}$ of my salary is 6,000/=. What is my salary?
b) ¼ of my grandmother's age is 20yrs. How old is my grandmother?
c) ¾ of the Askari's salary is 3,000/=. How much does he get?
d) ${}^{2}/_{5}$ of Kadodi's weight is 10kgs. Find Kadodi's weight?
e) ${}^{1}/_{3}$ of the distance from Iganga to Jinja is equal to ¼ of the distance from Jinja to Kampala. If it is 80km from Jinja to Kampala, how far is Iganga to Jinja?
f) ${}^{1}/_{3}$ of my salary is equal to ${}^{5}/_{6}$ of Musa's salary. If my salary is 12000/=, what is Musa's salary?
g) ${}^{1}/_{6}$ of the area of a triangle is ${}^{7}/_{12}$ that of the area of the rectangle. If the area of the triangle is $420m^2$. Find the area of the rectangle.
h) John spends ¼ of the salary on food and ¼ of the remainder on rent and is left with 600/=. What is the salary?
i) A teacher spends ½ of the salary on rent and ¼ of the remainder on fees and is left with sh. 8000. Calculate his salary.
j) ½ of the pupils in a school like maths and ${}^{2}/_{5}$ of the remainder like English. If there remains 180pupils who like other subjects, how many pupils are there in the school?

Ratios and proportions

- Ratios are comparisons between two or more quantities by division.
- Ratios are always expressed in the simplest form.

Forming ratios

Examples

In a class, there are 24 girls and 18 boys. Express the number of boys as a ratio of girls.

Soln:

Ratio Boys to Girls

18 : 24 (divided by 6)

$\frac{{}^{3}\cancel{18}}{\cancel{6}} : \frac{\cancel{24}\,{}^{4}}{\cancel{6}}$

3 : 4

Girls to Boys

24 : 18

$\frac{24}{6} : \frac{18}{6}$

4 : 3

Activity 1:20

1. In a music club, there are 12 singers and 8 instrumentalists.
   a) What is the ratio of singers to instrumentalists?
   b) Find the ratio of instrumentalists to singers.
2. There are 120 pupils in a school. If 40 are girls;
   a) Find the ratio of girls to boys.
   b) Find the ratio of boys to girls.
   c) Express the number of boys as a ratio of the whole class.
3. Express 500g as a ratio of 1 hour.
4. Express 500g as a ratio of 1 kg.
5. In a village, 40 farmers grow beans, 30 grow maize and 60 grow cabbages.
   a) Find the ratio of farmers who grow maize to those who grow cabbages.
   b) Find the ratio of those who grow maize to the total number of farmers.
   c) What is the ratio of those who grow maize to those who grow beans and those who growing cabbages?

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Increasing and decreasing in ratios

Increasing

For ratio increase, the new amount is bigger than the old amount.

Example

Increase 300/= in the ratio 5 : 2

New	old
5	2
?	300/=

2 parts = 300/=

1 part = $\frac{300}{2}$

3 parts = $(^{300}/_{2} \times 5)$/=

150 x 5

750/=

OR: $\frac{\text{New}}{\text{Old}}$ x Amount

$\frac{5}{\cancel{2}} \times \cancel{300}$/=

5 x 150/=

750/=

Decreasing

For ratio decrease, the new amount is smaller.

Example I

Decrease 400kg in the ratio 3:4

New	Old
3	4
?	400kg

4 parts = 400kg

1 part = $\frac{400}{4}$kg

3 parts = $(^{400}/_{4} \times 3)$kg

= (100×3)kg

300kg

OR: $\frac{\text{New}}{\text{Old}} \times$ Amount

$\frac{3}{\cancel{4}} \times \cancel{400}$kg

3×100kg

300kg

Example II

A class had 60 pupils, the number reduced to 50 pupils. In what ratio did it reduce?

Old number = 60

New number = 50

New : Old

50 : 60

5 : 6

Activity 1:21

1. Increase 300 in the ratio 2:1
2. Increase 600 in the ratio 3:2
3. Increase 4800/= in the ratio 5:4
4. Increase 360 in a ratio 5:4
5. The school fees was 18,000/- and increase in the ratio 11:10. What is the new amount of school fees?
6. The school had 800 pupils last year. This year they have 1000 pupils. In what ratio has the number increased?
7. What is the ratio increase from 800 to 960?
8. Decrease the following in their respective ratios.

a) 600 in ratio 2:3
b) 400kg in the ratio 2:5
c) 1000/= in the ratio 3:5
d) 800litres in the ratio5:8
e) 700bags in the ratio 7:10

9. A class had 72 pupils, the number reduced in the ratio 7:8. What is the new number of pupils?
10. The marked price of a radio is 90,000/=. The man bought a radio at a
reduced price of the ratio of 2:3. How much did he buy the radio?

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Sharing in ratios

Examples:

1. Divide 4200kgs of sugar in the ratio of 2:5

Ratio = 2:5

Total = 2 +5

= 7

1st share $= \frac{2}{\cancel{7}_1} \times \overset{600}{\cancel{4200}}$kg

$= 2 \times 600$kg

$= 1200$kg

2nd share $= \frac{5}{\cancel{7}_1} \times \overset{600}{\cancel{4200}}$kg

$= 5 \times 600$kg

$= 3000$kg

2. Share 200/= in the ratio 2:3

All parts = 2 + 3

= 5 parts

5 parts = 200/=

1 part = 200

2 parts $= \frac{(200 \times 2)}{5}$/=

$= 40 \times 2$

80/=

3 parts $= \frac{(200 \times 3)}{5}$/=

$= (40 \times 3)$/=

120/=

Therefore, the shares are 80/= and 120/=

Activity 1:22

1. Share 360 in the ratio 2:3
2. Divide 72 in the ratio of 5:3
3. Divide 4500/= in the ratio 7:8
4. Share 90kg of sugar between two people in the ratio of 7:3
5. John and Diana shared 3000/= in the ratio 2:3. How much did each get?
6. A man and his wife had 200kg of coffee. They decided to share it in the ratio 7:3 respectively.
   a) How many kilograms did the man get?
   b) How many kilograms did the wife get?
7. Amos, Andrew and Allan shared 24,000/= in the ratio 1:2:3 respectively. How much did each get?
8. A B and C contributed money for a business in the ratio 3:4:5. If C contributed 10,000/=. How much did they contribute altogether?
9. Share 480 in the ratio 4:5
10. Dan and Mike shared money in ratio 3:5 respectively. If Mike got 3000/=,
    how much did Dan get?

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Proportions

There are three types of proportions.

- Simple direct proportions
- Inverse proportions
- Constant proportions

Simple proportions

In simple proportions, the more the number of items, the more the amount.

Examples

1. 4 girls have 8 breasts. How many breasts have 7 girls.

   Soln:

   4 girls = 8 breasts

   1 girl = ($^8/_4$) breasts

   7 girls = ($^8/_4$ x 7) breasts

   = (2 x 7) breasts

   = 14 breast

2. 4 pen costs 2000/=. Find the cost of 9 pens.

   Soln:

   4 pens = 2000/=

   1 pen = ($^{2000}/_4$)/=

   9 pens = ($^{2000}/_4$ x 9)/=

   9 pens = 500 x 9

   = 4500/=

Activity 1:23

1. One book costs 600/=. Find the cost of 5 books.
2. 2 bags weigh 70kg. What is the weight of 5 bags?
3. 1200/= can buy 2kg of maize flour. How many kgs can you get from 3600/=
4. A bag of coffee weighs 65kg. How many kilograms will 12 bags weigh?
5. 3 dresses can be made from 6 metres of cloth. How many metres of cloth can I use for 9 dresses?

6. 5 pieces of timber are used to make 2 tables. How many tables can you make from 15 pieces of timber?
7. The bus fare for 3 people is 25000/=. What is the fare for 2 people?
8. 5 jerrycans cost 75000/=. How many jerrycans can one buy with 105,000/=?

Inverse proportions

In this type of proportion, the more the number employed to do work, the less the time they will take and vice versa.

Examples

1. 3 men can do a piece of work in 6 days. How long will 9 men take to do the same piece of work?

   Soln:

   3 men = 6days

   1 man = (3 x 6) days

   9 men = $\left(\frac{3 \times 6}{9}\right)$ days

   9 men = $\left(\frac{18}{9}\right)$ days

   9 men **= 2 days**

   Therefore; 9 men can do the same piece of work in 2 days.

Activity 1: 24

1. It takes 4 days for 12 women to dig a shamba. How long will it take 8 women to do the same job?
2. 25 girls can construct a road in 8 days. How many girls will construct a road in 10 days?
3. A carpenter takes 2 hrs to make a chair. How many chairs will be made in 6 hours?
4. 12 technicians can paint a school building in 10 days. How long will 15 technicians take?
5. 6 porters can dig a piece of land in 5 days.
   a) How many porters can do the same work in 10 days?
   b) How many days will 15 porters take?
6. 5 children take 4 days to slash the school compound. How many days will 10 children take?

Constant proportions

This is a type of proportion whereby time taken to complete a task remains the same though the number of parties change.

Examples:

1. 6 men can sing a song in 10 minutes. How long will 10 men take to sing the same song?
2. 5 shirts take 20 minutes to dry. How long will 20 shirts take to dry?

Percentages

- Percent means out of 100.
- The symbol for percent is %

That is;

6 % = $^{6}/_{100}$

20% = $^{20}/_{100}$

Changing percentages to fractions and vice versa

Examples

1. Express 25% as a fraction in its lowest terms.

$$25\% = \frac{25}{100}$$

$$= \frac{\cancel{5}^1 \times \cancel{5}^1}{2 \times 2 \times \cancel{5}_1 \times \cancel{5}_1}$$

$$= \mathbf{\frac{1}{4}}$$

2. Express 12 ½ % as a fraction.

$$12\tfrac{1}{2} = \frac{25}{2}\%$$

$$= \frac{^{25}/_{2}}{100}$$

$$= \frac{25}{2} \div \frac{100}{1}$$

$$= \frac{25}{2} \times \frac{1}{100}$$

$= \frac{25}{200}$

$= \mathbf{{}^{1}/_{8}}$

3. Express $^{4}/_{5}$ as a %

   $^{4}/_{5}$

   $\frac{4}{\cancel{5}_1} \times \cancel{100}^{20}$

   $= (4 \times 20)\%$

   = 80%

4. Convert 0.25 as a percentage.

   0.25

   $= \frac{25}{100}$

   $= \frac{25}{\cancel{100}_1} \times \cancel{100}^{1}$

   $= 25 \times 1$

   = 25%

5. Change 20% as a decimal.

   20%

   $= \frac{20}{100}$

   $= \frac{2}{10}$

   = 0.2

Activity 1:25

1. Convert the following percentages to fractions in their lowest terms.

a) 50%	b) 30%	c) 21%	d) 33 ½ %
e) 12%	f) 40%	g) 65%	h) 90%
i) 62 ½%	j) 16 $^{2}/_{3}$%	k) 37 ½%	

2. Change the following fractions to percentages.

a) ½	b) $^7/_{20}$	c) $^3/_{20}$	d) $^3/_8$
e) ¼	f) $^{12}/_{25}$	g) $^2/_{25}$	h) $^5/_8$
i) $^9/_{20}$	j) $^4/_{10}$	k) $^{13}/_{50}$	l) $^2/_3$

3. Change the decimals to percentages.

a) 0.7	b) 0.45	c) 0.003	d) 0.9
e) 0.001	f) 0.12	g) 0.75	h) 0.025
i) 0.067			

4. Change these percentages to decimals.

a) 10%	b) 32%	c) 2.5%	d) 75%
e) 25%	f) 82%	g) 1.2%	h) 62%
i) 30%	j) 6 ¼%	k) 12 ¼%	

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Expressing percentages as ratios

Examples

1. 2%

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

$= \frac{1}{50}$

= 1:50

2. 33 $^1/_3$%

$= \frac{100}{3}\%$

$= \underline{100} \div \underline{100}$

$$= \frac{\overset{3}{\cancel{100}}\,^{1}}{3} \times \frac{\overset{1}{1}}{\cancel{100}\,_{1}}$$

$$= \frac{1}{3}$$

= 1:3

Express as percentages

Examples

1. 3:10

$$= \frac{3}{\cancel{10}\,_{1}} \times \cancel{100}\,^{10}$$

= 3 x 10

= 30%

2. $^{1}/_{5}$: $^{1}/_{3}$

$$= \frac{1}{5} \div \frac{1}{3}$$

$$= \frac{1}{5} \times \frac{3}{1}$$

$$= \frac{3}{5}$$

$$= \frac{3}{\cancel{5}\,1} \times \cancel{100}\,20$$

= 3 x 20

= 60%

Activity 1:26

1. Express the following percentages as ratios

a) 10%	b) 56%	c) 125%
d) 25%	e) 76%	f) 80%
g) 50%	h) 98%	i) 144%

2. Express the following ratios as percentages.

a) 1:2	b) 3:5	c) 5:16
d) 2:3	e) 3:8	f) 3:4
g) 2:5	h) $^{1}/_{5}$: ¼	i) $^{1}/_{8}$: $^{1}/_{5}$

j) $^1/_{20} : ^1/_7$ k) $^2/_5 : ½$ l) ¾ : $^1/_5$

Activity 1:27

1) A child paid 55% of the school fees. What percentage is left for him to pay?
2) A buyer paid 85% of the cost of a radio. What percentage is left for him to pay?
3) 30% of the people in Uganda are male, 50% are female and the rest are children. What percentage is for children?
4) Henry had 40 cows, he sold 15.
   i) What percentage was sold?
   ii) What percentage of the cows was not sold?
5. A boy got 8 marks out of 20. What percentage is this?
6. If 40 out of 120 pupils in a class passed their exams.
   i) What percentage of the pupils passed?
   ii) What percentage of the pupils failed?
7. Write 40 as a percentage of 200.
8. Express 200gm as a percentage of 1 kg.
9. What percentage of 1 hour is 150 minutes?
10. Express 60 as a percentage of 80.

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Percentage of numbers

Examples

1. What is 20% of 200/=?

$\frac{20}{\cancel{100}_1} \times \cancel{200}^2/=$

(20 x 2)/=

40/=

2. What is 12 ½ of 800 people?

25 % of 800 people
2

$\left(\frac{25}{2} \div \frac{100}{1}\right)$ of 800

$\frac{25}{\cancel{2}_1} \times \frac{1}{\cancel{100}_1} \times \cancel{800}^4$

25 x 4

= 100 people

Activity 1:28

What is;

a) 10% of 200/=?
b) 15% of 240 books?
c) 20% of 400 kgs?
d) 11% of 8000 books?
e) 60% of 2400 cows?
f) 25% of 1200/=?
g) 12 ½ of 3200 kg?
h) 35% of 640?
i) 90% of 360cm?
j) 80% of 1500?
k)
l)

m) _

n)

MK Bk. 6

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<u>Application of percentages</u>

Activity 1:29

1. In a class 10% of the pupils are absent. If there are 60 pupils.
   a) How many pupils are absent?
   b) How many are present?

2. There are 280 animals in the zoo. 10% are birds, 50% are primates and 40% consists of others.
   How many animals of each type named are in the zoo?
3. A school has 360 books. 30% are English books, 20% are science books and the rest are maths books
   How many books of each category are in the school?
4. 20 % of the pupils in a school are girls. If there are 35 girls in the school. How many pupils are in the school?
5. 10% of a number is 40. What is the number?
6. 25% of a number is 80. What is the number?

Percentage increase and decrease

Examples

1. Increase 200/= by 20%

   Get 20% of 200/=

   $\frac{20 \times \cancel{200}^{2}}{\cancel{100}_{1}}$/=

   (20 x 2)/=

   40/=

   New amount = 200/=

   + 40/=

   240/=

   OR

   100% = 200/=

   1% = $\frac{200}{100}$/=

   100% + 20% = $\left(\frac{\cancel{200}^{2}}{\cancel{100}_{1}} \times 120\right)$/=

   = 2 x 120/=

   240/=

2. Decrease 300 by 10%

$\frac{10}{\cancel{100}_1} \times \cancel{300}^3$

10 x 3

30

New amount = 300

- 30

270

OR

100% - 10 = 90%

$\frac{90}{\cancel{100}_1} \times \cancel{300}^3$

90 x 3

270

Activity 1:30

1. Increase 80 by 10%
2. Increase 240/= by 20%
3. Increase 400 by 15%
4. Increase 15000 by 30%
5. Okidi's pay was 1200 dollars. It was increased by 30%. What is his new pay?
6. The number of pupils in a class were 50 but they increased by 10%. What is the new number?
7. A shirt was priced at 9000/= last year. This year its price increased by 40%. What is the new price of the shirt?
8. Last year, there were 30,000 cars in Uganda. This year there are 20% more cars imported. How many cars are in Uganda this year?
9. Decrease 400 by 20%
10. Decrease 500kg by 10%

11. Reduce 80kg by 20%

Profit and Loss

- Profit is realized when the selling price of a commodity is more than the buying price.
- Loss is suffered when one sells a commodity at a lower price than it was bought.

Formulae

Profit = Selling Price (S.P) – Buying Price (B.P)

Loss = Buying Price (B.P) – Selling Price (S.P)

Examples

1. Nakajjumbe bought a phone at 80,000/= and sold it at 110,000/=. What profit did he make?

   Soln:

   Buying price = 80,000/=

   Selling price = 110,000/=

   Profit = S.P – B.P

   = 110,000/= - 80,000/=

   = 30,000/=

2. Makonde bought a pair of trouser at 19,000/= and later sold it at 15,500/=. What loss did he suffer?

   Buying price = 19,000/=

   Selling price = 15,500/=

Loss = Buying price – Selling price
= 19,000/= - 15,500/=
= 3,500/=

Activity

1. A cattle dealer bought a cow at 135,000/= and sold it at 147,000/=. Calculate the profit he made.
2. A land agent bought a piece of land at 750,000/= and sold it at 870,000/=. Find the profit made.
3. A trader bought 50kg of maize flour at 600/= per kg and sold it at 800/= per kg.
   a) Find the profit per kilogram.
   b) Find the total amount of money used to buy all the maize flour.
   c) Calculate the total amount earned as profit.
4. A soda agent bought 50 crates of soda at 23,250 each and sold at sh. 24,250 each.
   a) Calculate the profit made on each crate.
   b) Calculate the total profit made.
5. Akram bought a radio at 75,000/= and later sold it at 69,000/=. Calculate the loss he made.
6. A business lady bought a box of cosmetics at 240,000/= and collected 226,000/=. Calculate the loss.

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<u>Percentage profit and loss</u>

Formulars

Percentage profit $= \frac{\text{Selling price} - \text{Buying price}}{\text{Buying price}} \times 100$

OR: $\frac{\text{Profit}}{\text{Buying price}} \times 100$

Percentage loss $= \frac{\text{Buying price} - \text{Selling price}}{\text{Buying price}} \times 100$

OR: $\frac{\text{Loss}}{\text{Buying price}} \times 100$

Examples

1. A boy bought a bicycle at 120,000/= and sold it at 130,000/=.

a) Express the profit as a fraction of the buying price.

Fraction $= \frac{\text{Profit}}{\text{Buying price}}$

$= \frac{130{,}000/= - 120{,}000/=}{120{,}000}$

$= \frac{1\cancel{0{,}000}/=}{12\cancel{0{,}000}/=}$

$\mathbf{= {}^{1}/_{12}}$

b) Calculate the percentage profit.

%age profit $= \frac{\text{profit}}{\text{B.P}} \times 100$

$= \frac{10{,}0\cancel{00}/=}{12\cancel{0{,}000}/=} \times 1\cancel{00}$

$= \frac{\cancel{100}^{25}}{\cancel{12}_{3}}$

$= \frac{25}{3}$

$\mathbf{= 8\,{}^{1}/_{3}\%}$

2. Obiina bought a bicycle at sh. 70,000. Two years later, he sold it at a loss of 15%.

   a) Calculate the loss.

$$\%\text{age loss} = \frac{\text{loss}}{\text{B.P}} \times 100$$

$$\frac{15}{1} = \frac{\text{Loss}}{70000} \times 100$$

$$\frac{\cancel{100}\,\text{loss}}{\cancel{100}} = \frac{15 \times 700\cancel{00}}{1\cancel{00}}$$

$$\text{Loss} = 15 \times 700$$

$$= \mathbf{10500/=}$$

Activity

1. Namuwaya bought a dress at 10,000/= and sold it at 12,000/=. Calculate the percentage profit.
2. Okello bought a blanket at 30,000/= and sold it at 350,000/=.
   a) Express his profit as a fraction of the cost price.
   b) Find his percentage profit.
3. A business man bought a 50 kg of G-nuts at 800/= per kilogram. He paid 5000/= as transport. If he sold each kg at 1000/=.
   a) Find the total amount collected from the sales.
   b) Find his profit.
   c) Calculate the percentage profit.
4. A passenger bought an air ticket at 500,000/=, he later sold it at 550,000/=.
   a) Express the profit as a fraction of the cost price.
   b) Calculate the passenger's percentage profit.
5. A marial vendor bought 20 bunches of matooke at sh. 8000/=. She sold them at a loss of 500/= per bunch.
   a) Find the amount got from the sales.
   b) Find the total loss.
   c) Calculate the percentage loss.
6. After selling a bed at 60,000/=. Mulonde made a percentage profit of 20%.
   a) Find the price at which Mulonde sold the bed.

b) Find Mulonde's profit.

Simple Interest

In banking

- The money banked, borrowed or lent is called **Principal (P)**
- The percentage used to calculate interest is called **Rate (R).**
- The period that the principal is invested is called **Time** given in years or months.
- The additional amount paid back is **Interest**
- Total Amount = Principal + Interest

  Simple interest = P X R X T

Examples

1. My father deposited sh. 120,000 in the bank that offers an interest rate at 10% per year.

   a) Calculate the interest got after 2 years.

   S I = P x T x R

   $= 1200\cancel{00} \times 2 \times 10/\cancel{100}$

   = 1200 x 10 x 2

   = 24,000/=

   b) Calculate the amount collected after 2 years.

   Amount = principal + Interest

   = 120,000/= + 24,000/=

   = 144,000/=

2. A trader borrowed 400,000 from a bank at an interest rate of 5% per annum for 6 months.
   a) Calculate the simple interest.

      S I = P x T x R

      $= 40{,}0\cancel{00} \times {}^{6}/_{12} \times {}^{5}/_{\cancel{100}}$

      = (100 x 2 x 5)/=

      = 10,000/=

   b) What amount will the trader pay altogether?

      Amount = Principal + Interest

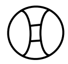
      = 400,000 + 10,000

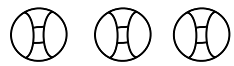
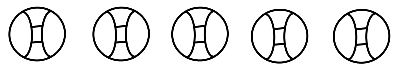
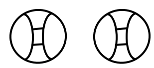
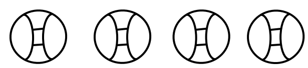
      = 410,000/=

Activity

1. Calculate the simple interest on 50,000/= at a rate of 15% per year for 2 years.
2. Calculate the simple interest on 150,000/+ at 5% per annum for 3 years.
3. What interest is paid on a loan of 70,000/= at a rate of 20% per annum for 2 years?
4. A school kept 800,000/= in a bank at a rate of 15% per year for 1 ½ years.
   Calculate the simple interest.

1. The Headteacher gave out balls to the classes to make practices for football.

   Scale:  = 10 balls

P.4	
P.5	
P.6	
P.7	

   a) Which class got the least number of balls?
   b) How many less balls did P.6 get than P.7?
   c) Find the total number of balls given to all the classes.
   d) If each ball was costing sh. 20,000, how much money did the H/M pay for the balls of P.6.

2. In Maya village, five men planted three in order to trap strong winds.

Name	Number of trees
Moses	300
Peter	500
Paul	450
Chris	150

a) Who planted the highest number of trees?
b) How many trees did Paul and Chris plant altogether?
c) Construct a pictograph for the information above.
d) If each seedling costs sh. 300, how much did Chris spend?
e)
f)
g) -
h)

Bar graphs

Definition:

- These are graphs constructed using bar like structures.
- The bars can be vertical or horizontal depending on the information of wish of the drawer.

Scales

- It has the vertical and horizontal scales. The scales used depends on the broadness of the quality.

Bars

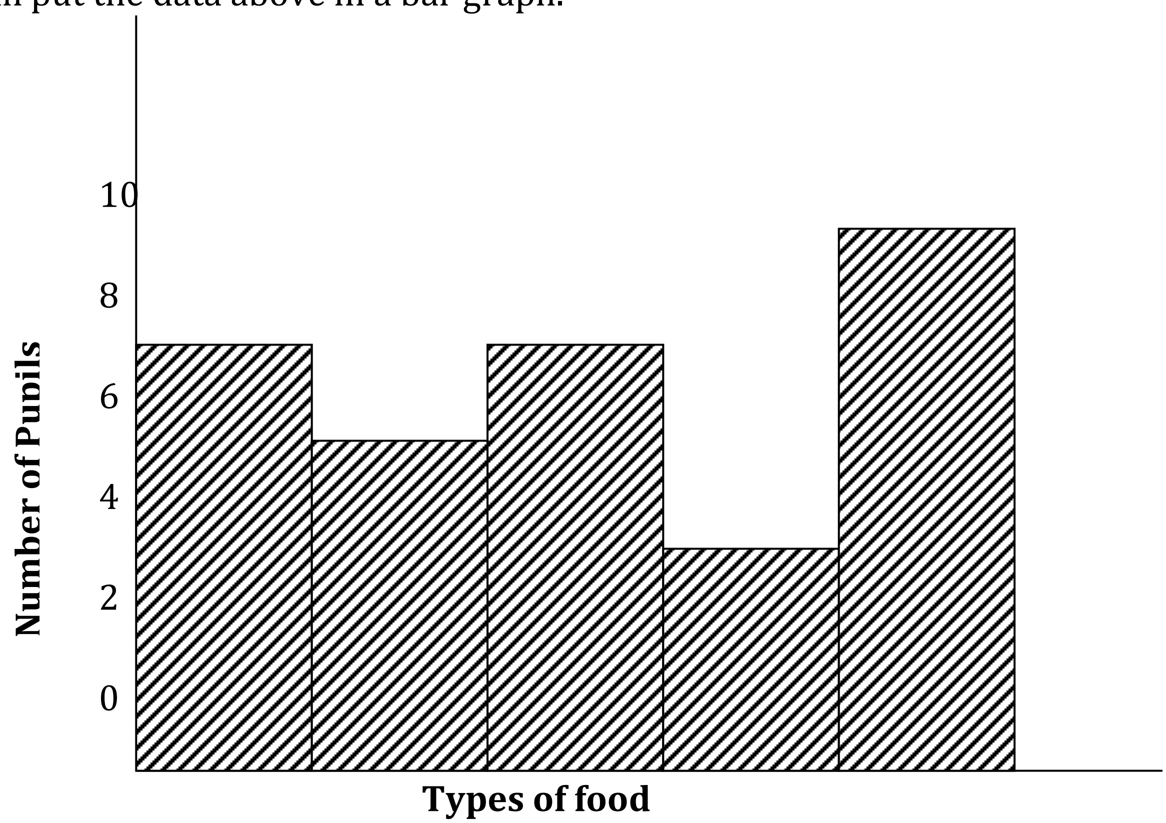
- All bars should be proportional and bars are always shaded.

Example

The table below shows the number of pupils who like different food types.

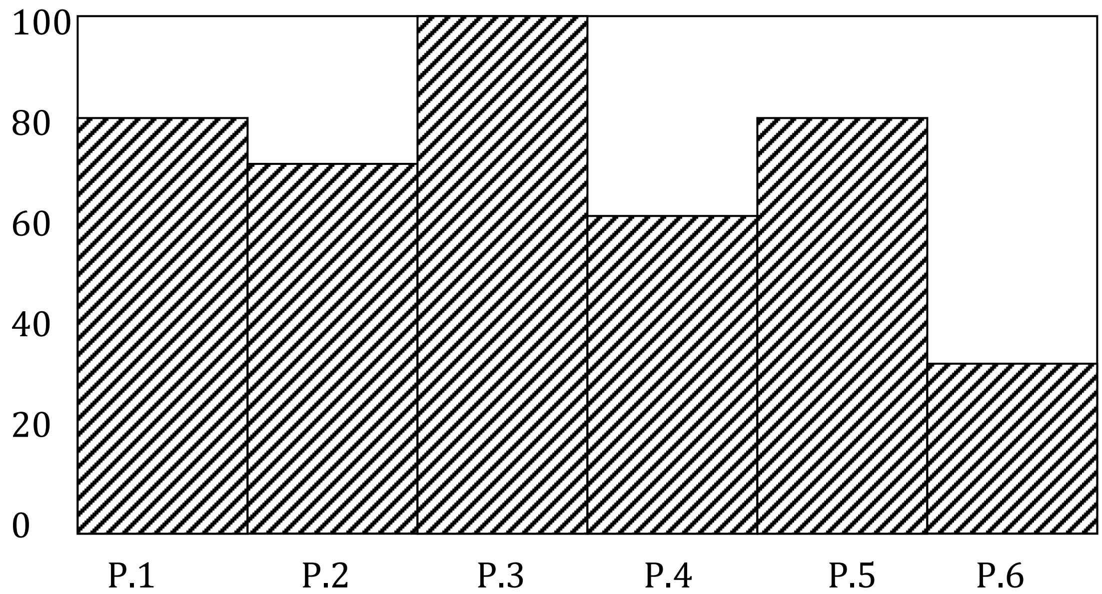
Type of food	Rice	Matooke	Yams	Millet	Cassava
Number of pupils	8	6	8	4	10

We can put the data above in a bar graph.



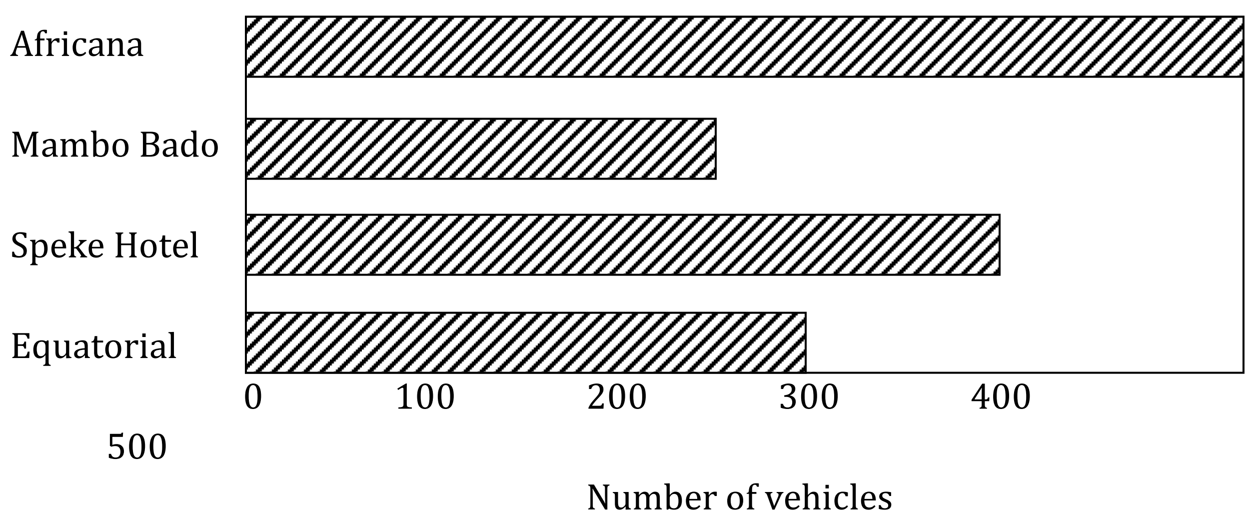
Exercise

1. The bar graph below shows the number of pupils in different classes at Mother Mony p/s.



a) Which class has the highest number of pupils?
b) What is the total number of pupils in the classes?
c) Which two classes have the same number of pupils?
d) Find the average number of pupils in the school/per class.

2. Below is a bar graph showing the number of vehicles that park at different hotels per day.



i) Find the total number of vehicles that park at Speke hotel and Mando Bado.
ii) If each vehicle pays sh. 2000 for parking, how much money is collected at Equatorial hotel?
iii) Which Hotel is the least busy?
iv) How many more vehicles park at Africana that Speke hotel?

3. The table below shows the number of time each type of food is prepared in a term at a school.

Food	Matooke	Posho	Rice	Cassava	Millet
Number of times	10	20	30	20	25

a) Which food type is prepared 30 times?
b) Which two food types are prepared the same times?
c) Find the total cost matooke takes in a term if each time the Headteacher spends 400,000/=
d) Draw a bar graph to show the above information.

Line graph

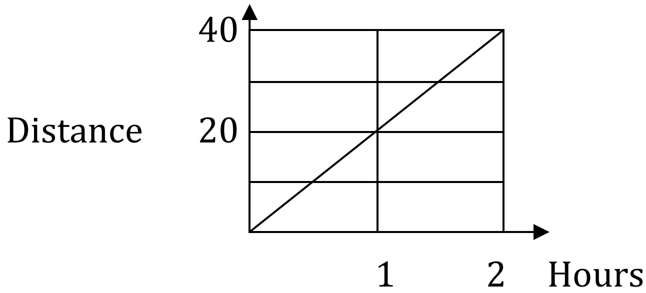
- This type of graph is interpreted using a straight line drawn on the graph. The line can also be zig-zag
- The graph has two scales i.e the horizontal and the vertical.

It is mostly used for;

- Distance against time used.
- Quantity of goods sold against cost.
- Temperature change against time.

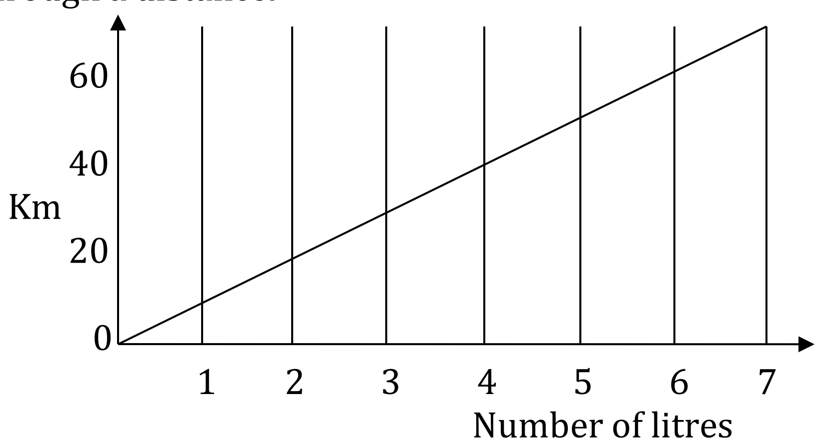
Example:

A motorist covers 40km in 2 hrs.



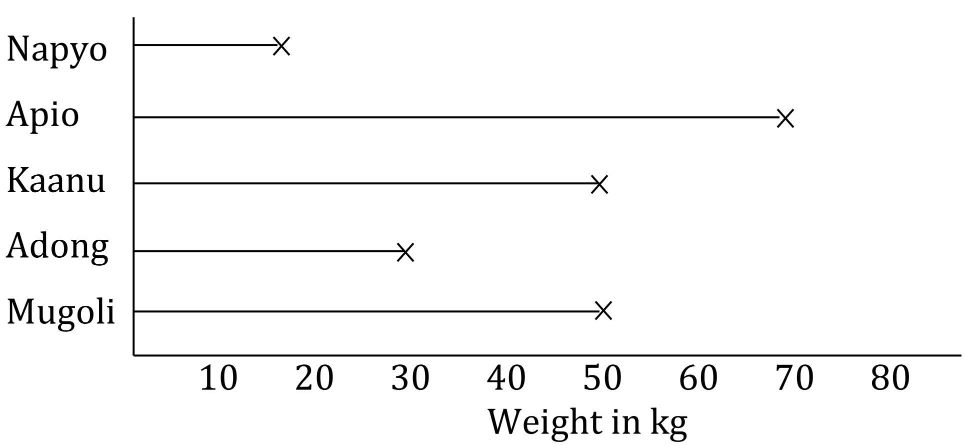
Exercise

1. The graph below shows the number of litres of petrol consumed by a car through a distance.



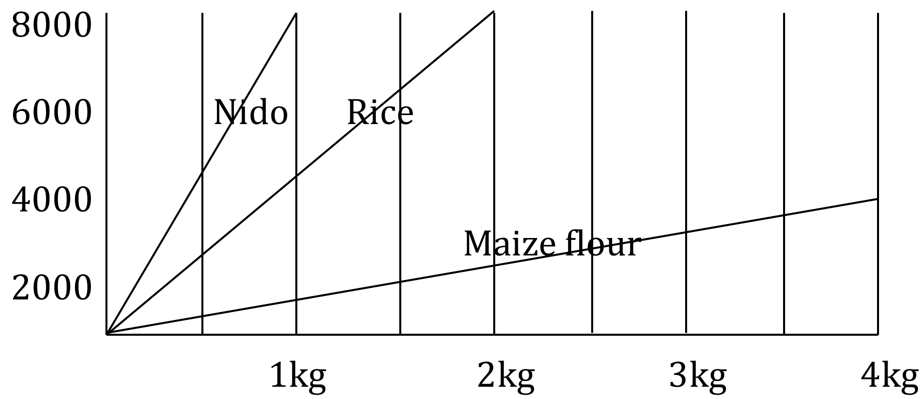
a) How many kilometres does the car travel on 1 litre?
b) What distance can the car cover on 6 litres of petrol?
c) How many litres does the car need to cover 45km?

2. The weight of Nderema's children is shown on the graph below.



a) Who is the heaviest child?
b) Which of the children weighs 30kgs?
c) Which two children have the same weight?
d) Find the average weight of all the children.

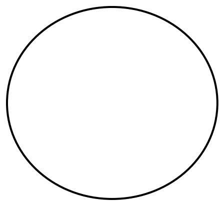
3. The graph below shows the cost of units of different items in a supermarket.



a) What is the cost of 1kg of rice?
b) Find the cost of 2 ½ kg of maize flour.
c) How many kg of maize flour can I buy with 3000/=
d) What is the cost of ½ kg of Nido?
e) Find the total cost of 1 kg of Nido, 4 kg of rice and 3 kg of maize flour.

Pie – chart

- Pie - charts are also called circle graph.
- The chart is circular in form.

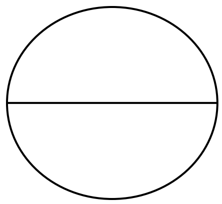


It constitutes one of the following;

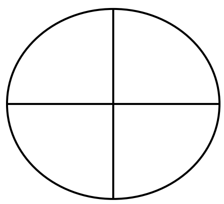
a) 1 whole

b) 10%

c) 360^0



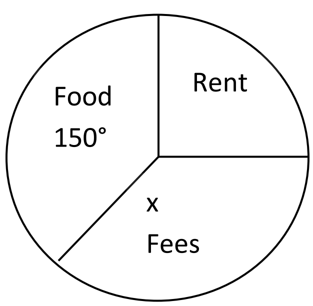
½ or 50% or 180^0



¼ or 25% 0r 90^0

Exercise

1. A man spends his salary as shown by the pie chart below. He earns 180,000/= per month.



a) Find the value of x.

$x + 90^0 + 150^0 = 360^0$

$x + 240^0 = 360^0$

$x + 240^0 – 240^0 = 360^0 – 240^0$

$x = 120^0$

b) How much does he spend on fees?

$\frac{120^0}{360^0} \times 180,000$

$= 1 \times 60,000$

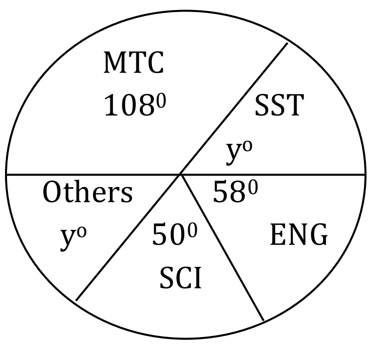
$= 60,000/=$

c) Express the expenditure on food as a fraction of the total.

$\frac{150^0}{360^0}$

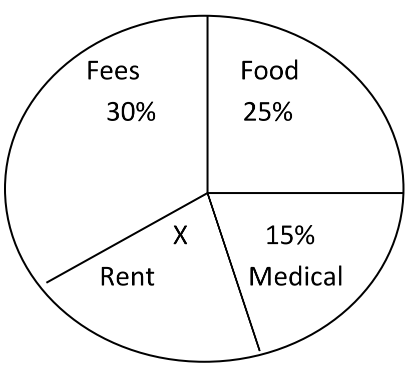
$= \frac{5}{12}$

2. The pie chart below shows the types of books in the school library of 1440 books



a) Find the value of y.
b) How many books are there for MTC?
c) How many more books are for English than Science?
d) What fraction of the book represents SST books?

3. Mrs Bogoyo spends her salary of sh. 72,000 as follows;



a) Find the percentage for rent.
b) How much does she spend on medical?
c) How much more does she spend on fees than on food?

Constructing pie charts

Steps:

- Change the amount given (in the sectors to degrees)
- Check and see if the degrees got add up to 360^0.
- Draw a circle (with a reasonable radius)
- Use the outer scale reading of the protractor and count the degrees clockwise.

Example

1. Alupo spends his money as follows.

¼ on food, $^1/_3$ on rent and $^5/_{12}$ on fees. Construct a pie chart of radius 3cm.

Changing fraction parts to degrees.

Food = ¼ x 36^0
= 90^0

Rent = $^1/_3$ x 360^0
= 120^0

Fees = $^5/_{12}$ x 360^0
= 150^0

Pie chart (3cm radius)

Exercise

1. On a farm, $^1/_{10}$ of the animals are goats, $^1/_5$ are sheep, $^2/_5$ are cattle and $^3/_{10}$ are chicken. Use the information to draw a pie chart.
2. In a village meeting, 35% of the people were women, 40% men and the rest children.
   a) What percentage represented children.
   b) Construct a pie chart.
3. A man got sh. 60000 from the sales of beans, sh. 80000 from peas, sh. 50000 from tomatoes and sh. 60000 from others. Use the above information to draw a pie chart.
4. Mwebe's land is divided into plots as shown below.

Land for;	Sheep	Goats	Cows
Percentage	30%	50%	20%

If he had 270 hectares;

i) How many hectares are for sheep?

ii) Use the information to draw a pie chart.

<u>STATISTICS</u> (Mean, Median, Mode and Range)

Definition:

Mean: Is the total/sum of scores divided by the number of scores.

Median: Is the midway mark between the highest and lowest.

Mode: Is the score which appears more than others.

Range: the difference between the highest and lowest marks.

Frequency: The number of times an event occurs.

Example:

Given 9 , 2 , 6 , 3 and 4, Work out;

a) The mean

Mean $= \frac{\text{Total of scores}}{\text{Number of scores}}$

$= \frac{9 + 2 + 6 + 5 + 6 + 3 + 4}{7}$

$= \frac{35}{7}$

<u>Mean = 5</u>

b) The mode

Scores	freq
9	1
2	1
6	2
5	1
3	1
4	1

6 is the mode

c) The range

Range = Highest – Lowest

= 9 – 2

Range = 7

d) Median

Median = 2, 3, 4, 5, 6, 6, 9

Median = 5

<u>Activity</u>

1. Given that 18 , 12 , 6 , 24 , and 30. Find the;
   i) Mean
   ii) Range
2. Work out the median of 6 , 7 , 4 , 9 and 8.
3. Given 20, 4 , 8 , 8 , 4 , 7 and 14, find;
   i) The mode
   ii) The median
4. Okello scored the following marks in a series of maths tests; 55% , 60% , 40% 60% , 55% , 80% and 60%.
   i) Find his modal mark.
   ii) Work out the average

5. Calculate the mean of 40 and 42.

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MORE ABOUT STATISTICS

Examples

The table below shows a pupil's marks in a science test.

Scores	80	70	60	12	30	40
Frequency	1	2	3	1	2	5

Find;

a) The modal mark

Modal mark was 40

b) The modal frequency

Modal frequency was 5

c) The mean

Mean $= \frac{80 + (70\text{x}2) + (60\text{x}3) + (30 \text{ x}2) + (40 \text{ x } 5)}{14}$

$= \frac{80 + 140 + 180 + 60 + 12 + 200}{14}$

$= \frac{672}{14}$

$\mathbf{= 48}$

Activity

1. A group of boys was given a test. They scored as follows;

Scores	20	80	60	70
Number of boys				

   i) How many boys did the test?
   ii) Find the modal mark
   iii) Calculate the mean mark.

2. The following are the marks in their raw form.
   20, 15 , 10 , 35 , 40, 10 , 30 , 30 , 20 , 40 , 30 , and 40.
   i) Make a table to show the scores, tallies and frequency.
   ii) What is the modal frequency
   iii) What is the mode?
   iv) Find the range of scores.

MORE ABOUT AVERAGE

Examples

1. The mean age of 5 pupils is 14 yrs. The age of 4 of the pupils are 16 , 12 , 13 and 15.
   a) What is the age of the fifth pupil?

   Total age of 5 pupils = 5 x 14
   = 70 yrs

   Total age of the 4 pupils = 12 + 16 + 13 + 15
   = 56 yrs
   Age of the fifth pupil = 70 – 56
   = 14 years

   b) Find the median.
   Ages in order = 12 , 13 , 14, 15 , 16

Median age = 14 years

2. The average weight of 4 men is 55kg. If one of the men weighs 70kg, what is the average weight of the other 3 men?

Total weight of all (4 x 55)	= 220kg
Weight of one man	- 70kg
Weight of 3 remaining men	= 150kg
Average weight for the 3 men	= $\frac{150}{3}$
	= 50 kg

Exercise

1. The mean age of 4 girls is 16 years. If three of them are aged 17, 12 and 15, find the age of the 4^{th} girl.
2. The average number of books for 4 classes is 20. If one class has 23 books, what is the average number of books does the other class have?
3. The average of 3 numbers is 15. Of which one of them is 21, find the average of the other 2 numbers.
4. The average length of 8 sticks is 9cm. If three sticks of them measure 6cm, 10cm and 6cm, find the average length of the remaining 5 sticks.

PROBABILITY

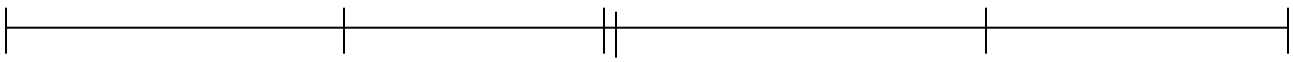
Probability is the measure of chances for an even to occur.

Some things happen	-	certain
Some things don't ever happen	-	impossible
Some things may happen sometimes		likely

The probability scale

0% 50% 75%

100%



0 very unlikely ¼ unlikely ½ likely ¾

very

(impossible)

likely(certain)

If something can't happen then the probability is 0.

If something can happen certainly, then the probability is 1.

Therefore: $0 \leq p(x) \leq 1$

Probability $= \dfrac{\text{Desired chance}}{\text{Sample space}}$

Example

1. Amos has five cards numbered; {3 , 4 , 5 , 6 , 7 }

   If the cards are mixed and put in a box, what is the probability that he randomly chooses;

   a) a card marked 5?

      Prob (5) = $^1/_5$

   b) a card of an even number?

      Even numbers {4 , 6 }

      Prob (even) = $^2/_5$

   c) a counting number?

      Counting numbers = {3 , 4 , 5 , 6 , 7}

      Prob (counting numbers) = $^5/_5$ = 1

Exercise

1. A die is tossed once. What is the probability that;

   a) An odd number appears on top.

   b) A number less than 4 appears on top.

2. Okello will visit his mother next week. What is the probability that he will visit her on;
   a) a day that begins with letter "T"
   b) Sunday
   c) on a day that ends with letter "Y"

3. 4 red pens and 6 blue pens are mixed and put in a box. If a pen is picked at random, what is the probability that it is;
   a) a red pen
   b) blue pen
   c) black pen

4. Letter card are as below.

   F L O W E R

   If the cards are mixed and put in a bucket, what is the probability of picking at random;
   a) a vowel
   b) a consonant

MEASURES (TIME)

Note: 1 hr = 60mins

1 min = 60sec

1 hr = (60 x 60) sec

= 3600 seconds

Changing hours to minutes

Example

Change 4 hrs to minutes.

1 hr = 60 mins

4 hrs = (4 x 60) mins

= 240mins

= 240 minutes

Activity

Change the following hours to minutes.

a) 3 hrs b) 11 hrs c) 4 ½ hrs

d) 6 hrs e) 1 ½ hrs f) 20 hrs

Changing minutes to seconds

Example

Change 5 minutes to seconds

1 min = 60 seconds

5 mins = (5 x 60) seconds

= 300 seconds

Activity

Change the following minutes to seconds

a) 20 minutes b) 30 minutes c) 15 minutes

d) 72 minutes e) 60 minutes f) 25 minutes

g) 10 minutes h) 3 minutes i) 50 minutes

Changing hours to seconds

Example

How many seconds are there in 1 hr.

1 hr = 60 mins

1 min = 60 seconds

Therefore: 60 mins = (60 x 60)

= 3600 seconds

Activity

Change the following hours to seconds.

a) ½ hrs	b) 4 hrs	c) 6 hrs
d) 5 hrs	e) 20 hrs	f) ¼ hrs
g) 3 ½ hrs	h) ¾ hrs	i) $^1/_{10}$ hrs

–

MEASURES (DISTANCE , TIME & SPEED)

Distance , Time and speed go can be realized concurrently.

ITEM	**UNITS**
Distance	km, metres
Time	hours, minutes , seconds
Speed (the rate of moving)	m/sec , km/hr

Examples

1. A car moves 40km every hour. Find its average speed.

   Its speed = 40km/hr

2. A tax covers 40km in 30 mins

   Therefore; 40km take = 30m

   80km take = (30 +30) min

   Therefore its speed = 80km/hr

Finding distance

Distance = speed x time

Example

Find the distance covered by a cyclist at 14km/hr for 3 hrs.

Distance = speed x time

$= \frac{14km}{\cancel{hr}} \times 3\ \cancel{hrs}$

$= (14 \times 3)$

= 42 km

Activity

1. A bus moved at a speed of 60km/hr for 4 hrs. What distance did it cover?
2. The speed of a train is 20km/hr. What distance does it cover in 5 hrs?
3. Mayanja drove his car for 45km at a speed of 40km/hr. What distance did he cover?
4. A motorist makes a journey from 8:30am to 10:50am at 70km/hr. What distance does he cover?
5. What distance is covered by a lorry that moves for 6 hrs at a speed of 35km/hr.

MORE ABOUT DISTANCE (Given time points)

1. Moving at 60km/hr, a bus completed the journey from 10:30am to 1:20pm. How long was the journey?
2. At a speed of 54km/hr a cyclist left Katonga at 9:00am and arrived at Kamapala at 12:30pm. How far is Kampala from Katonga?
3. A bus moves at an average speed of 90km/hr from 8:15am to 11:15am. What distance does it have?

Finding Time

Example:

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

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

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

$$= 100\text{km} \div \frac{40\text{km}}{\text{hr}}$$

$$= 120\cancel{\text{km}} \times \frac{\text{hr}}{40\cancel{\text{km}}}$$

$$\text{Time} = \mathbf{3\ hrs}$$

Activity

1. How long will it take a car to cover a distance of 80km at a speed of 20km/hr?
2. A bus travels at a distance of 200km at a speed of 40km/hr. Find the time it takes.
3. The speed of a cyclist is 70km/hr. How long will he take to cover a distance of 350km?
4. Moving at a sped of 70km/hr, Lule covered a distance of 490km on his bicycle. How many hours did he take?
5. It is 220km from Masaka to Kampala. How long will a car take to cover that distance at a speed of 40km/hr?

Finding speed

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

Example

A car travels for 2 hrs to cover a distance of 210km. Find its average speed.

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

$= \frac{210\cancel{hr}}{3\cancel{hr}}$

$= \underline{70km/hr}$

Activity

1. A bus travelled for 2 hrs to cover a distance of 160km. At what speed was the bus travelling?
2. Muguma took 10 minutes to run a distance of 100m. What was his speed (m/min).
3. Find the speed at which a driver should drive to cover a distance of 240km in 5 hrs.
4. Find the average speed of a train that covered 144km in 4hrs.
5. It is 150m from Kampala to Malaba. At what speed should a taxi run to cover the journey in 2 ½ hrs.

Changing km/hr to m/sec

Example

Change 180km/hr to m/sec.

1 km = 1000m

1 hr = 3600 sec

Therefore; $\frac{\text{Distance in metres}}{\text{Time in seconds}}$

$= \frac{180 \times 1000}{(3600 \times 1) \text{ sec}}$

= 50m/sec

Exercise

Express the speed below in m/second.

a) 36km/hr
b) 72km/hr
c) 216 km/hr
d) 162km/hr
e) 144km/hr
f) 360km/hr

Changing m/sec to km/hr

Example

Convert 20m/sec to km/hr.

1000m = 1km

Therefore; 1m $= \frac{1}{1000}$ km

20m $= \left(\frac{20}{1000}\right)$ km

$= {}^{20}/_{1000} \div ({}^{1}/_{3600})$ hr

$= \frac{2\cancel{0}\text{ km}}{1\cancel{000}} \times \frac{36\cancel{00}}{1\text{hr}}$

$= 2 \times 36$

= 72km/hr

Activity

Convert to km/hr.

a) 40m/sec
b) 30m/sec
c) 90m/sec
d) 100m/sec
e) 25m/sec
f) 70m/sec
g) 60m/sec
h) 150m/sec
i) 50m/sec

Finding Average speed

Example

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

Distance $= S \times T$

$= \frac{60km}{\cancel{hr}} \times 3\ \cancel{hr}$

$= 180km$

Total distance = (180 x 2)

Total time = 3 + 2

= 5

Average speed $= \frac{180 \times 2}{5}$

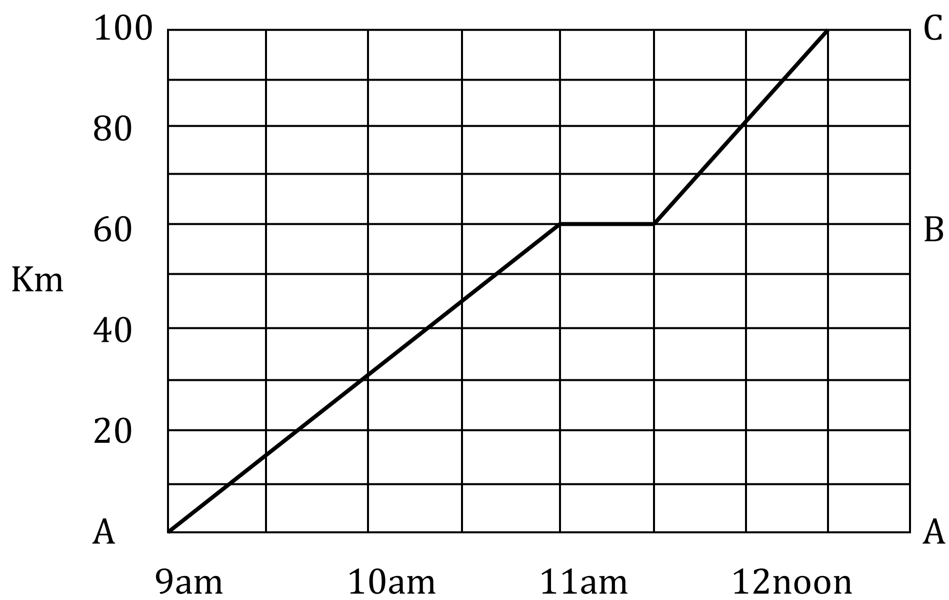
= 72km/hr

Activity

1. A car takes 2 hrs to cover a certain distance at 60km/hr but it returns in 3 hrs. Calculate its average speed for the whole journey.
2. A lorry takes 4 hrs to travel from Kampala to Lyantonde at 45km/hr but returns in 6 hrs. Find its average speed for the whole journey.
3. Ali took 4 hrs to cover a journey at 60km/hr but it takes only 2 hrs to return though the same distance. Calculate its average speed for the whole journey.
4. Bosco ran for 3 hrs at a speed of 6km/hr and another 2 hrs at a speed of 5km/hr. Find the average speed for the whole journey.
5. A bus takes 6 hrs to cover a distance of 80km/hr but it returns in only 4 hrs. Calculate its average speed for the whole journey.

TRAVEL GRAPHS

1. Town A and C are 100km apart. A motorist travelled from A to B for 2 hrs at a speed of 30km/hr, rested for 30mins and continued to C in only 1 ½ hr.



i) What is the distance from A to B.

ii) How far is C from B?

iii) At what speed did he more from B to C.

iv) What time did he take from A to B.

v) Find the average of the motorist for the whole journey.

NAMUWAYA EDUCATION CENTRE

TERM III LESSON NOTES 2019 BY CHAMBE IBRA.

MEASURES

CIRCUMFERENCE

Finding Radius

Radius = $\frac{\text{Diameter}}{2}$

Example

1. Find the radius of a circle of diameter 9cm.

   Radius $= \frac{\text{Diameter}}{2}$

   $= \frac{9\text{cm}}{2}$

   = 4 ½ cm or 4.5cm

Activity

Find the radius of a circle whose diameter is;

a) 6cm
b) 12cm
c) 24cm
d) 20cm
e) 45cm
f) 100cm
g) 17cm

Finding diameter

Example

Find the diameter of a circle whose radius is 15cm.

Diameter = Radius x 2

= 15cm x 2

= 30cm

Activity

Find the diameter of a circle whose radius is;

a) 4cm
b) 10cm
c) 16cm
d) 6cm
e) 10 ½ cm
f) 11cm

____

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Calculating the circumference of a circle

Example

1. Find the circumference of a circle whose diameter is 10cm. (Use π = 3.14)

   C = π D
   = 3.14 x 10cm
   = 31.4cm

2. Calculate the circumference of a circle whose radius is 3 ½ .(Use π = $^{22}/_{7}$)

   C = π D or π r
   $= 2 \times \frac{22}{7} \times 3\frac{1}{2}$ cm
   $= \frac{\cancel{2}}{1} \times \frac{\cancel{22}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}}$ cm
   C = 22cm

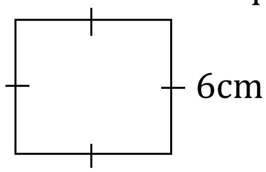
Activity

1. Find the circumference of a circle whose diameter is 5cm. (Use π = 3.14)
2. A circular bottom of a mug has a radius of 50mm. Find the circumference.
   (Use π = 3.14)
3. Find the circumference of a circle whose radius is 7cm. (Use π = $^{22}/_{7}$)

Area of squares

Examples

1. Find the area of a square whose side is 6cm.

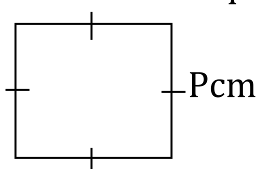


Area = side x side

= 6cm x 6cm

= $36cm^2$

2. Find the area of a square whose side is pcm.



Area = side x side

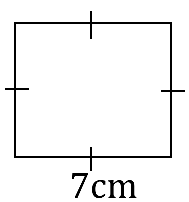
= pcm x pcm

= p^2 cm^2

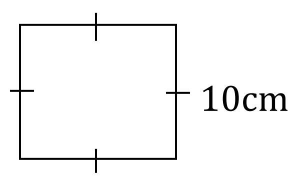
Activity

1. Find the area of the following squares.

a)



b)



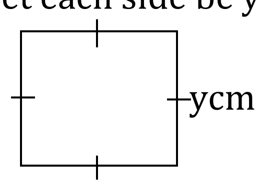
2. The side of a square is 8cm. Find its area.

Finding the side of the square

Example

1. The area of a square is 64cm2. Find the length of each side of the square.

Let each side be y.



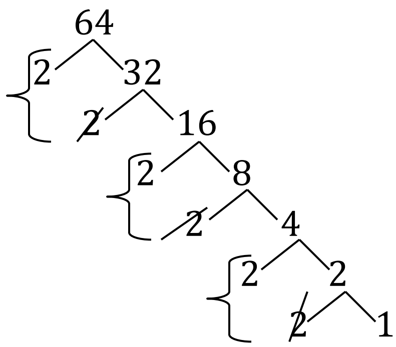
y x y = Area

$\sqrt{y^2} = \sqrt{64}$

$\sqrt{y \times \cancel{y}} \quad = \sqrt{2 \times 2 \times 2 \times 2}$

$y = 8$

Therefore each length = 8cm



Activity

1. Find the length of each side of the square whose area is;

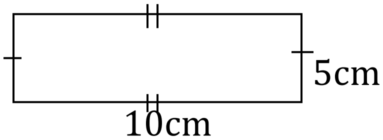
   a) $25cm^2$ b) $36cm^2$ c) $81cm^2$

2. Find the area of a square piece of paper whose side is 12cm. Find the value of x^2.
3. If $3x^2 = 27$. Find the value of x.
4. The area of a square is 900cm2. Find the length of each side of the square.

Area of rectangle

Example

A rectangle is 10cm long and 5cm wide. Find the area of the rectangle.



Area of a rectangle = Length x Width

= $10cm \times 5cm$

= $\mathbf{50cm^2}$

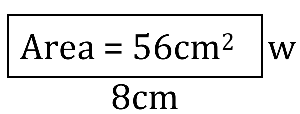
Activity

1. The length of the field is 700m long and 600m wide. Find its area.
2. Find the area of a rectangle whose length is 40cm and width 30cm.
3. A rectangle measures 25m by 20m. Find its area.
4. The length of a rectangle field is 120m by 80m. Find the area of the field.

Finding the side of a rectangle when area is given

Example

The area of a rectangle is 56cm2. The length is 8cm. Find the width of the rectangle.



Length x width = Area

$8cm \times w = 56cm^2$

$$\frac{\cancel{8cm} \times w}{\cancel{8cm}} = \frac{56\cancel{cm^2}}{8\cancel{cm}}$$

Width = 7cm

Activity

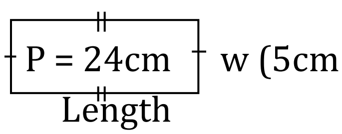
1. A rectangular piece of paper is $4800mm^2$, its width is 60mm. Find its length.

2. The area of a rectangular field is $96cm^2$, its width is 8cm. Find the length.
3. The area of a rectangle is 42cm2. The length is 7cm. Find its width.
4. A rectangular garden is $50m^2$, its width is 5cm. Find its length.

<u>Finding area when given perimeter</u>

<u>Example</u>

1. The perimeter of the rectangle is 24cm and the width is 5cm.
   a) Find length
   b) Find area



$$L + W + L + W = \text{Perimeter}$$
$$L + L + W + W = p$$
$$2L + 5cm + 5cm = 24cm$$
$$2L + \cancel{10cm - 10cm} = 24cm - 10cm$$
$$\frac{2L}{2} = \frac{14cm}{2}$$
$$L = 7cm$$

The length = 7cm

Area = Length x Width
= 7cm x 5cm
= $35cm^2$

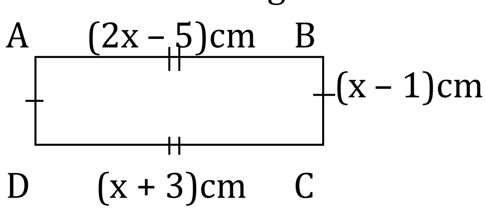
Activity

1. The perimeter of a rectangle is 40cm and the width of the rectangle is 8cm.
   a) Find the length of the rectangle.
   b) Find the area of the rectangle.
2. The perimeter of a rectangle is 36cm, its length is 10cm.
   a) Find its width.
   b) Find its area.
3. The perimeter of a rectangular garden is 80cm, its width is 18cm.
   a) Find its length.
   b) Find its area.

Finding sides, area & perimeter

Example

ABCD is a rectangle.



a) Find the value of x.

$2x - 5 = x + 3$

$2x - 5 + 5 = x + 3 + 5$

$2x - x = 8$

$\mathbf{x = 8}$

b) Find the width and the length.

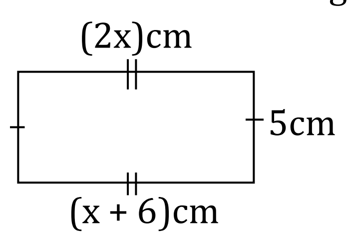
Width	Length
= (x +3)cm	= (x -1)cm
= (8 + 3)cm	= (8 – 1)cm
= 11cm	**= 7cm**

c) Find the area and perimeter.

Area	Perimeter
A = L x W	P = 2(L x W)
A = 11cm x 7cm	P = 2(11 + 7)
A = 77cm²	**P = 36cm**

Activity

1. Work out the following.



The diagram is a rectangle.

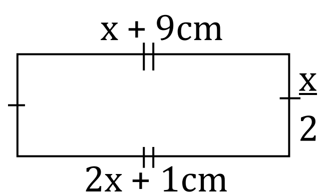
a) Find the value of x.

b) Find the length.

c) Find the area.

d) Work out the perimeter.

2.



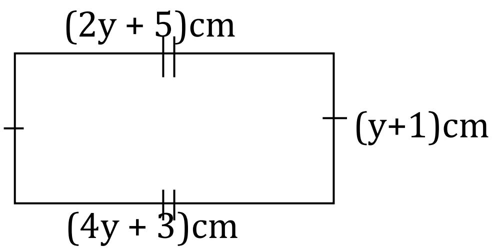
a) Find the value of x.

b) Find the length and width of the rectangle.

c) Find the perimeter of the rectangle.

d) Find the area of the rectangle.

3.



a) Find the value of y.

b) Find the width and length of the rectangle.

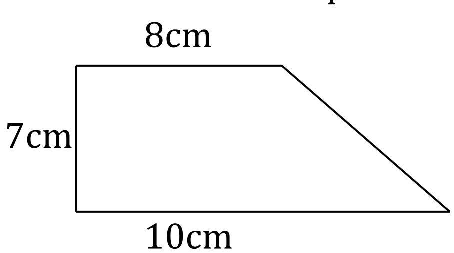
c) Work out the area

d) Find the perimeter of the rectangle.

Area if trapezium

Example

Find the area of the trapezium below.



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

$= \frac{1}{2}$ x 7cm (8 + 10)

$= \frac{1}{2}$ x 7 x 18 cm

$= \frac{1}{2}$ x 7cm x 9cm

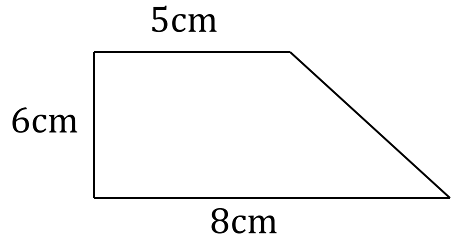
= 7cm x 9cm

= 63cm^2

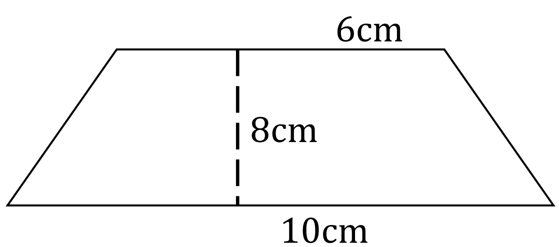
Activity

1. Find the area of the shapes below.

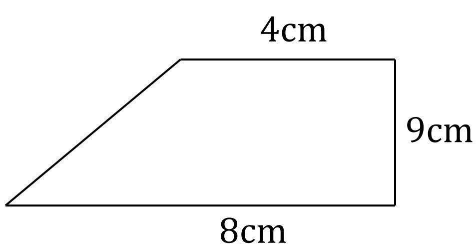
a)



b)



c)



2. Find the area of a trapezium of height 10cm and the parallel sides are 12cm and 18cm.
3. If A = ½ h (a + b). Find A if h = 8cm, a = 14cm and b = 15cm.

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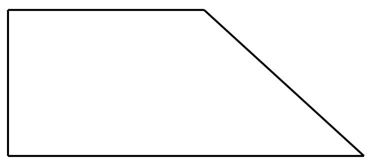
Finding one side of a trapezium

Example

The area of a trapezium is 60cm2, height is 4cm and one of the parallel sides id 10cm. Find the length of the second parallel side.



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

$\frac{1}{2} \times 4\ (a + b)\ \ A$

$2(a + 10) = 60$

$2a + 20 = 60$

$2a + 20 - 20 = 60 - 20$

$\frac{\cancel{2}a}{\cancel{2}} = \frac{40}{2}$

$\mathbf{a = 20cm}$

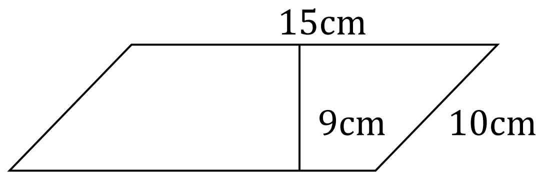
Activity

1. Find the length of the second parallel side of a trapezium if the area is $56cm^2$, the height 8cm and one of the parallel sides is 4cm.
2. $A = \frac{1}{2}h(a + b)$. Find the value of A, if b = 6cm, h = 9cm and a = 10cm.
3. The parallel sides of a trapezium are 10cm and 12cm. Find the height of the trapezium if the area is $77cm^2$.

Area of parallelogram

Example

Find the area of the parallelogram below.



Area of parallelogram $= b \times h$

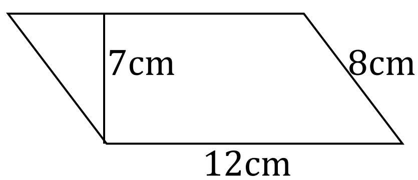
$= 15cm \times 9cm$

$= \mathbf{135cm^2}$

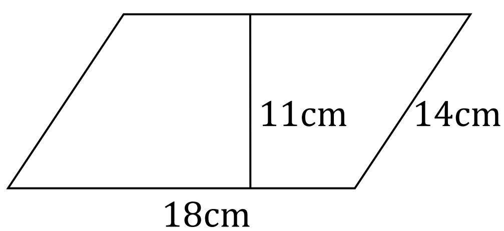
Activity

Find the area of the shapes below

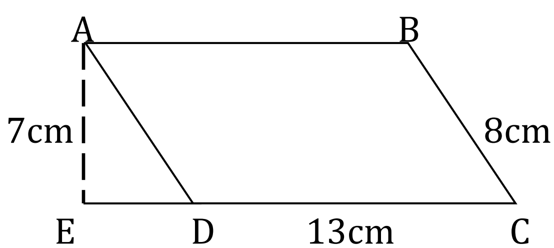
1.



2.



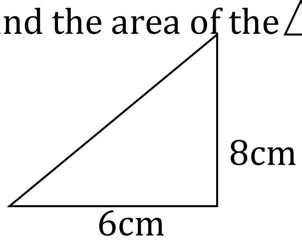
3.



Area of triangle

Examples

1. Find the area of the △



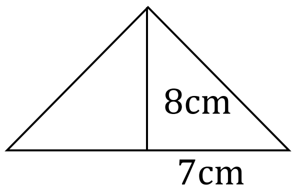
$A \quad = \frac{1}{2}\, b\, h$

$= \frac{1}{2} \times 6cm \times 8cm$

$= 3cm \times 8cm$

$= 24cm^2$

2. Workout the area of the triangle below.



$A = \frac{1}{2} \times b \times h$

$A = \frac{1}{2} \times 7cm \times 8cm$

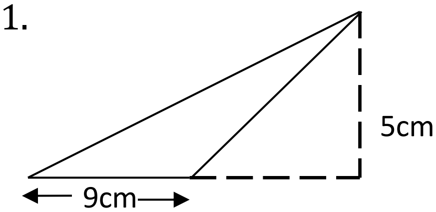
$A = 7cm \times 4cm$

$A = 28cm^2$

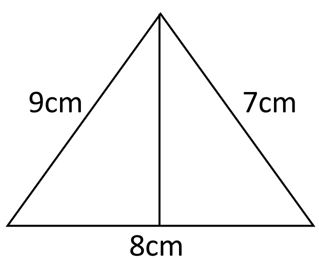
<u>Activity</u>

Find the area of the triangle below.

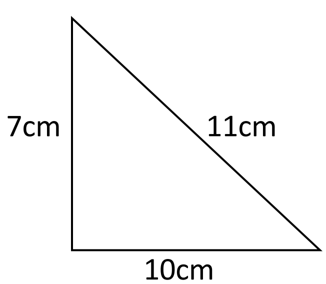
1.



2.

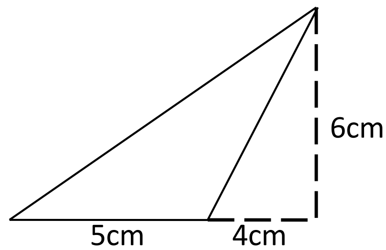


3.

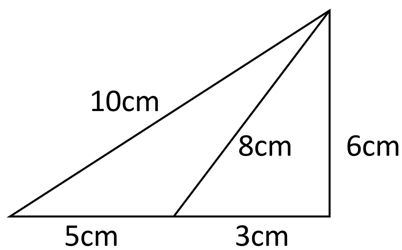


Find the area of the shaded triangle

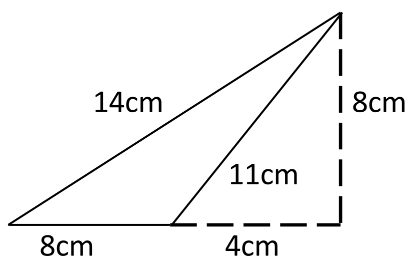
4.



5.



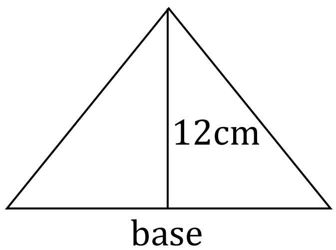
6.



Finding one side of a triangle when area is given

Example

Find the base of a triangle whose area is $60cm^2$ and height is 12cm.



$\frac{1}{2}$ x base x height = Area

$\frac{1}{2}$ x b x 12cm = $60cm^2$

b x 6cm = 60cm2

$\frac{6b\ cm}{6\ cm} = \frac{60cm \times cm}{6cm}$

b = 10cm

Note: Base = $\frac{2 \times Area}{Height}$

Height = $\frac{2 \times Area}{base}$

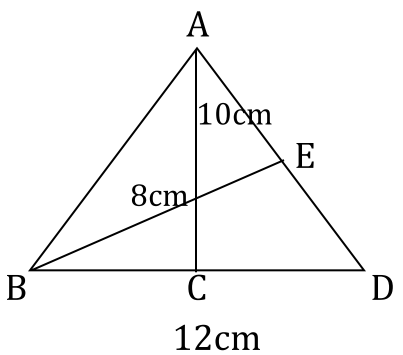
Activity

1. Find the height of a triangle whose area is $36cm^2$ and its base is 12cm.
2. Find the base of a triangle whose area is 20cm2 and height 8cm.
3. The area of a triangle is 40cm2. Find the height if the base is 10cm.
4. The height of a triangle is 9cm and its area is $36cm^2$. Find its base.

<u>**Finding base or height by comparing area**</u>

<u>Example</u>

ABD is a triangle. AC and BE are heights of the same triangle. BD = 12cm AC = 10cm BE = 8cm. Find length AD.



½ x AD x 8cm	= ½ x 12cm x 10cm
AD x 4cm	= 6cm x 10cm
4ADcm	= 60cm

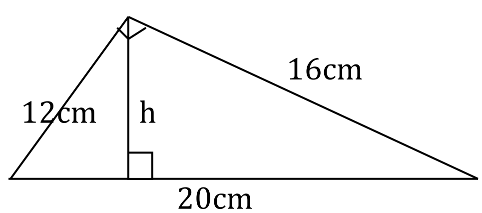
$$\frac{\cancel{4}\text{AD}\cancel{\text{cm}}}{\cancel{4\text{cm}}} = \frac{60\text{cm} \times \cancel{\text{cm}}}{4\cancel{\text{cm}}}$$

AD = 15cm

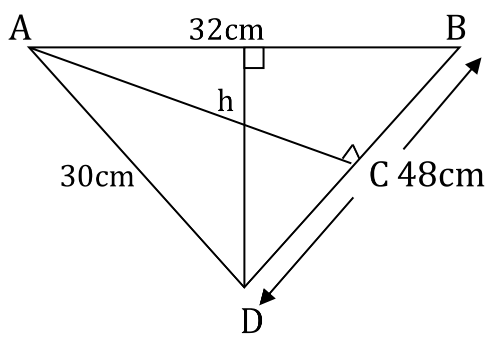
<u>Activity</u>

Find the value of the unknown in the figure below.

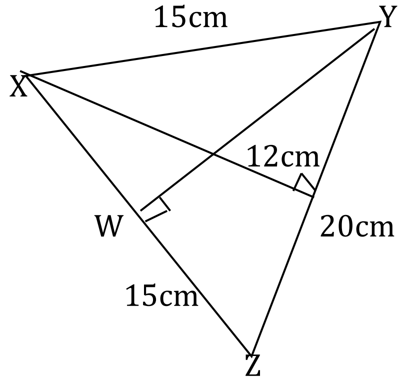
1.



2.



3.

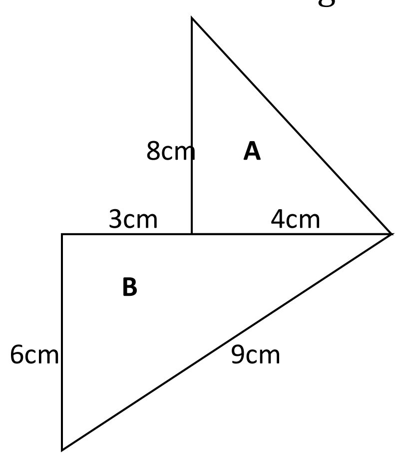


Finding sum of area

Example

Find the total area of each figure below.

a)



Area of fig. A

= ½ x b x h

= ½ x 4 x 8

= 2 x 8

= 16cm²

Area of fig. B

= ½ x b x h

= ½ x 7 x 6

= 7 x 3

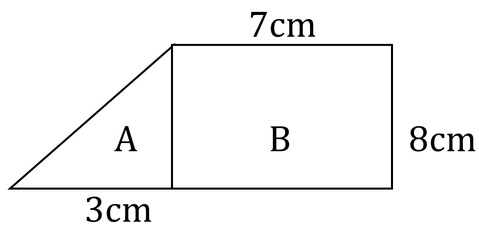
= 21cm²

Area A + Area B

= (16 + 21)

= 37cm²

b)



Area of fig. A

= ½ x b x h

= ½ x 3 x 8

= 12cm²

Area of fig. B

= L x W

= 8 x 7

= 56cm²

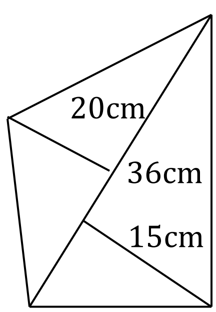
Total area = (12 + 56)cm²

= 68cm²

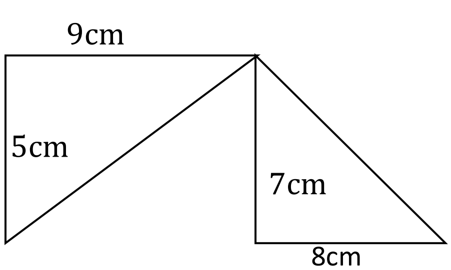
Exercise

Find the area of the shapes below.

1.



2.



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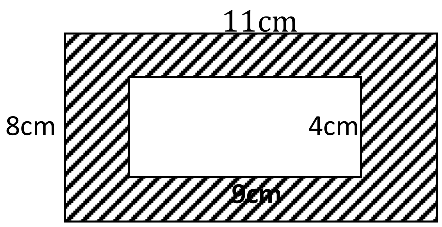
Finding differences of Area
Examples

1. Find the area of the shaded part.

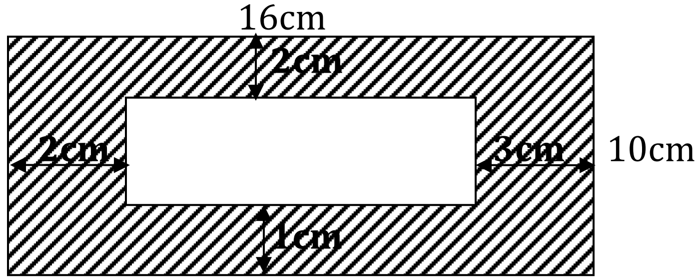


Area of outer rectangle = L x W
= 11cm x 8cm
= **$88cm^2$**

Area of inner rectangle = L x W
= 9cm x 4cm
= **36cm2**

Area of shaded part = $88cm^2 – 36cm^2$
= **$52cm^2$**

2. Study the diagram below carefully and find the area of the shaded part.



Finding length of inner figure.
= 16 – (2 + 3)
= 16 – 5
= 11cm

Finding width of inner figure.
= 10 - (2 + 1)
= 10 – 3
= 7cm

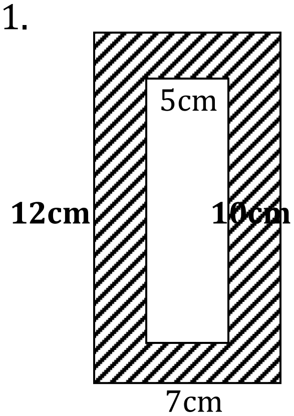
Area of outer fig. = L x W
= 16 x 10
= 160cm²

Area of inner fig. = 11cm x 7cm
= 77cm²

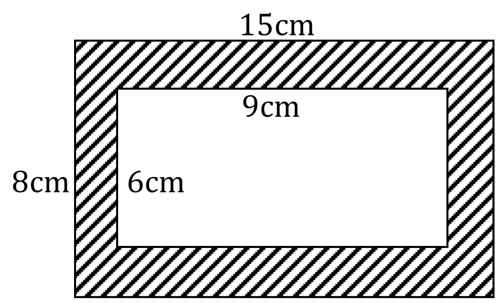
Exercise

Find the area of the shaded parts.

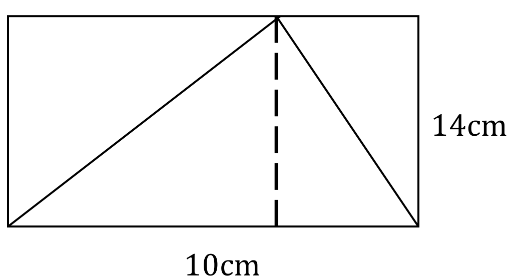
1.



2.



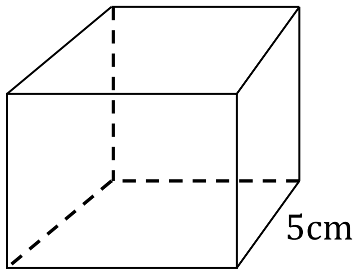
3.



Finding total surface area of cubes and cuboids

Examples

1. Find the Total Surface Area of the cube below.



T.S.A = $\left[(S \times S) + (S \times S) + S \times S\right]$

$= 2\ (S^2 + S^2 + S^2)$

$= 2 \times 3S^2$

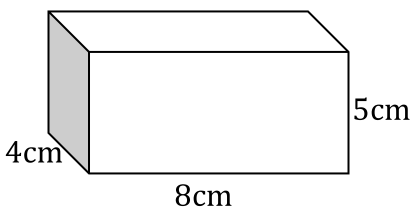
$= 6s2$

$= 6 \times 5^2$

$= 6 \times 25m$

$= \mathbf{150m^2}$

2. A cuboid measure 8cm long 4cm wide and 5cm high. Find its volume.



T.S.A $= 2\ (lw\ + wh + lh)$

$= 2(8x4 + 4 \times 5 + 8\ x5)$

$= 2\ (32 + 20 + 40)$

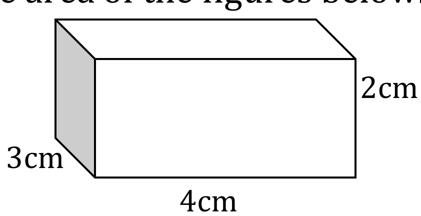
$= 2 \times 92$

$= \mathbf{184cm^3}$

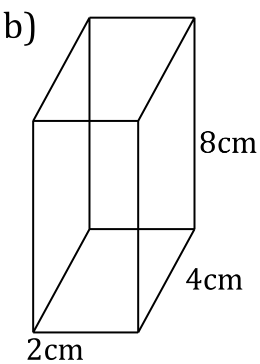
Exercise

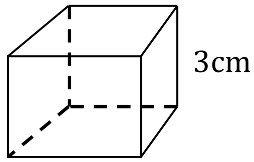
Find the area of the figures below.

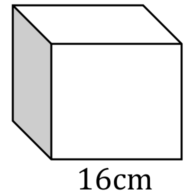
a)



b)



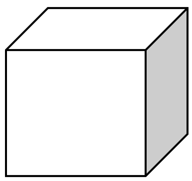
c) 

d) 

<u>Finding the measures of each side of a cube given its total surface area</u>

<u>Examples</u>

The total surface area of a cube is 384cm^3



T.S.A = 6s2

$6S^2 = 384$

$\frac{6S^2}{6} = \frac{384}{6}$

$S^2 = 64$

$\sqrt{S^2} = \sqrt{64}$

$S = 8$cm

Each side measures 8cm

<u>Activity</u>

Find the measure of each side of a cube whose total surface area is;

a) 96cm^2 b) 150cm^2 c) 726cm^2

d) 600m^2 e) 2646m^2 f) 2904m^2

g) 486cm^2 h) 6m^2

–

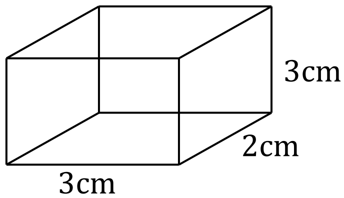
<u>Finding volume of cubes and cuboids</u>

Volume is the amount of space occupied by an object.

Units can be m^3 , cm^3 , mm^3

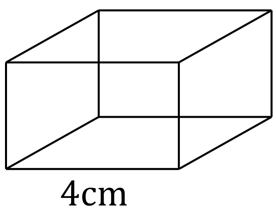
Examples

1. Find the volume of cuboid below.



Volume = l x w x h
= 3 x 2 x 3
= 6 x 3
= 18cm³

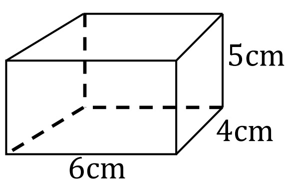
2. A cube measures 4cm a side. Find its volume.

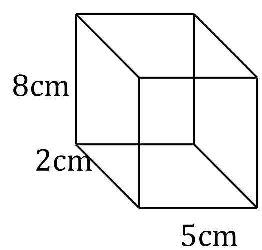


Volume = S x S x S
= S^3
= 4 x 4 x 4
= 16 x 4
= 64cm³

Activity

1. Find the volume of the figures below.





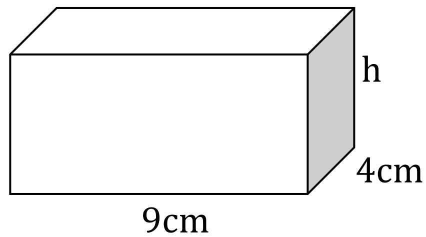
2. Calculate the volume of a cuboidal tank whose length is 11m, width 4m and
height 6m.
3. A cubical milk tank measures 6m a side. Find the volume of the tank.
4. A soap box measures 40cm by 10cm by 5cm. What is its volume?

–

Finding one unknown side of a cuboid given the volume and the other sides.

Examples

1. Find the height of the rectangular prism below whose volume is $180cm^3$.



Volume $= l \times w \times h$

$9 \times 4 \times h = 180$

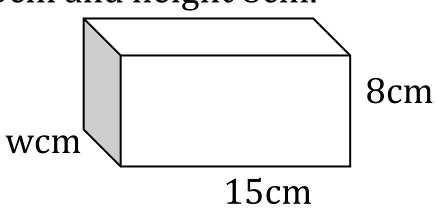
$36h = 180$

$\frac{\cancel{36}\,h}{\cancel{36}} = \frac{180}{36}$

$\mathbf{h = 5cm}$

height = 5cm

2. Find the width of a rectangular prism whose volume is 480cm3, length 15cm and height 8cm.



Vol $= l \times w \times h$

$15 \times 8 \times w = 480cm^3$

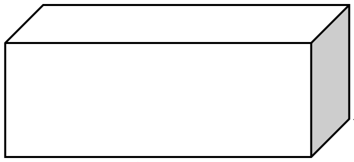
$120cm\ w = 480cm^3$

$\frac{\cancel{120cm^2}w}{\cancel{120cm^2}} = \frac{480\cancel{cm^3}}{120\cancel{cm^3}}$

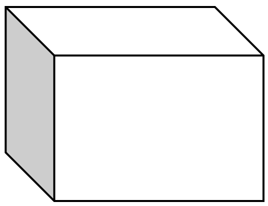
$\mathbf{w = 4cm}$

Exercise

1. Find the side marked by the letter.



Volume = $36cm^3$



The volume is $120cm^3$

3. The volume of a rectangular prism is 135m3. If the height and length are

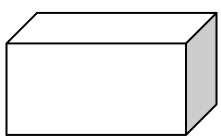
   3m and 5m respectively, what is the width?

3. The square base area of a cuboidal prism is 36cm2, and the volume is 360cm2. Find the height of the tank.

Finding volume of rectangular prism/cubes in litres

Examples

1. A rectangular tank is 30cm by 60cm by 90cm. Find its volume in litres.



Vol. of the tank = l x w x h

= (30 x 60 x 90

But 1 litre = 1000cm3

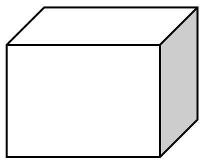
No of litres in the tank = $\frac{(30 \times 60 \times 90)cm^3}{1000\ cm^3}$

= 3 x 6 x 9

= 18 x 9

= 162 litres

2. A tank in form of a cube measures 50cm a side. Find the number of litres at full capacity.



50cm

Vol $= S \times S \times S$

$= (50 \times 50 \times 50)cm^3$

But 1 litre = 1000cm3

Number of litres $= \frac{50 \times 50 \times 50}{1000}$

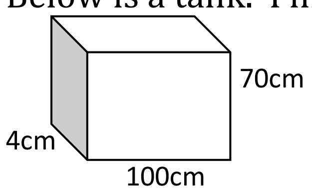
$= 5 \times 5 \times 5$

$= 25 \times 5$

= 125 litres

Activity

1. Calculate the volume in litres of a rectangular tank 80cm by 70cm by 20cm.
2. Below is a tank. Find its volume in litres.



3. How many litres of petrol are in a rectangular tank measuring 50m by 100m by 20m?
4. The bottom area of a rectangular tank is 1480cm2. Find its volume in litres if the height is 300cm.

MORE ABOUT VOLUME IN LITRES

Examples

1. The tank below is holding 72 litres of water.

i) Calculate the volume of h.

Volume of tank = 72litres

But 1 litre = 1000cm

Therefore; 72 hrs = 72 x 1000

$40 \times 60 \times h = 72000$

$h = \frac{72000}{40 \times 60}$

$h = \frac{120}{4}$

$\mathbf{h = 30cm}$

ii) How many litres are needed to fill the tank?

Height needed = (80 – 30)

= 50cm

Volume needed = $40 \times 60 \times 50$

= 2400×50

= $120000cm^3$

Number of litres = $\frac{120000}{1000}$

= 120 litres

2. Container has a volume of 108000cm3.
   i) Find the capacity of the container.
   ii) If the container is ¾ full of water. How many litres are needed to fill it?

Changing litres to millitres

Conversion table

L	dl	cl	ml
1	0	0	0
	1	0	0
		1	0

1 litre = 1000ml

Example

1. Change 7 litres to millitres

   L to ml

   1 l = 100ml

   7l = (7 x 1000)ml

   = 7000ml

2. How many ml are in 4 ½ l?

   L to ml

   1 l = 1000ml

   $\frac{9}{2}l = \frac{9}{2} \times 1000$ ml

   = 4500ml

Exercise

1. Change the following litres to millitres

a) 5 litres   b) 6 ¼ litres   c) 0.8 litres

d) 7 litres 300 lillilitres

<u>More about litres and millitres</u>

2. A cow gives 14 litres of milk daily. Express its daily milk production in millitres.
3. Aber fetched 15 litres of water and Mugura 18 litres of water. How many millitres of water did the two fetch?

<u>Changing millitres (ml) to litres (l)</u>

Examples

1. Change 3500 millitres to litres

   Ml to l

   1000ml = 1l

   1ml = $\frac{1}{1000}$ l

   3500ml = ($^1/_{1000}$ x 3500)l

   = $^1/_{1000}$ x 3500

   = 3 ½ litres

   OR **= 3.5 litres**

Exercise

1. Express the following millitres as litres.

a) 2000ml   b) 6000ml   c) 12000ml

d) 8500ml e) 870ml f) 5600ml

2. A baby takes 250 millitres of milk every feeding.
   i) How many litres does it take in 1 feeding.
   ii) How many litres does it take in 4 feedings.

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GEOMETRY

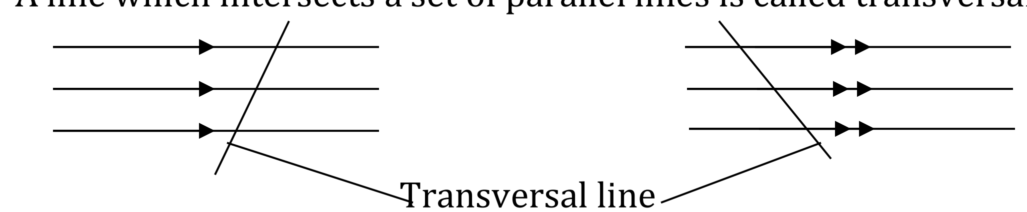
Construction of regular polygons

- Equilateral triangle
- Square
- Pentagon
- Hexagon
- Septagon/heptagon
- Octagon
- Nonagon

Construction of parallel lines

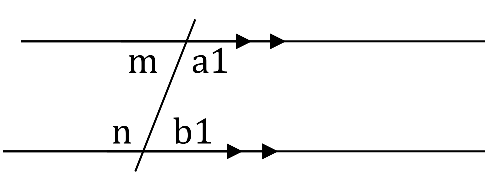
Angle proportion parallel lines

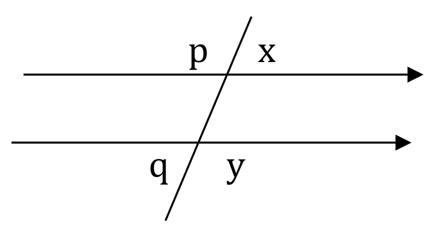
A line which intersects a set of parallel lines is called transversal line



When a transversal line intersects a pair of parallel lines, 8 angles are formed.

Examples





<a + <b1 = 180^0

<m + <n = 180^0

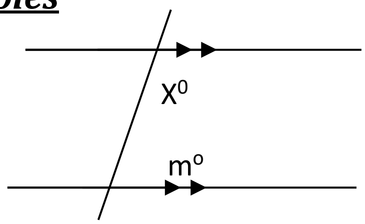
<x + <y = 180^0

<p + <q = 180^0

<u>Finding the unknown angles</u>

<u>Examples</u>

1.

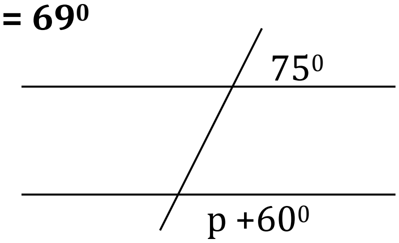


c + 111^0 = 180^0 (co-interior <)

x + 111^0 – 111^0 = 180^0 – 111^0

x = 69^0

2.



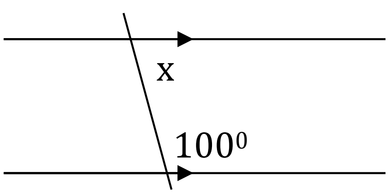
p + 60^0 + 75^0 = 180^0 (co-ext <)

p + 135^0 – 135^0 = 180^0 – 135^0

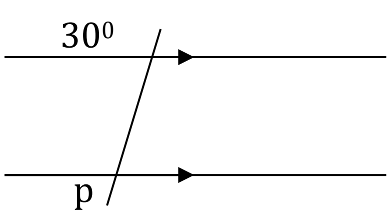
p = 45^0

<u>Activity</u>

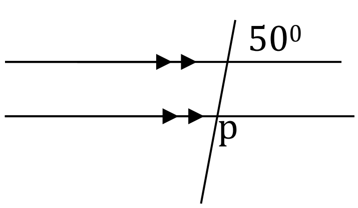
1.



2.

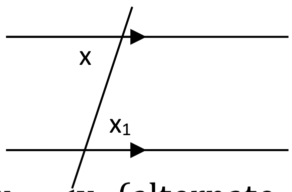


3.



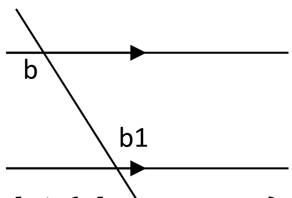
Alternate angles

1.



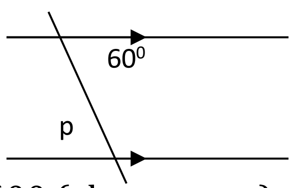
<x = <x_1 (alternate <s)

2.



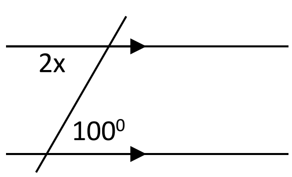
<b = <b1 (alternate <s)

3.



<p = 600 (alternate <s)

4.



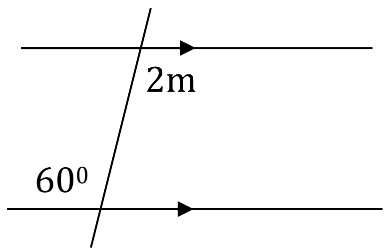
$2x = 100^0$ (alternate <s)

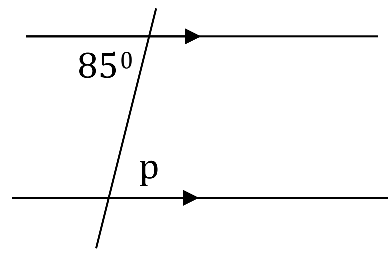
$\frac{2x}{2} = \frac{100}{2}$

$\mathbf{x = 50^0}$

Activity

1. Find the size of the marked angles below.

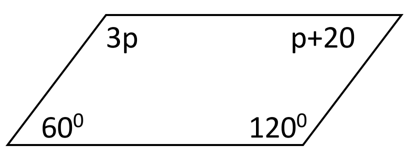




Finding angles formed by parallel lines

Examples

1. Find the values of the unknowns below.



$3p + 60^0 = 180^0$

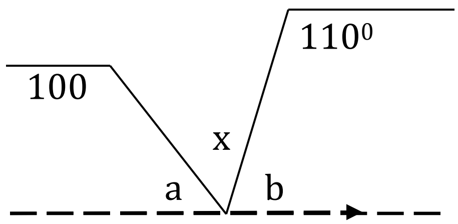
$3p + 60^0 - 60^0 = 180^0 - 60^0$

$3p = 120$

$\frac{3p}{3} = \frac{120}{3}$

$\mathbf{p = 40^0}$

2.



$a + 100^0 = 180^0$

$a + 100^0 - 100^0 = 180^0 - 100^0$

$\mathbf{a = 80^0}$

$b + 110^0 = 180^0$

$b + 110^0 - 110^0 = 180^0 - 110^0$

$\mathbf{b = 70^0}$

$a + x + b = 180^0$

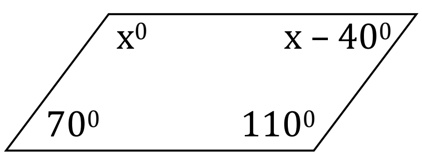
$8^{00} + x + 70^0 = 180^0$

$150^0 + x = 180^0$

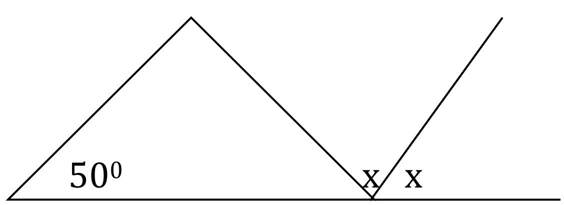
$150^0 - 150^0 + x = 180^0 - 150^0$

$\mathbf{x = 30^0}$

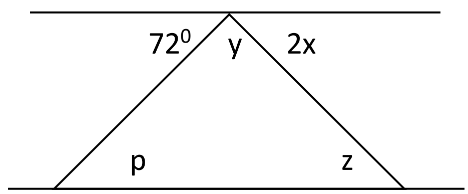
1. Find the value of the unknowns



2.



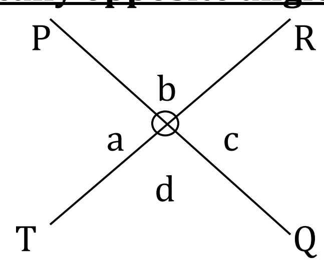
3.



CONSTRUCTION

- Constructing perpendicular lines on a given point.
- Constructing perpendicular bisectors on a given line.
- Constructing perpendicular bisectors from a given point.
- Constructing of angles (30^0 , 60^0 , 90^0, 45^0 ....) using a pencil, ruler and a pair of compasses.
- Constructing triangles using;
  S.S.S
  S.A.S
  A.S.A
- Constructing quadrilaterals
  Rectangles
  Squares

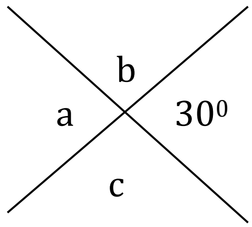
Vertically opposite angles



Lines TR and PQ have a common point O.
O is the point of intersection
<a and <c are vertically opposite angles and are equal.
<b and <d are vertical <s and they are equal.

Activity

1. Find the size of the angles marked by letters giving reasons.



i) <a = ______

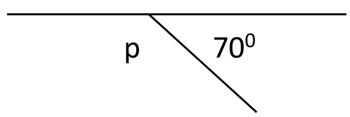
ii) <b + 300 = _____

iii) <b = _______

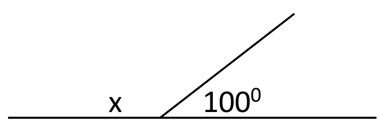
iv) <a + <b = _______

v) <a ++ <c = ________

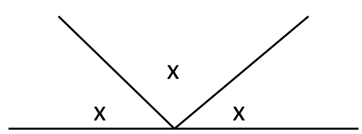
2.



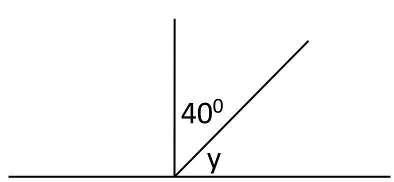
3.

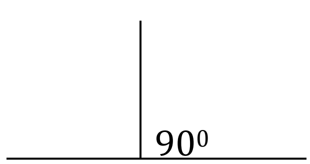


4.



5.





An angle with 90^0 is called a right angle.
Any two angles that add up to 90^0 are complementary angles.
Complementary angles add up to 90^0.
40^0 and 50^0 are complementary angles because $40^0 + 50^0 = 90^0$
40^0 is a complement of 50^0.

<u>Finding complementary angles</u>
What is the complement of 30^0?
Let the complement be y.
$y + 30^0 = 90^0$
$y + 30^0 - 30^0 = 90^0 - 30^0$
$y = 60^0$

<u>Activity</u>
What is the complement of each of the following?

a) 15^0 b) 89^0 c) 75^0
d) 50^0 e) 27^0 f) 25^0
g) $(x + 20^0)$ h) $(x - 20^0)$

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<u>Angle descriptions</u>

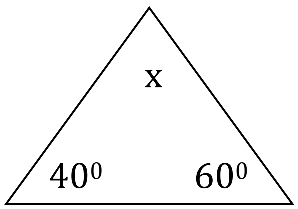
- Acute angles
- Obtuse angles
- Right angles
- Angles on a straight line
- Angles at a point

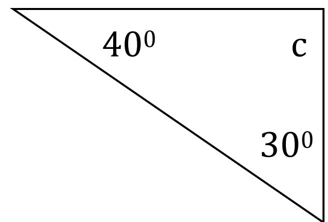
Interior and exterior angles of a triangle

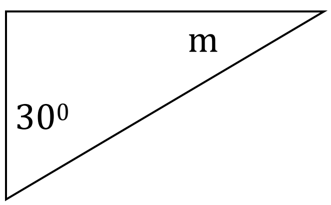
- Right angled triangle
- Equilateral triangle
- Scalene triangles
- Isosceles triangles

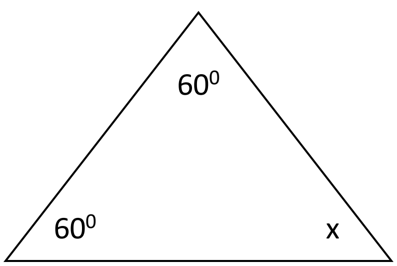
Angles in a triangle

Find the size of the angles marked by letters.

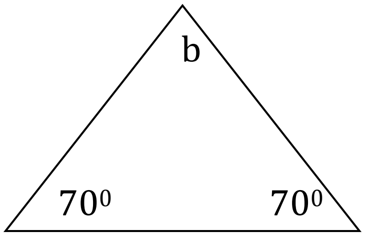
1. 

2. 

3. 

4. 

Angles of Isosceles triangles



Two base <s of an isosceles triangle are equal

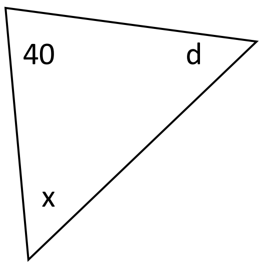
$b + 70^0 + 70^0 = 180^0$

$b + 140^0 - 140^0 = 180^0 - 140^0$

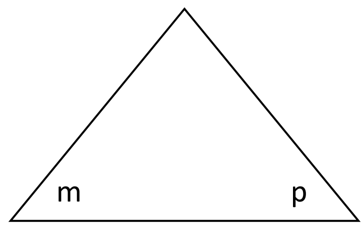
$b = 40^0$

Activity

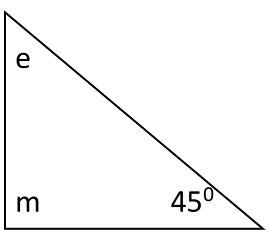
a)



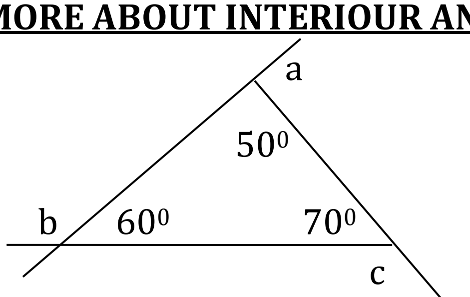
b)



c)



MORE ABOUT INTERIOUR AND EXTERIOR ANGLES



Using angles on a straight line

$<a = 180^0 - 50^0$

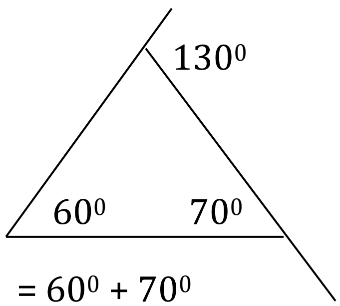
$= 130^0$

$<b = 180^0 - 60^0$

$= 120^0$

<c = $180^0 - 70^0$

= 110^0



<a = $60^0 + 70^0$

= 130^0

<u>Finding centre angles given sides</u>

1. Find the size of each centre angle of a regular polygon of 3 sides.

   All centre angles = 360^0

   Each centre angle = $\frac{360^0}{3}$

   = 120^0

2. A regular polygon has 12 sides. What is the size of each centre angle?

   No of sides = 12

   All centre angles = 3600

   Each centre angle = $\frac{\text{All centre}}{\text{No of sides}}$

   = $\frac{360^0}{12}$

   Centre angle = 30^0

<u>Activity</u>

Find the size of each angle of the following regular polygons whose number of sides are;

a) 4 sides b) 8 sides c) 6 sides d) 10 sides

e) 5 sides f) 12 sides g) 7 sides h) 20 sides

Finding the number of sides when the centre angle or exterior angle is given

1. Find the number of sides of a regular polygon whose centre angle is 60^0.

$$\text{Number of sides} = \frac{\text{All centre <s}}{\text{Each centre <s}}$$

$$= \frac{360^0}{60^0}$$

$$= \mathbf{6\ sides}$$

2. Find the number of sides of a regular polygon whose exterior angle is 72^0.

$$\text{Number of sides} = \frac{\text{All centre <s}}{\text{Each Ex <z}}$$

$$= \frac{360^0}{72^0}$$

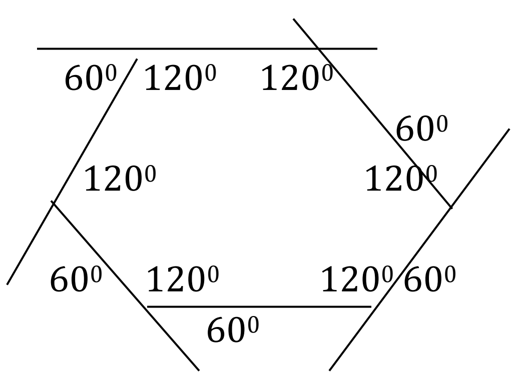
$$= \mathbf{5\ sides}$$

Activity

Find the number of sides of regular polygons whose centre are?

a) 10^0	b) 60^0	c) 30^0	d) 90^0
e) 40^0	f) 120^0	g) 45^0	h) 36^0

Exterior angles and interior angles of a regular polygon



Find the size of each interior angle of a regular polygon whose exterior angle is 120^0.

Let the interior be y.

$y + ext < \ = 180^0$

$y + 120^0 = 180^0$

$y + 120^0 - 120^0 = 180^0 - 120^0$

$y = 60^0$

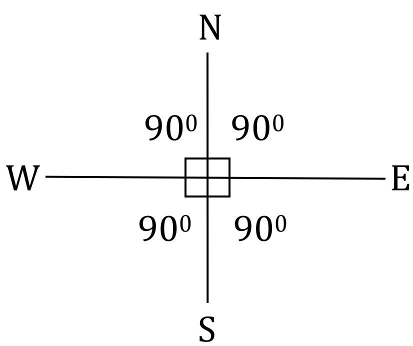
Find the size of each interior angle of a regular polygon whose exterior angle is;

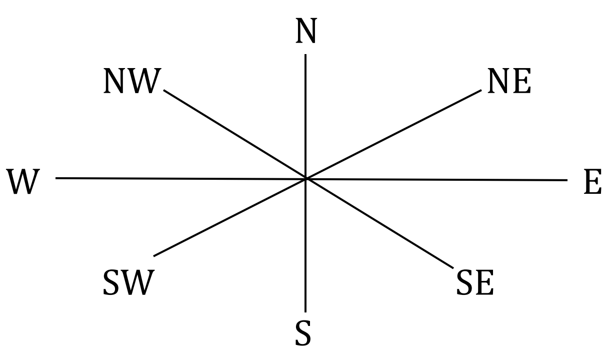
a) 10^0 b) 80^0 c) 30^0 d) 70^0
e) 40^0 f) 20^0 g) 50^0 h) 60^0

Find the size of each exterior angle of a regular polygon whose interior angle is;

a) 120^0 b) 160^0 c) 108^0 d) 130^0
e) 150^0 f) 100^0 g) 170_0 h) 140^0

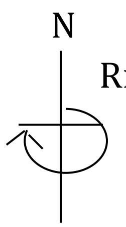
<u>Angles on a compass</u>



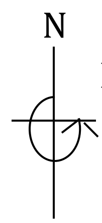


1. What is the larger angle between N and E?
2. What is the smaller angle between W and S?
3. What is the larger angle between W and S?
4. What is the angle between N and W?

Turns



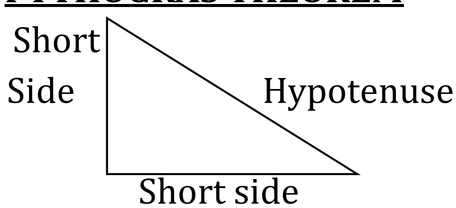
Right hand turn clockwise



Left hand turn ant-clockwise

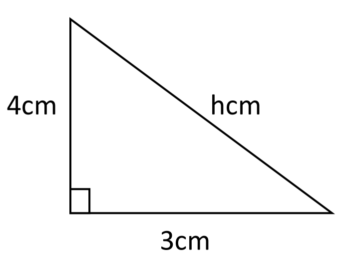
1. Through what angle do I turn if I turn from North to SE clockwise?
2. Through what angle do I turn if I turns clockwise;
   a) From NE to South?
   b) From West to SE
   c) From SN to SE
3. Through what angle do I turn if I turned anti-clock wise.
   a) From NE to West.
   b) From West to East.

<u>PYTHOGRAS THEOREM</u>



Finding the longest side (hypotenuse) of a right angled triangle.

1.



Find the value of h.

$a^2 + b^2 = c^2$

$3^2 + 4^2 = h^2$

$(3 \text{ x } 3) + (4 \text{ x } 4) = h^2$

$9 + 16 = h^2$

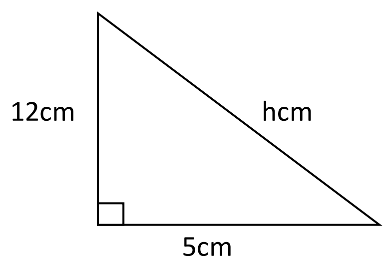
$\sqrt{25} = \sqrt{h^2}$

$\sqrt{5 \text{ x } 5} = \sqrt{h \text{ x } h}$

$5 = h$

Therefore h = 5cm

2.



Find the value of h

$a^2 + b^2 = c^2$

$5^2 + 12^2 = h^2$

$(5 \text{ x } 5) + (12 \text{ x } 12) = h^2$

$25 + 144 = h^2$

$\sqrt{169} = \sqrt{h^2}$

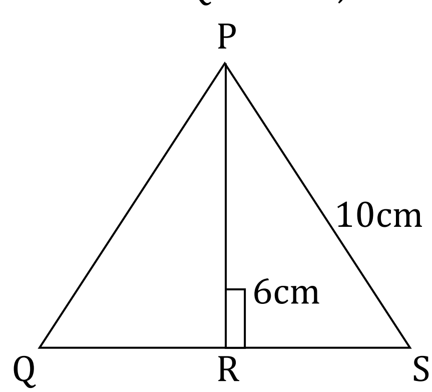
$\sqrt{12 \text{ x } 13} = \sqrt{h \text{ x } h}$

$13cm = h$

Therefore h = 13cm

<u>Pythogram theorem</u>

1. Given that PS = PQ = 10cm, PR = 6cm and bisect <P



i) Find the length of QS.

PR = 6cm

PS = 10cm

$RS^2 + 6^2 = 10^2$

$RS^2 + 6 \times 6 \quad = 10 \times 10$

$RS^2 + 36 \quad = 100$

$RS^2 + 36 - 36 \quad = 100 - 36$

$\sqrt{RS^2} \quad = \sqrt{65}$

$\sqrt{RS \times RS} \quad = \sqrt{8 \times 8}$

RS = 8cm

The length of QS = 8cm x 2

= 16cm

ii) Calculate the perimeter of the figure.

P = sum of all sides

= 16cm + 10cm + 10cm

= 26cm + 10cm

<u>= 36cm</u>

iii) Calculate the area of the figure.

base = 16cm

height = 6cm

Area = ½ bh

= ½ x 16cm x 6cm

= 8cm x 6cm

<u>**= $48cm^2$**</u>

iv) Find the area of the triangle PRS

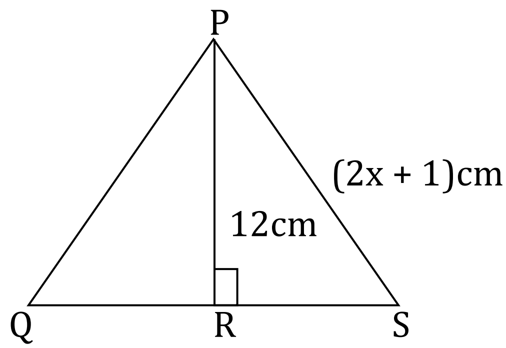
= ½ bh

= ½ 8cm x 6cm

= 4cm x 6cm

= $24cm^2$

2. PQS is an isosceles triangle. PQ = 13cm



i) Calculate the value of x.

20pp sides equal

$(2x + 1)cm = 13$

$2x + 1 = 13$

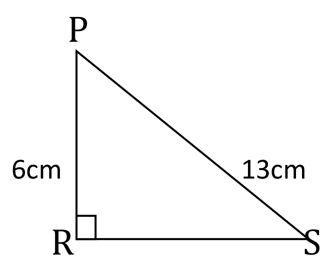
$2x + 1 - 1 = 13 - 1$

$2x = 12$

$\frac{2x}{2} = \frac{12}{2}$

$\mathbf{x = 6}$

ii) Find the length of QS using pythogras theorem



$RS^2 + 122 = 132$

$RS^2 + (12 \times 12) = 13 \times 13$

$RS^2 + 144 = 169$

$RS^2 + 144 - 144 = 169 - 144$

$\sqrt{RS^2} = \sqrt{25}$

$\sqrt{RS \times RS} = \sqrt{5 \times 5}$

RS = 5cm

The length of QS = RS + RS

= 5cm + 5cm

= 10cm

iii) Find the perimeter of the figure

P = sum of all sides

= 13cm + 13cm + 10cm

= 26cm +10cm

= 36cm

iv) Calculate the area of the triangle.

A = ½ bh

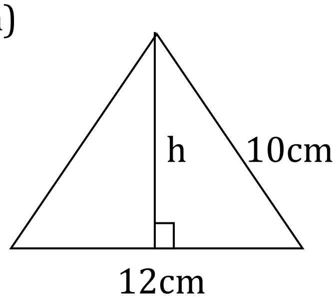
= ½ x 10cm x 12cm

= 5cm x 12cm

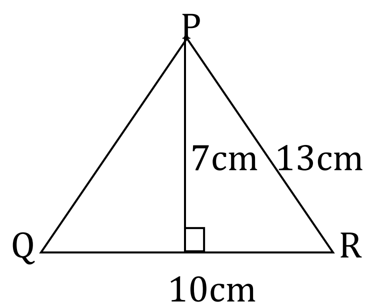
= 60cm²

Calculate the height, the perimeter and the area of each of the figures below

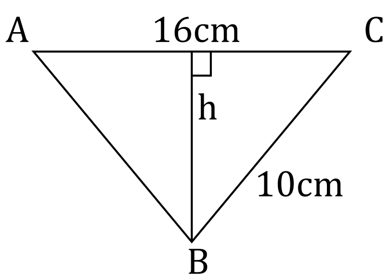
a)



b)

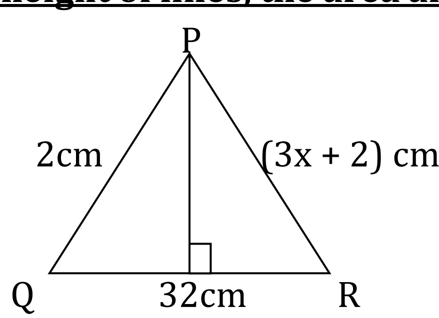


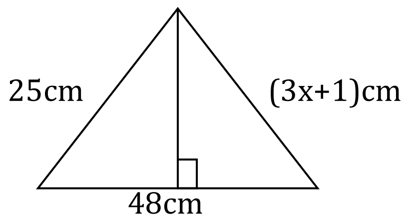
c)



d)

<u>Find x, height of lines, the area and the perimeter</u>





Lines of folding symmetry

- Equilateral triangle
- Isosceles triangle
- A rectangle
- A kite
- A square
- A trapezium
- An isosceles triangle
- A circle
- A regular pentagon
- Letters of alphabet

Length

Converting km to metres.

1. Change 3km to metres

   1km = 100m

   3km = 3 x 1000m

   = 3000m

2. Change 0.4km to metres

   1km = 1000m

   0.4km = 0.4 x 1000m

   $= \left(\frac{4}{10} \times 1000\right)m$

   = 4 x 100 m

   = 400m

Activity

Change cm to km.

a) 40000cm　　b) 110,000cm　　c) 160,000cm

d) 48,000cm　　e) 32,000cm　　f) 490,000cm

–

Changing metres to cm

1. Change 4m to cm

   1m = 100cm

   4m = 4 x100cm

   = 400cm

2. Express 0.9 m to cm

   1m = 100cm

   0.9m = 0.9 x 100cm

   $= \frac{9}{10} \times 100cm$

   = 9 x 10 cm

   = 90cm

Activity

Change the following m to cm.

a) 5m b) 1.2m c) 25m d) 9.6

e) 36m f) 0.18m

Changing cm to metres

1. Change 40cm to metres.

   100cm = 1m

   40cm $= \left(\frac{40}{100}\right)m$

   $= \left(\frac{4}{10}\right)m$

   = 0.4m

2. Change 600cm to metres.

100cm = 1m

600cm = $\left(\frac{600}{100}\right)$m

= 6 cm

Activity

Change the following cm to metres.

a) 120cm b) 18cm c) 360cm

d) 80cm e) 700cm f) 90cm

Activity

Change the km to metres.

a) 5km b) 0.6km c) 7km d) 24km

e) 8km f) 36cm g) 9km h) 0.93km

i) 13km j) 11km

–

Changing metres to km

1. Change 9000m to km.

Since 1000m = 1km

9000m = $\left(\frac{9000}{1000}\right)$ km

= 9km

2. **Change 800m to km**

1000m = 1km

800m = $\left(\frac{800}{1000}\right)$km

= $\left(\frac{8}{10}\right)$ km

= 0.8km

Activity

Change the following metres to km.

a) 6000m b) 700m c) 8000m d) 80m

e) 900m f) 130m

Changing km to cm

1. Change 7km to centimeters

   1km = 10000cm

   7km = 7 x 10000cm

   = 70000cm

2. Change 0.4km 10 cm

   1km = 100000cm

   = 0.4 x 100000 cm

   = $\frac{4}{10}$ x 100000cm

   = 4 x 10000cm

   = 40000cm

Change km to cm

a) 4km b) 0.06km c) 11km d) 48km

e) 14km f) 69km g) 18km h) 53km

Change cm to km

Since 100,000cm = 1km

800,000cm = $\frac{800000}{100000}$

= 8km

Changing square metres to cm²

1. Change $2m^2$ to cm^2

   1cm = 100cm

   1m x 1m = 100cm x 100cm

   $1m^2$ = 100,000 cm^2

$2m^2 = (2 \times 10000)cm^2$

$= \mathbf{20,000cm^2}$

2. Express 1.2m2 to cm2.

   1m = 100cm

   1m x 1m = 100cm x 100cm

   $1m^2 = 10,000cm^2$

   $1.2m^2 = 1.2 \times 10,000cm^2$

   $= \left(\frac{12 \times 10,000}{10}\right) cm^2$

   $= (12 \times 1000)cm^2$

   $= \mathbf{12000\ cm^2}$

Activity

Change the following to square centimeters. (cm^2)

a) $3m^2$ b) $8.2m^2$ c) $5m^2$ d) $10.5m^2$

e) $4m^2$ f) $20m^2$ g) $6m^2$ h) $12m^2$

____

____

<u>Expressing km² to m²</u>

1. Express 4km2 as m2

   1km = 1000m

   1km x 1km = 1000m x 1000m

   $1km^2 = 1000,000m^2$

   $4km = (4 \times 1,000,000)m^2$

   $= \mathbf{4,000,000m^2}$

2. Change $2.5km^2$ to m^2

$1km^2 = 1,000,000m^2$

$2.5km^2 = (2.5 \times 1,000,000)\ m^2$

$= \left(\frac{25}{10} \times 1,000,000\right) m^2$

$= \mathbf{2,500,000m^2}$

Activity

Change the following to square metres.

a) $2km^2$ b) $0.02km^2$ c) $4km^2$

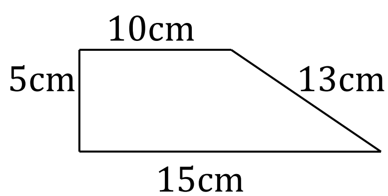
d) $0.03km^2$ e) $0.25km^2$ f) $3.6km^2$

g) $0.03km^2$ h) $8km^2$

–

Finding perimeter of geometry shapes.

1. Find the perimeter of the figure below.



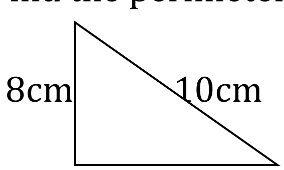
P $= 15cm + 13cm + 10cm + 5cm$

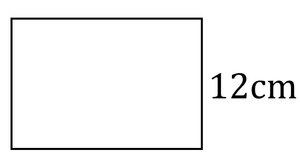
$= 28cm + 15cm$

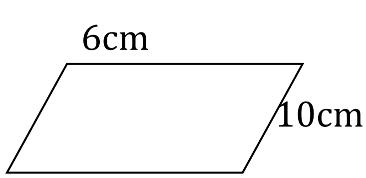
$= \mathbf{43cm}$

Activity

Find the perimeter of the following figures.







NUMERACY (THEME)

TOPIC 5: <u>INTEGERS</u>

Intergers are positive and negative numbers including zero plotted equidistantly on a number line.

Negative Positive

+ +

$^{-}7$ $^{-}6$ $^{-}5$ $^{-}4$ $^{-}3$ $^{-}2$ $^{-}1$ 0 $^{+}1$ $^{+}2$ $^{+}3$ $^{+}4$ $^{+}5$ $^{+}6$

$^{+}7$

A set of positive integers = {1 , 2 , 3 , 4 , 5 , 6 , ...}

A set of negative integers = { ... -4 , -3 , -2 , -1 }

N.B $_1$: Zero in neither positive nor negative.

N.B $_2$: Any integer without a sign is a positive integer.

Review the following;

- Inverse
- Integers on a number line/arrows on a number line.
- Ordering integers

<u>Addition and subtraction of integers</u>

Addition of integers

<u>Examples</u>

1. Add: +3 + +2

   $^{+}3 + 2$

   Therefore $^{+}3 + ^{+}2 = ^{+}5$

2. Add: +2 + +6

   +2 + 6

   $^{+}2 + ^{+}6 = ^{+}8$

3. Work out: -2 + -5

   $^-2 – 5$

   $^-2 + ^-5 = ^-7$

4. Add: -6 + -1

   -6 – 1

   Therefore $^-6 + ^-1 = ^-7$

Subtraction of integers

Examples

1. Subtract: $^+3 - ^+2$

   $^+3 – 2$

   Therefore $^+3 - ^+3 = ^+1$

2. Work out: $+5 - ^+4$

   $^+5 – 4$

   Therefore; $^+5 - ^+4 = ^+1$

Activity

1. Add the following integers

a) +2 + +3	b) +5 + +1	c) -6 + -2
d) -3 + +2	e) +6 + +6	f) -3 + -3
g) +7 + -2	h) -2 + +6	

2. Subtract the following integers.

a) +3 - +2	b) +4 - +6	c) -4 - -4
d) -7 - +8	e) 2 – 4	f) -1 -1
g) +3 - -3	h) +5 – 3	

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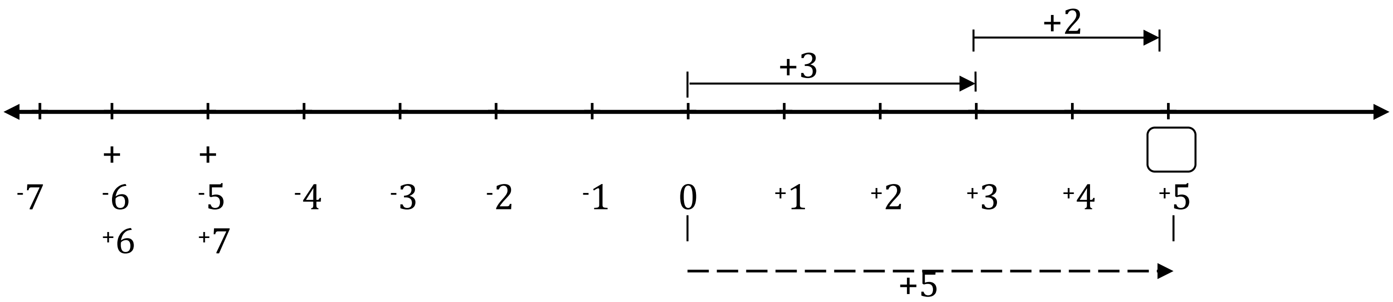
Integers on a number line

Addition and subtraction of integers on a number line.

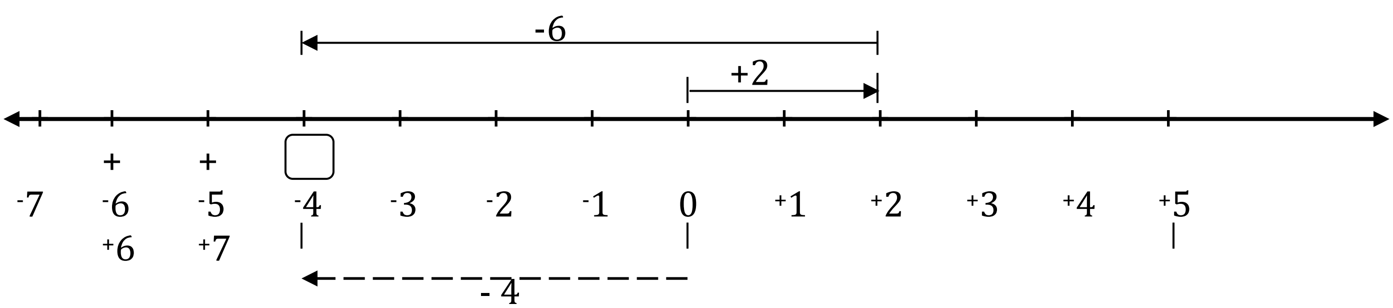
Examples

1. Add: +3 + +2



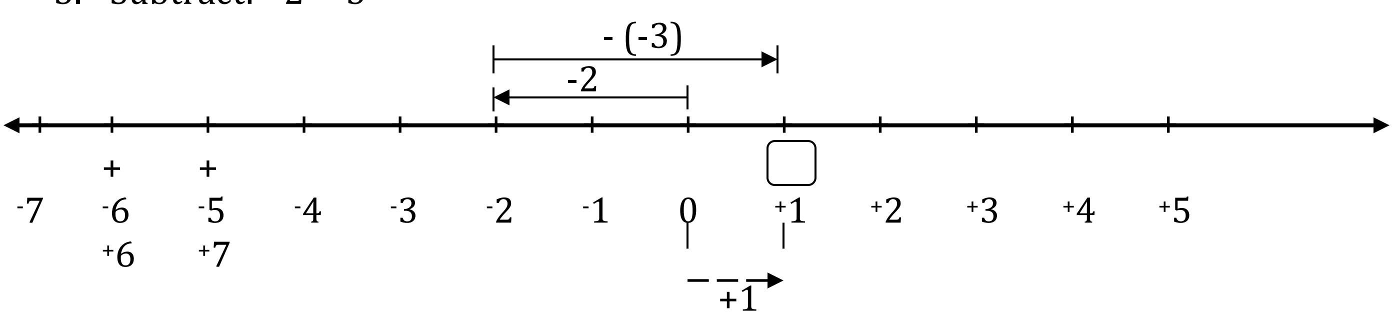
Therefore: +3 + +2 = +5

2. Simplify: +2 + -6



Therefore; +2 + -6 = -4

3. Subtract: -2 - -3



So; -2 - -3 = +1

Activity

1. Simplify the following using a number line.

a) +4 + +2　　b) -3 + -4　　c) -2 – 5

d) -3 - -3　　e) 4 – 6　　f) +5 + -3

g) -4 + 6　　h) 3 - -6　　i) 4 - +3

2. Show +3 + -6 on a number line.

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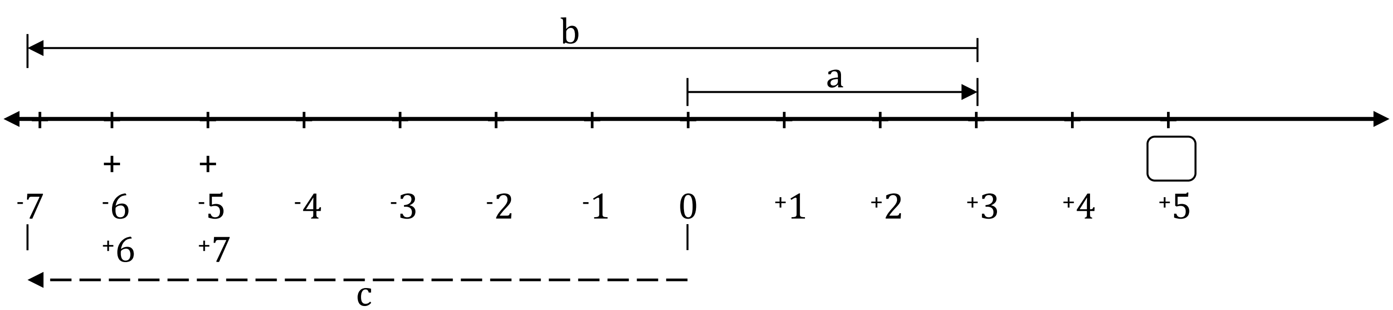
Mathematical statements (Addition and subtraction statement) and algebraic statement

Examples

Study the number line below and answer questions that follow.



a) Write an algebraic statement for the above number line.

An algebraic statement = (+a) + (-b) = -c

b) Write the mathematical statement for the above number line.

Mathematical statement consists of either addition or subtraction statement.

i) Addition statement

a = +3

b = + (-10)

c = -7

Addition statement = +3 + -14 = -7

ii) Subtraction statement

a = +3

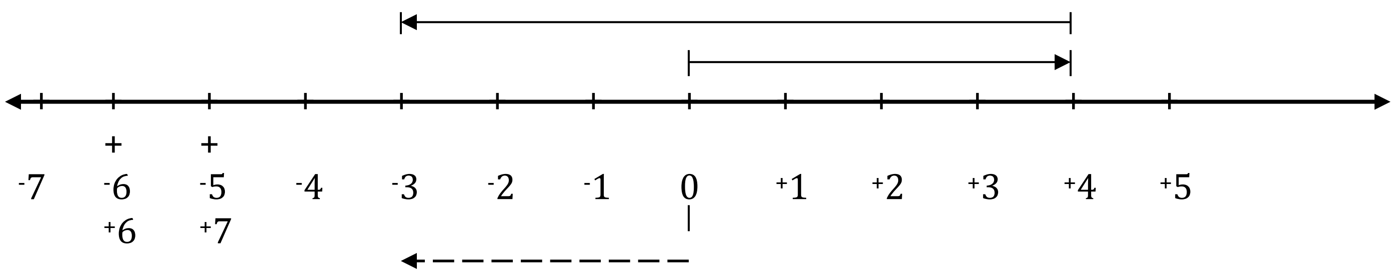
b = - (+10)

c = -7

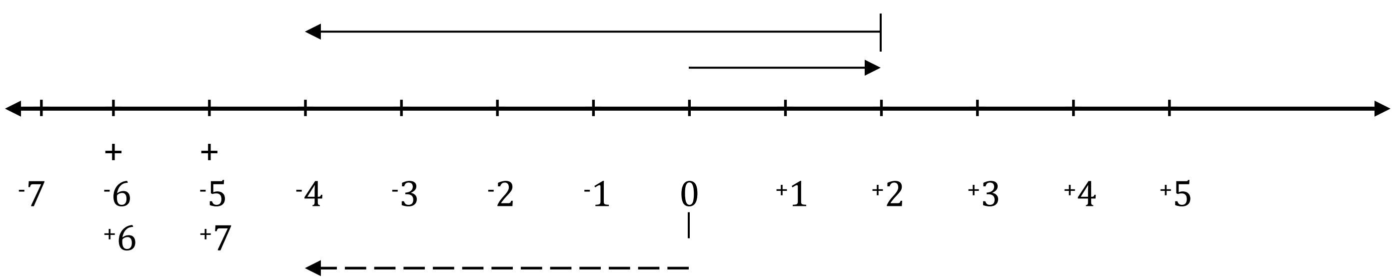
Subtraction statement = +3 - +10 = -7

Activity

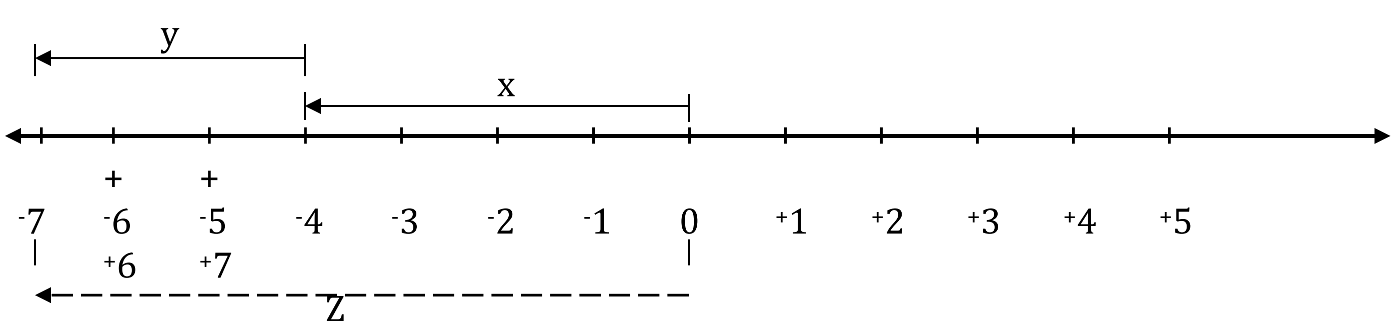
1. Write the subtraction statement for the number line below.



2. Write the addition statement for the given number line below.



3. Study the number line below and answer questions that follows.



a) What integer is respected by letter x , y and z?
   i) X ____________ ii) Y ______________ iii) z _____________
b) Write the mathematical statement for the above number line.

APPLICATION OF INTEGERS

Questions (some)

i) Kato borrowed shs. 5,000. If he paid back shs. 3,000. Find Kato's financial status.
ii) The temperature was 20^0F but has dropped by 23^0F. What is the temperature now?
iii) Peter was born 20AD and died 15BC. How old was he when he died?
iv) A motorist moved 100m forward and reversed 150km. How far is she from the starting point?
v) A patient's temperature dropped by 20C and by another 30c, find the patient's present temperature.

SOLUTION SETS AND INEQUALITIES

Inequality symbols are > , < , $\geq$, $\leq$

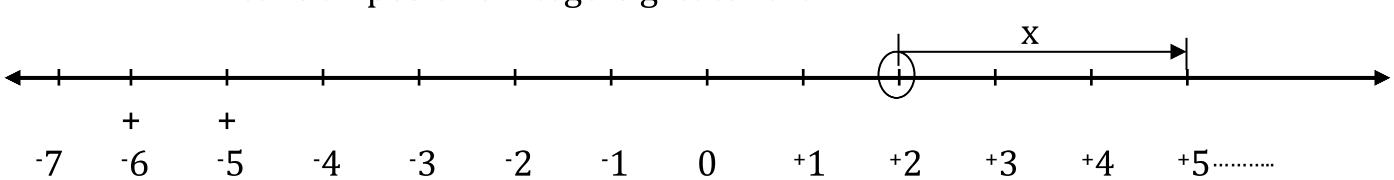
Solution set is a set of all possible values of unknown letter from the given inequality like;

x > 2

Finding solution set from the given inequality.

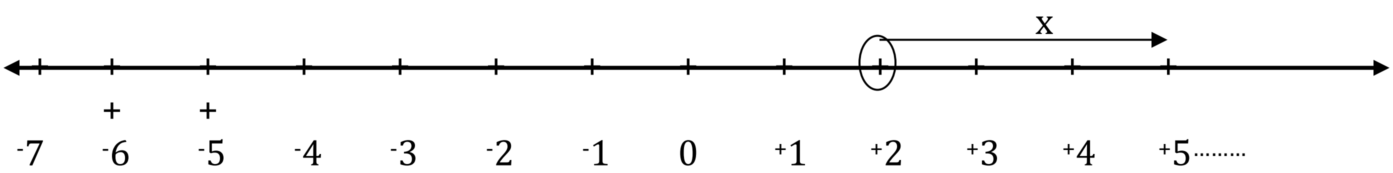
Examples

1. Given that; x > 2. Find all possible values of x if x is a positive integers.
   X > 2 means all positive integers greater than 2



Solution set for x = {3 , 4 , 5 , ….}

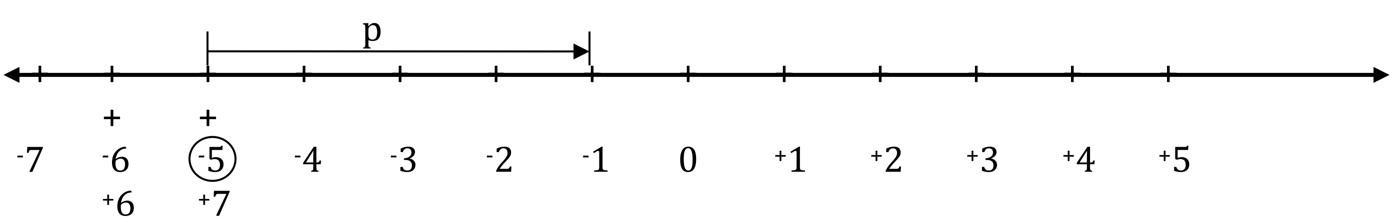
2. If $x \geq 2$. Find the solution set for x (x is a positive integer)
   $x \geq 2$ means all positive integers greater or equal to two.



The solution set for x = { 2 , 3 , 4 , 5 ....}

N.B: The circle is shaded because of equal sign

3. Given that; $p \geq -5$, find the solution set for p if p is a negative integers.
   $P > -5$ means p is a set of negative integers greater that or equal to -5



The solution set for p = { -5, -4 , -3 , -2 , -1 }

<u>NB:</u> Zero is neither negative nor positive integer, so all negative integers greater or equal to -5 stops in -1. Hence no dot after negative one (-1)

<u>Activity</u>

1. Find the solution set for $x < 5$ if x is a positive integer.
2. Given that $p \geq -6$. Find the possible values of p is a negative integer.
3. Find the solution set for $x \leq -2$.
4. Given that; $-4 < x \leq 4$
5. Find the solution set for $-3 \leq p < 6$

–

TOPIC: <u>ALGEBRA</u>

Writing phrases for algebraic expressions.

Examples

Add b to a $= a + b$

Subtract b from a $= a - b$

Multiply b by a $= ab$

Divide b by a $= \frac{b}{a}$

$2x + 3 =$ multiply x by 2, then add 3 to the result

$2(x + 3) =$ Add 3 to x then multiply the results by 2

$4y - 7 =$ multiply y by 4, then subtract 7 from the result

$4(y - 7) =$ subtract 7 from y then multiply the result by 4

$\frac{x}{4} + 5 =$ Divide x by 4, then add 5 to the result

$\frac{x + 5}{4}$ Add 5 to x then divide the result by 4

Exercise

Write phrases for the following.

a) $x + y$ b) $x\,y$ c) $x + 2$ d) $x - y$

e) $\frac{x}{y}$ f) $3n + 5$ g) $10x + 4$ h) $12a + 10$

i) $2a - 1$ j) $6p - 6$ k) $(m + 10)$ l) $\frac{t + 3}{2}$

m) $\frac{7}{x - 1}$ n) $\frac{b}{5} + 20$

<u>Expressing phrases as algebraic expressions</u>

2 more than p $= p + 2$

2 less than x $= x - 2$

Twice x $= 2x$

Three times of q $= 3q$

Half a $= \frac{a}{2}$

5 years younger than x $= x - 5$

7 years older than p $= p + 7$

Twice as old as n = $2n$
Four times k's age = $4k$
Average of a and b = $\frac{a + b}{2}$
Square p = p^2
Multiply the square of a by 3 = 3a2
Multiply n by 3 and square the result = $(3n)^2$
Multiply the sum of m and 9 by 7 = $7(m + 9)$

Exercise

Express the following as algebraic statements.

a) a more than 5
b) b divide by 4
c) m times 3
d) 13 more than d
e) X subtracted from 8
f) Thrice the sum of x and y
g) A third the difference between 9 and m
h) Half the sum of 2b , 3b , 8t and 6

Meaning of algebraic term

Example

2p means 2 x p or p x p
3qp means 3 x q x p
4q2 means 4 x q x q
$(4q)^2$ means 4q x 4q

Exercise

Expand the following.

a) $3x$	b) $3mn$	c) $2y^2$	d) $(5x)^2$
e) n^3	f) $6y$	g) $7ab$	h) $5x^3$
i) $(ab)^2$	j) $(5x)^3$	k) xy^2	l) a^5
m) $2a^5$	n) $4ab^2$	o) $(4ab)^2$	

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Substitution

Examples

1. Given b = 6
   Find b + 8
   6 + 8
   = 14

2. If = = 8, q = 6, what is pq9
   p x q x 9
   8 x 6 x 2
   = 96

3. Given b = 6 , c = -3 , a = 2
   Find $\frac{b\ c}{9}$
   = $\frac{b \times c}{9}$
   = 3 x -3
   = -9

Exercise

If p = 8, q = 6 , r = 4 , a = 2, b = 6

Find the value of the following;

a) 3p
b) p + 3
c) qr
d) 2p
e) ¼ pc
f) pqr
g) q – r
h) 2q + r
i) 6ac
j) $4c^2$
k) abc
l) ab
m) a^bc

Collecting like terms

Examples

1. Simplify: $x + y + 2x + 4y$

   $x + 2x + y + 4y$

   $\mathbf{3x + 5y}$

2. $3x + 6y - x - 2y$

   $3x + 6y - x - 2y$

   $3x - x + 6y - 2y$

   $\mathbf{2x + 4y}$

Exercise

Simplify;

a) $p + q + p$
b) $8x + 3 + 4y - x$
c) $x + y + 2x + 3y$
d) $6t + 5 - 2t + 5$
e) $m + p + p + m$
f) $3x + 4 + 4x + 5x$
g) $q + 4p + 3q + 2p$
h) $2b + 4 - b$
i) $m + 2b + 3m + 5$
j) $b + 3k - 4b - k$

Removing brackets

$+ (2x + 3) = 2x + 3$

$- (4x + 6) = -4x - 6$

Simplify; $\frac{1}{2}(8a + 4b)$

$\frac{1}{2} \times 8a + \frac{1}{2} \times 4b$

$1 \times 4a + 1 \times 2b$

$4a + 2b$

Exercise

a) Remove the brackets
   i) 2 (a + 3)
   ii) 2 (6 + b)
   iii) 5 (4b – 2)
   iv) 4 (a – 2b)
   v) 3 (8x + 5y)

b) Substitute if a = 4 , b = 1 and c = 3
   i) 3b – c
   ii) 2 (a + b)
   iii) 2 (c – b)
   iv) 5 (a – b)
   v) 7 (b + c)

Change of positive and negative signs involving brackets.

i) -2 (x – 2y)
ii) -2 (3x + 5)
iii) +4 (x + 1)
iv) +3x (y – 1)
v) +5 (x – 6)

Simplify

a) ½ (2a + 4b)

b) $^1/_3$ (6x – 9y)

c) $\frac{2a + 4b}{2}$

d) $^1/_3$ (+2xy – 15x)

e) $^1/_5$ (15x – 20y)

More about removing brackets

Examples

1. Remove the brackets

a) 3 (2 + x) + 2(x + 4)
b) 3x 2 + 3x y + 2 x y + 2 x 4
c) 6 + 3x + 2x + 8
d) 3x + 2x + 8 + 6

e) $5x + 14$

2.

a) $3 (x + 3) - 2(x - 1)$
b) $3 \times y + 3 \times 3 - 2 \times y - 2x - 1$
c) $3x + 9 - 2x + 2$
d) $x + 11$

Exercise

Remove the brackets and simplify.

a) $(x + 1) + (2x + 3)$
b) $(2x + 3) + (4x + 4)$
c) $(9x - 4) - (x - 1)$
d) $5 (q + 3) + 3 (q - 1)$
e) $4 (m + 3) + 3 (m + 1)$
f) $5 (q + 3) - 3 (q - 1)$

Finding the products of powers with the same base

Examples

Simplify

a) $m \times m$
$m \times m$
m^2

b) $y^2 \times y^3$
$y^2 \times y^3$
$y \times y \times y \times y \times y$
$= y^5$

OR

$m^1 \times m^1$
$= m^{1+1}$
$= m^2$

$x^2 \times x^3$
$= x^{2+3}$
$= x^5$

Simplify; $4y^2 \times 3y^4$

= $4y^2 \times 3y^4$

= $(4 \times 3)\ (y^2 \times y^4)$

= 12(y2 +4

= $12\ y^6$

Exercise

<u>Simplify the following.</u>

a) m x 3 x m
b) q x q x q x q
c) $y^2 \times y^3$
d) $w^3 \times w \times w^2$
e) $5y^1 \times 4y^5$
f) $2x^2 \times 4x^3$
g) $8m^2 \times 3m^6$
h) $7m^2 \times 6m^3$

<u>Dividing powers of the same base</u>

Examples

1. Simplify: $p^5 \div p^3$

$P^5 \div p^3 = \dfrac{p \times p \times p \times p \times p}{P \times p \times p}$

= p^2

2. Simplify: y4 ÷ y3

$\dfrac{y \times y \times y \times y}{y \times y \times y}$

= y

3. Simplify: $12\ t^4 \div 3t^2$

$= \dfrac{12 \times t \times t \times t \times t}{3 \times t \times t}$

= 4 x t x t

= $4t^2$

Exercise

a) $y^4 \div y^3$
b) $m^7 \div m^2$
c) $d^9 \div d^5$
d) $q^7 \div q^4$
e) $t^7 \div t^4$
f) 10m9 ÷ 2m5

g) $18p^3 \div 9p2$ h) $48x^5 \div 16x^2$ i) $36m^6 \div 6m^4$

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Finding unknown

Examples

1. Solve: $p + 4 = 12$

   $p + 4 = 12$

   $p + 4 - 4 = 12 - 4$

   $p = 12 - 4$

   $\mathbf{p = 8}$

2. $h - 15 = 12$

   $h - 15 + 15 = 12 + 15$

   $h = 12 + 15$

   $\mathbf{h = 27}$

3. Solve $2x = 8$

   $\frac{2x}{2} = \frac{8}{2}$

   $\mathbf{x = 4}$

Exercise

Find the value of the unknown

a) $y + 3 = 7$ b) $a - 2 = 7$ c) $m + 11 = 24$

d) $p - 11 = 12$ e) $x + 51 = 84$ f) $n - 57 = 63$

g) $r + 49 = 75$ h) $q - 43 = 41$ i) $p + 24 = 42$

j) $x - 28 = 36$ k) $3a = 21$ l) $8w = 72$

m) $13m = 260$ n) $21h = 168$ o) $20p = 400$

Word problems in algebra

Example

Katamba bought some eggs. On his way home 4 eggs broke and he was left with 8 eggs. How many eggs did he buy?

Let the eggs bought be n.

Eggs bought n

Eggs broken 4

Therefore $n - 4 = 8$

$n - \cancel{4 + 4} = 8 + 4$

$n = 12$

Exercise

1. A farmer had some cows. She paid 8 cows as dowery. Altogether she had 15 cows. How many cows had she before?
2. I think of a number, add 7 to it, my answer is 12. What is the number?
3. A tube brewed y litres of local beer. He sold 17 litres and was left with 4 litres. How many litres did he brew?
4. Bulya had y mathematics numbers to work out. She worked out 23 and was left with 2. How many numbers was she given altogether?

5. A number multiplied by 13 gives 52. Find the number.

Solving equations

Example

1. Solve: $m + 4m = 20$

$$\frac{5m}{5} = \frac{20}{5}$$

$$m = 4$$

2. Solve: $3g + g + 2g = 30$

$$\frac{6g}{6} = \frac{30}{6}$$

$$g = 5$$

Activity

Solve the equations

a) $2y + y = 12$

b) $2x + 2x + x = 25$

c) $t + 4t = 45$

d) $p + 5p + 2p = 40$

e) $n + 7n = 32$

f) A mother is 4 times as old as her daughter. Their total age is 30 years. Find the daughter's age.

g) A father is 3 times as old as his daughter. Their total age is 48 years. How old is the daughter?

–

Finding the unknown involving fractions

Examples

1. Solve: $\frac{a}{3} = 4$

   $= \cancel{3} \times \frac{a}{\cancel{3}} = 4 \times 3$

   $a = 12$

2. Find the number of oranges that can be divided among 5 boys so that each gets 6 oranges.

   Let the number of oranges be p.

   So; $\frac{p}{5} = 6$

   $\cancel{5} \times \frac{p}{\cancel{5}} = 6 \times 5$

   $\mathbf{p = 30}$

Exercise

Find the value of the unkown.

a) $\frac{a}{2} = 13$ b) $\frac{m}{4} = 8$ c) $\frac{x}{7} = 5$

d) $\frac{k}{9} = 8$ e) $\frac{d}{4} = 20$

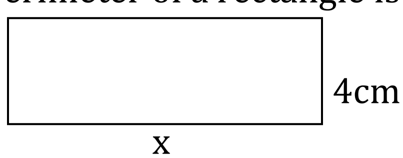
f) 4 pupils shared x books equally. Each pupil received 16 books. How many books were there?

g) 8 homes shared p litres of paraffin equally. Each home received 64 litres. How much paraffin was shared?

Forming and solving equations

Example

The perimeter of a rectangle is 24cm. Find x.



l x w x l x w = perimeter

$x + 4 + x + 4 = 24$

$x + x + 4 + 4 = 24$

$2x + 8 = 24$

$2x + \cancel{8 - 8} = 24 - 8$

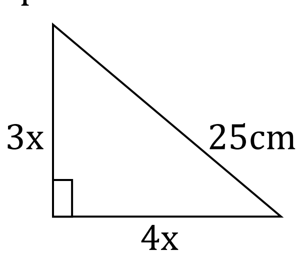
$\frac{2x}{2} = \frac{16}{2}$

$\mathbf{x = 8cm}$

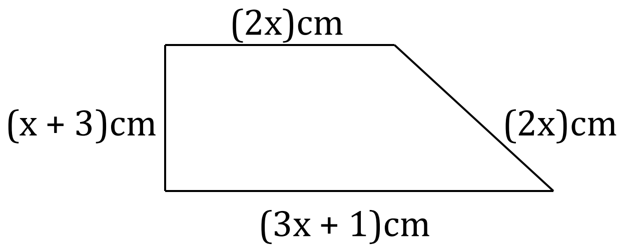
Exercise

Find the values of the unknown letter.

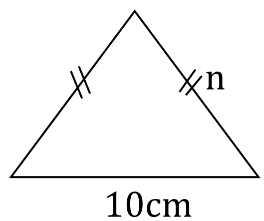
1. The perimeter of the triangle below is 60cm. Find x.



2. The perimeter of the trapezium below is 44 cm. Find x.



3. The perimeter of an isosceles triangle below is 36cm. Find n.



Solving equations involving brackets

Examples

1. Solve: $3(y + 4) = 21$

$3 \times y + 3 \times 4 = 21$

$3y + 12 = 21$

$3y + \cancel{12 - 12} = 21 - 12$

$\frac{\cancel{3}y}{\cancel{3}} = \frac{9}{3}$

$\mathbf{y = 3}$

2. $5(y + 1) - 3(y - 1)$

$5y + 5 - 3y + 3 = 14$

$5y - 3y + 5 + 3 = 14$

$2y + 8 = 14$

$2y + 8 - 8 = 14 - 8$

$\frac{2y}{2} = \frac{6}{2}$

$\mathbf{y = 3}$

Exercise

Solve;

a) $2(x + 2) = 10$

b) $3(x - 2) + 2(x - 1) = 12$

c) $5(x + 1) = 15$

d) $4(x + 2) + 3(x - 1) = 12$

e) $7(x - 3) = 7$

f) $7(n + 3) - (2n - 4) = 35$

g) $6(p - 4) = 30$

h) $(p - 2) + (p - 4) = 0$

i) $6(x + 3) = 30$

j) $5(t - 1) - 3(t - 7) = 0$

More of equations

Examples

1. Solve: $4x - 3 = x + 6$

$$4x - x = 6 + 3$$
$$\frac{3x}{3} = \frac{9}{3}$$
$$x = 3$$

Exercise

a) $2x + 4 = x + 11$

b) $2x - 7 = x + 1$

c) $5x + 1 = 4x + 4$

d) $11x + 3 = x + 33$

e) $7x - 4 = 3x + 8$

f) $5(x - 2) = 2(x - 2)$

g) $6(x + 4) = 3(x - 2)$

h) $(x - 1) = 4(x - 12)$

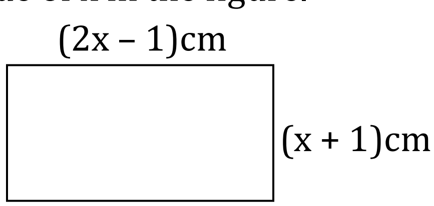
i) $3(x - 2) = 2(x - 1)$

j) $7(x - 2) = x + 10$

Forming equations and finding the unknown

Examples

1. Find the value of x in the figure.



Opposite sides of a rectangle are equal

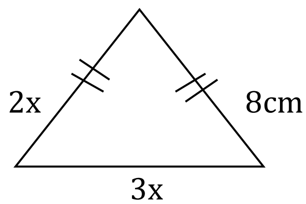
Therefore; $2x - 1 = x + 3$

$$2x - x = 3 + 1$$
$$\mathbf{x = 4}$$

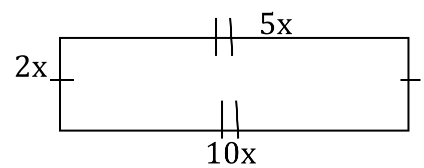
Exercise

Form equations and find x.

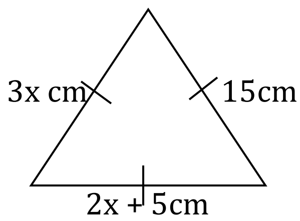
a)



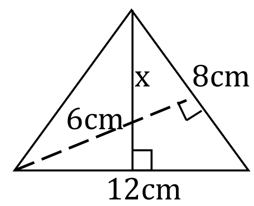
b)



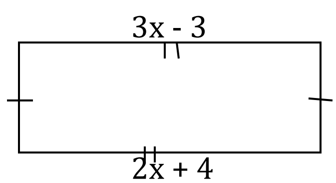
c)



d)



e)



<u>Basic algebraic symbols</u>

=	equal to
≠	not equal
>	greater than
<	less than
≤	less than or equal to
≥	greater than or equal to

<u>Examples</u>

a) $n = 4$ means n is equal to 4

b) $n \neq 4$ means n is not equal to 4

c) $p > 5$ means p is greater than 5

Exercise

1. Write in words.

a) $x = 3$
b) $x \neq 3$
c) $p \leq 7$
d) $p < 7$
e) $y > 6$
f) $y \geq 6$
g) $y < 10$
h) $t \leq 10$
i) $x = 30$
j) $a > 13$

2. State each of these using symbols.

a) m is less than 9
b) w is equal to 4
c) 8 is greater than x
d) h is less than or equal to 11
e) ½ and $^2/_4$ are equal

Finding the solution set for the inequality

Examples

1. Given the solution set for; $x < 5$
   (If x is a whole number)
   x is a whole number less than 5
   members of x = {0 , 1 , 2 , 3 , 4}

2. Given the solution set for; $x > -5$
   (if x is a negative integer)
   $x > -5$ means
   x is a negative integer than -5
   members of set x = { -4 , -3 , -2 , -2}

Exercise

Find the solution set for the inequalities

1. a) $x < 3$ (If x is a counting number)

   b) $x \leq 3$

2. $n > -4$ (If n is a negative integer)

   b) $n \geq -4$

3. a) $p < 8$ (If p is a whole number)

   b) $p \leq 8$

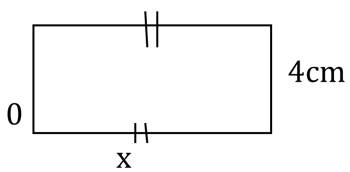
4. $m > 7$ (If m is a counting number)

   $m \geq 7$

Forming and solving equations

Example

The perimeter of a rectangle is 24cm. Find x.

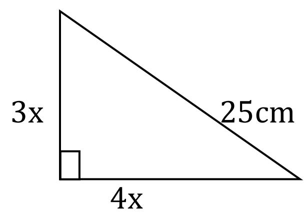


$$
\begin{aligned}
L + W + L + W &= \text{Perimeter} \\
x + 4 + x + 4 &= 24 \\
x + x + 4 + 4 &= 24 \\
2x + 8 &= 24 \\
2x + \cancel{8 - 8} &= 24 - 8 \\
\frac{\cancel{2}x}{\cancel{2}} &= \frac{16}{2} \\
\mathbf{x} &\mathbf{= 8cm}
\end{aligned}
$$

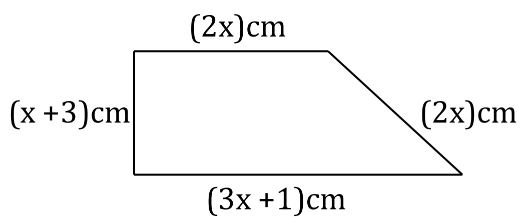
Exercise

Find the values of the unknown letter.

1. The perimeter of the triangle below is 60cm. Find x.



2. The perimeter of the trapezium below is 44cm. Find x.



3. The perimeter of an isosceles triangle below is 36cm. Find n

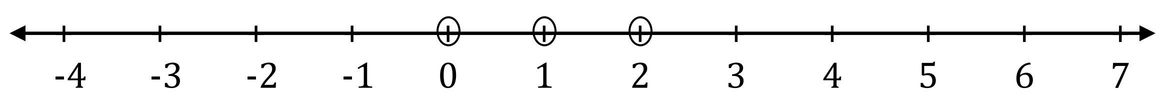
Finding the solution set for the inequalities

Give sets of numbers and number lines for the following.

Examples

1. $-1 < x < 3$

   x represents integers between -1 and 3



The solution set for x = {0 , 1 , 2}

Find the solution sets and their number lines

a) $-2 < y < 3$
b) $-2 \leq y \leq 3$
c) $-2 \leq y < 3$
d) $-1 < p < 4$

e) $-1 \leq p \leq 4$
f) $-5 < q < 2$
g) $-5 < q \leq 2$
h) $-3 \leq x \leq 4$

Solving inequalities and finding solution set.

Example

Solve the inequality and find the solution set for x.

When 3 is added to x, the result is greater than 5

$x + 3 > 5$

$x + 3 - 3 > 5 - 3$

$\mathbf{x > 2}$

If x is a counting number less than 10

Therefore; $x > 2$ = a set of number greater than 2 but less than 10

= { 3 , 4 , 5 , 6 , 7 , 8 , 9 }

Exercise

Find the solution set for the inequalities below.

a) $y + 2 > 4$
b) $p + 6 > 10$
c) $x + 3 < 9$
d) $n + 5 < 12$
e) $y + 7 > 11$
f) When 4 is added to an integer (x) the result is less than 5. Find all possible values of n.

Measures (Money)

Uganda currency

The Uganda currency consists of the following;

Coins, bank notes

a) Coins are usually or a smaller value.
b) Bank notes are usually or bigger denomination than coins but also differ.

Each bank note has a value and an identifying number which is different from that on any other bank note.

The central bank writes new coins, and prints bank notes. The bank notes in each bundle are numbered.

Example

1. If bank notes are numbered consecutively from AP 003782 to AP 003881. How many notes are there?

First note AP003782

Last note AP003881

Number of notes

$$\begin{array}{lr} \text{AP} & = 003881 \\ \underline{-\ \text{AP}} & \underline{=003782} \\ & 99 \end{array}$$

This means there are 99 notes without the last note. Therefore, the notes are (99 + 1) = 100 notes

Subtract and later add 1 note because during subtraction one note is left out. (99 + 1 = 100)

2. Amos has bank notes numbered from AP 004300 to AP 004399
   a) How many bank notes does Amos have?

   Number of notes

   $$\begin{array}{lr} \text{AP} & 004399 \\ -\ \underline{\text{AP}} & \underline{004300} \\ & 99\ +1 \end{array}$$

   100 notes

   b) If each note is worth 1,000shillings in value, how much money does Amos have?

   Amount of money in the bundle = 100notes x 1000/=

   = sh. 100,000

Activity

1. Find how much money is in a bundle of sh. 1000 bank notes if they are numbered from UH 627400 to UH 627499.

2. A cashier is paying salaries to workers. How many 1000 shilling notes will give to a worker who gets a salary of sh. 90,000?
3. How many 500 shilling coins are equivalent to one ten thousand shilling notes?
4. Ali deposited some money. He has bank notes numbered from AZ 00360 to AZ 00389. The cashier told him that bank notes from AZ 000372 to AZ 00382 are counterfeit (forged). If the bank notes were of 10,000 shillings denomination;
   a) How much money did he deposit in the bank?
   b) How many bank notes were forged?

Uganda and other currencies

Different countries use different types of money. The money used by a country is its currency.

Example

Country	Currency
Uganda	Uganda shilling (Ush)
Kenya	Kenya shilling (Ksh)
Rwanda	Rwanda Francs (RWF)
South Africa	Rand (ZAB)
Zambia	Kwacha (Kch)
USA	US Dollars ($)
Britain	Pound sterling (€)
Japan	Japanese Ven (¥)
European union	Euro (Euro)
German	Deutsh mark (DM)

CURRENCY	BUYING	SELLING
1 pound sterling (€)	3730	3780
1 US Dollar (US $)	2355	2370
Kenya shilling	28	29
1 Rwanda Francs	2	2.4
1 Tanzania shilling (TZ)	1.57	1.58

Activity

1. Convert Ush. 34,000 to Kenya shillings.
2. I have Ush. 860,000. Find how much money I have in US Dollars.
3. A Tanzanian trader arrived in Uganda with TZ sh. 40,000. Find how much money she had in Uganda shillings if 1 T.Z sh. = 1.6

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