SECOND EDITION

MATHS WISE 6

Teaching Guide

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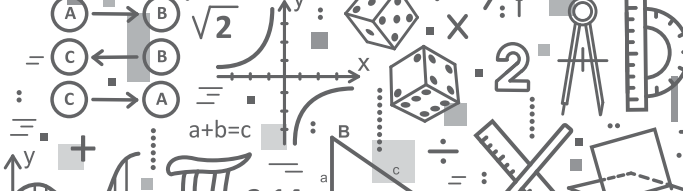

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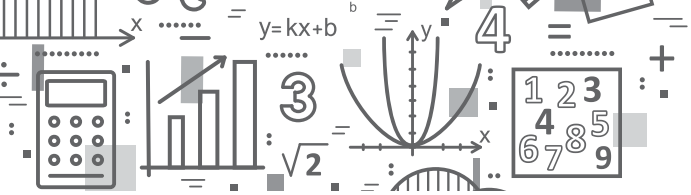

USING THIS TEACHING GUIDE

This teaching guide provides lesson plans for each unit. Each lesson starts with activities that can be completed within a specified time before the main lesson is taught. Working on starter activities help prepare the students for the more formal lessons and is an informal introduction to the topic at hand without straight away barraging them with new concepts.

While devising these activities, make sure that they can be done within a reasonable time span and that the resourses that are to be used are easily available.

Time required for completing each lesson is also given but can change depending upon the students' learning capabilities.

The guide refers to the textbook pages where necessary and exercise numbers when referring to individual work or practise session or homework.

This is not a very difficult guide to follow. Simple lesson plans have been devised with ideas for additional exercises and worksheets. Make sure that lessons from the textbook are taught well. Planning how to teach just makes it easier for the teacher to divide the course over the entire year.

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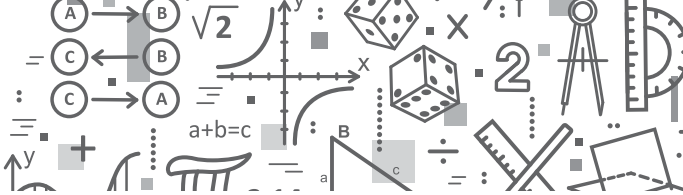
Aysha Shabab



UNIT 1 SETS

Topic: Sets
Time: 3 periods

Objectives

To enable students to:

- define a set
- identify the elements of a set
- represent sets in different ways
- recognise and define different types of sets

Starter activity

Students should be given activity sheets with drawings of objects, for example pictures of fruits, flowers, insects, playing cards, etc. and should be asked to separate the objects and divide them into groups, for example. A, B, C, etc. The students may be asked questions like the ones given below.

1. Give a reason for the grouping.
2. Are the groups of objects or sets well-defined?
3. What is common among the members of each group?

Discuss the answers the students give.

Main lesson

Refer to pages 9 to 14 of the textbook.

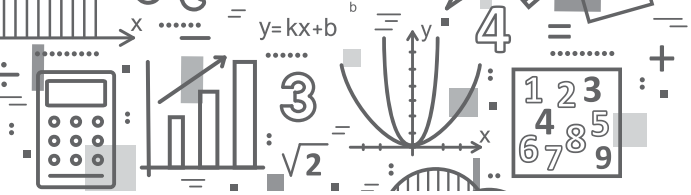
- Define a set, explain the terms well-defined and distinct objects
- Notation of a set. Name the set with a capital letter and enclose the elements in curly brackets
  Example A = {a, b, c, d} etc.
- Elements of a set; symbols $\in$ and $\notin$
- Cardinal number of a set (number of elements) e.g. in the set, A = {a, b, c, d}, the cardinal number is 4 as there are four elements.
- Methods of representing a set:
  Descriptive form, Tabular form, and Set builder notation. Give at least two examples of each form.

Practise session

As oral practice, give examples of sets of numbers. The teacher writes a few sets on the board and students are asked to name the elements. Alternatively give the number of elements, and ask the students to write sets on the board in three different ways.

Individual work

Exercises 1a, 1b, and 1c on pages 11, 13, and 14 of the textbook should be given as class work.



Homework

1. Write the following sets in a tabular form:
   a. names of all the students in the class
   b. names of week days
2. Write any two sets in a descriptive form.
3. Write the sets of natural numbers from 1 to10 in set builder form.
4. Find the number of elements of a given set.
5. List the elements of a given set.

Recapitulation

Worksheets will be given to assess the students learning and understanding of the topic. Difficult topics should be discussed.

Topic: Types of sets
Time: 2 periods

Objectives

To enable students to:

- identify different types of sets
- use Venn diagram to represent the elements of a set

Starter activity

The teacher writes a few examples of finite, infinite, and null sets on the board to help introduce the topic.

Examples

- set of days in a week
- set of whole numbers
- set of men who are 12 ft tall etc.

The students should be asked the following questions:

1. Which of the sets have a fixed number of elements?
2. Which set contains an unlimited number of elements?
3. Which set does not have any element?

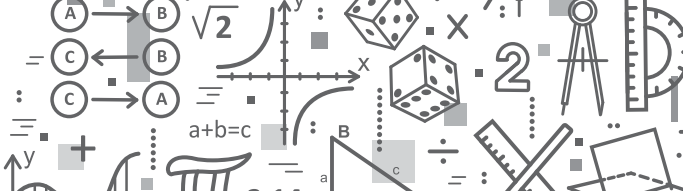
Discuss the answers the students give.

Main lesson

Refer to pages 14 to17 of the textbook.

The teacher should explain and define the following with examples:

- finite and infinite sets and how to write them
- null set or empty set and the symbol ϕ
- the super and subset and their symbols $\supset, \subset, \subseteq$
- difference between proper and improper subset
- equal sets
- the universal set and its notation
- Venn diagrams



Practise session

Students should be asked to give examples of finite, infinite and null sets, subsets, supersets etc. on the board. The students should also be able to represent sets as Venn diagrams.

Individual work

Exercises 1d and 1e on pages 15 and 17 of the textbook should be given as classwork.

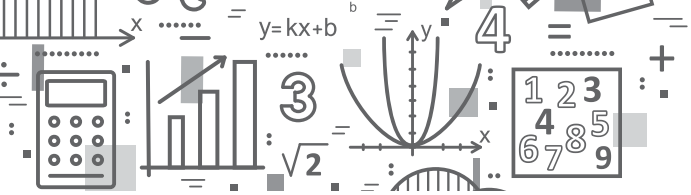
Homework

Worksheets should be given for assessment. These can include the following:

- writing sets in table form
- writing sets in set-builder form
- naming the types of sets
- giving the number of elements of each of the following sets
- drawing Venn diagram to represent sets.

Recapitulation

Worksheets will be given to assess the students learning and understanding of the topic. Difficult topics should be discussed.



UNIT 2 FACTORS AND MULTIPLES

Topic: Factors and multiples
Time: 6 periods

Objectives

To enable students to:

- identify the factors of a number
- identify the multiples of a number
- identify a square number
- recognise prime and composite numbers
- test for divisibility

Starter activity

Ask the following questions to begin the lesson:

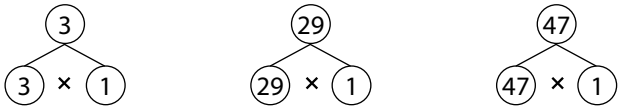
- What are prime numbers?
- What are composite numbers?
- Are all composite numbers even numbers?
- Which is the only even prime number?
- What are factors?
- What are the factors of 12?
- What are the common factors of 12 and 18?
- What are multiples?
- What are the common multiples of 4 and 6?
- Which are less than 60?
- How you will find out that a number is divisible by 2?

Main lesson

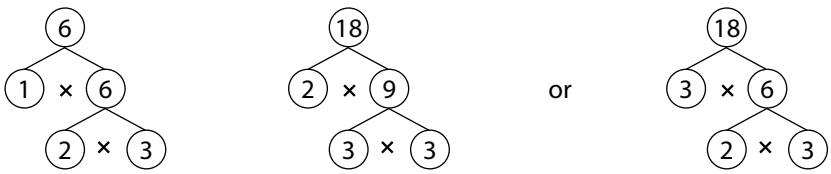
The difference between the prime and composite numbers will be explained to the students by giving examples.

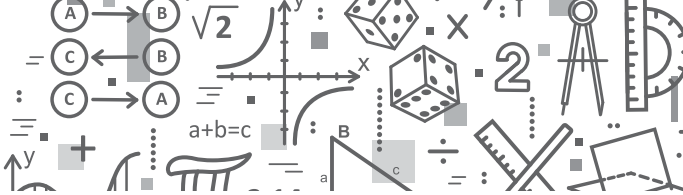
Examples

2, 3, 5, 7, 11, 13, … 97 are called prime numbers as they have only two factors, the number itself and 1.



Composite numbers have more than 2 factors.





Square numbers will be explained to the students, with the help of examples.

It will be explained to the students that when a number is multiplied by itself, the result is a square number.

- 1^2, 2^2, 3^2, 4^2, 5^2, 6^2, 7^2, 8^2, 9^2, 10^2
  $1^2 = 1 \times 1 = 1$, $2^2 = 2 \times 2 = 4$, $3^2 = 3 \times 3 = 9$, $4^2 = 4 \times 4 = 16$, $5^2 = 5 \times 5 = 25$

Test of divisibility will be explained by giving the following examples:

- All even numbers are divisible by 2.
- Divisibility by 3: The sum of all the digits in a number is divisible by 3. For example, 1362
  1 + 3 + 6 + 2 = 12. The sum is 12 which is a multiple of 3 hence it is divisible by 3.
- Divisibility by 4: The last two digits of a number are divisible by 4. For example, 3052
  52 ÷ 4 = 13, hence the number is divisible by 4.
- Divisibility by 5: If the last digit of a number is 5 or 0, for example, 260, 325, it is divisible by 5.
- Divisibility by 9: The sum of the digits in a number is divisible by 9.
  For example, 1524 = 1 + 5 + 2 + 4 = 12, it is not divisible by 9 because 12 is not a multiple of 9.
  Let's look at this example, 1692 = 1 + 6 + 9 + 2 = 18. 18 is a multiple of 9, hence it is divisible by 9.
- Divisibility by 10: If the number has 0 zero in its unit place. For example, 500, 250, 110 etc.
- Divisibility by 11: A number is divisible by 11 if the difference between the two sets of alternate digits is either 0 or a multiple of 11.

Example 1

1463
1 + 6 = 7, 4 + 3 = 7
Difference: 7 – 7 = 0

Example 2

90827
9 + 8 + 7 = 24, 0 + 2 = 2
Difference: 24 – 2 = 22
22 ÷ 11 = 2

Practise session

1. Which of the following numbers are the factors of 72?
   12, 5, 7, 3, 2, 10, 9, 11, 8
2. What are the square numbers between 1 and 40?
3. Which of the following numbers are divisible by 9?
   1791, 354, 801, 90 081, 3456, 1009
4. Write down the common multiples of 6 and 9 that are less than 100.

Individual work

Exercise 2a on page 27 will be done as classwork.

Homework

1. Write down all the square numbers between 1 and 100.
2. Write down the factors of the following numbers:
   37, 108, 221, 241, 101, 160

Topic: Factorisation, Prime factors, Index notation
Time: 1 period

Objectives

To enable students to:

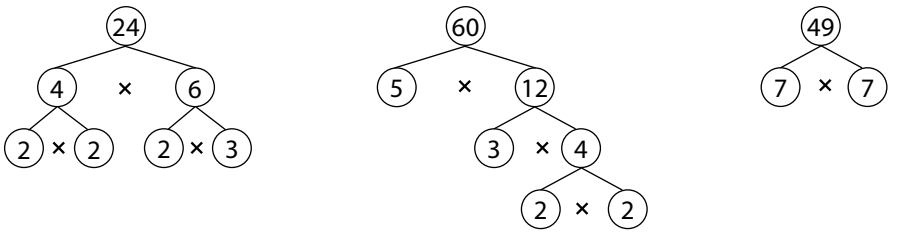
- break up a number into prime factors
- express a number in the index notation form

Starter activities

1. The students will be asked to find the missing factors in the following expressions:

   $12 = 2 \times 2 \times$ _____.
   $24 = 2 \times 3 \times 2 \times$ _____.
   $56 = 2 \times 2 \times 2 \times$ _____.
2. They will make a factor tree with the following numbers 24, 60, 49.

$24 = 2 \times 2 \times 2 \times 3$ $60 = 5 \times 3 \times 2 \times 2$ $49 = 7 \times 7$ or 7^2



There can be different multiple factor trees for a number that will give the same product of prime factors.

Main lesson

Prime factorisation and Index notation will be explained to the students using the following examples:

Example 1

Find the prime factors of 72 and then write the answer in index notation.

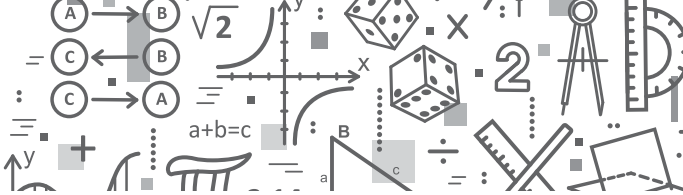
2	72
2	36
2	18
3	9
3	3
	1

$72 = \underbrace{2 \times 2 \times 2} \times \underbrace{3 \times 3}$

$2^3 \times 3^2$

$2^3 = 2 \times 2 \times 2$ This is read as 2 cubed (power of 3)
$3^2 = 3 \times 3$ This is read as 3 raised to the power of 2

The power is called 'index'. (plural, indices).



Example 2

Express 125 as prime factors in index notation.

5	125
5	25
5	5
	1

$125 = 5 \times 5 \times 5$
$125 = 5^3$

Practise session

Express the following numbers as a product of their prime factors in index notation:

48, 124, 30, 63, 96

Individual work

Exercise 2b on page 28 of the textbook will be done in class.

Homework

Express the following as prime factors in index notation:

625, 320, 400, 165, 90

Topic: HCF and LCM
Time: 3 periods

Objectives

To enable students to:

- calculate the HCF and LCM and write the answer in index notation
- solve the word problems

Starter activity

1. What are the factors of 12 and 18?
2. What are the common factors of 12 and 18?
3. Which is the lowest common factor of 12 and 18?
4. Which is the highest common factor of 12 and 18?
5. What are the multiples of 6 and 8?
6. What are the common multiples of 6 and 8?
7. Which is the least common multiple of 6 and 8?

Main lesson

HCF and LCM will be explained to the students with the help of the following examples.

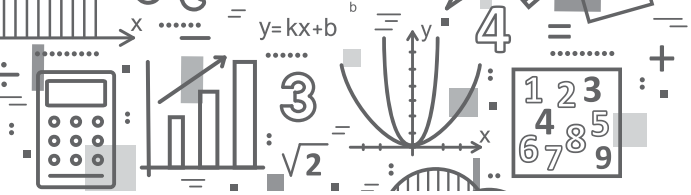
Example 1

Find the HCF and LCM of 25, 60, and 84, using index notation.

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$
$60 = 5 \times 2 \times 2 \times 3 = 2^2 \times 5^1 \times 3^1$
$84 = 7 \times 2 \times 2 \times 3 = 2^2 \times 7^1 \times 3^1$

Product of the common factors with lowest index = 2^2

HCF = $2^2 \times 3^1$
$4 \times 3 = 12$



LCM = product of all the factors with their highest index.

$2^2 \times 2 \times 3 \times 5 \times 7$
$4 \times 2 \times 3 \times 5 \times 7 = 840$

The LCM of 24, 60, and 84 is 840 because 840 is divisible by all these 3 numbers.

$\frac{\overset{35}{\cancel{840}}}{\underset{3}{\cancel{24}}} = 35$ $\qquad$ $\frac{\overset{14}{\cancel{840}}}{\cancel{60}} = 14$ $\qquad$ $\frac{\overset{10}{\cancel{840}}}{\cancel{84}} = 10$

Example 2

Find the LCM of 16, 24, 32, 40.

$16 = 2 \times 2 \times 2 \times 2 = 2^4$
$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3^1$
$32 = 2 \times 2 \times 2 \times 2 \times 2 = 2^5$
$40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$
$2^3 \times 2^2 \times 3 \times 5$
$8 \times 4 \times 3 \times 5 = 480$

Practise session

Find the HCF and LCM using both the methods for the following:

a) 10, 20, 30
b) 42, 56, 70
c) 36, 48, 72, 96

Individual work (1st period)

Question 1 of Exercise 2c on page 30 of the textbook will be done.

Homework

Question 2 of Exercise 2c on page 30 of the textbook will be done.

Individual work (2nd period)

Question 1 of Exercise 2d on page 32 of the textbook will be done.

Homework

Question 2 of Exercise 2d on page 32 of the textbook will be done.

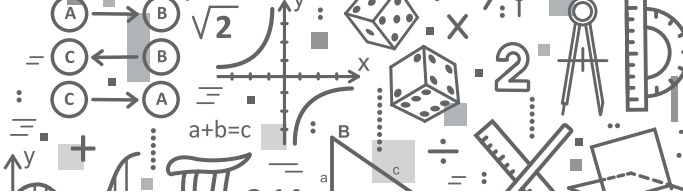
Word problems based on HCF and LCM (3rd period)

Individual work

Questions 1 and 2 of Exercise 2c on page 33 of the textbook will be done.
Questions 1 to 5 of Exercise 2f on page 33 of the textbook will be done.

Homework

Questions 6–10 of Exercise 2f on pages 33 and 34 of the textbook will be done.



UNIT 3 INTEGERS

Topic: Whole numbers
Time: 2 periods

Objectives

To enable students to:

- differentiate between natural numbers and whole numbers
- represent whole numbers on a number line
- add, subtract, multiply, and divide whole numbers
- verify the commutative and distributive laws in addition and multiplication of whole numbers
- verify the distributive law of multiplication over addition and subtraction

Starter activity

Students will be asked write the number for the number of fingers or count the number of books in their bags and write the numeral to represent it.

The teacher will then ask:

- What is this way of counting objects called?
- What is the name given to this number system?
- How many people have three hands, two faces etc.
- How do you represent this in numerals?

Discuss the answers students give.

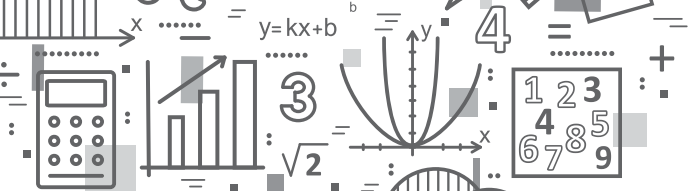
A few numerals in Roman script will be written on the board and the students will be asked to read them, e.g. I, II, IV, VI, X, IX, XI etc.

- What is this way of writing numerals called?
- Why did the Romans write this way?

Main lesson

Refer to the pages 36 to 41 of the textbook.

- Revision of the natural way of counting numbers, N, the set of natural numbers
- Develop the concept of zero
- Introduce the set of whole numbers W = {0, 1, 2…}
- Importance of the digit zero, place value
- Represent whole numbers on the number line
- Addition and subtraction of whole numbers on the number line
- Why zero is called the additive identity?
- Commutative and Associative properties of addition of whole numbers
- Multiplication and division of whole numbers
- '1' as the multiplicative identity
- Multiplication of a whole number by zero
- Commutative and Associative laws of multiplication
- Distributive law of multiplication over addition and subtraction
- Introducing simple number patterns.



Practise session

Activity sheets will be given to:

- draw number lines
- mark the numbers more than or less than a given number
- name the properties
- practise addition, subtraction, multiplication, and division sums

Individual work

Exercise 3a on pages 41 and 42 of the textbook should be given.

Homework

Ask the students to find the population of five big cities of Pakistan. They can then answer these questions using the information gathered:

- Which city has the largest population?
- Which city has the smallest population?
- What is the difference in the population of any two cities?

Assignments on the following topics could also be given

- Multiplication and division with large numbers
- Form number patterns

Recapitulation

- Whole number system
- Natural numbers as a subset of whole numbers
- 0 as the additive identity
- 1 as the multiplicative identity
- Multiplication of numbers by 0

Topic: Integers
Time: 2 periods

Objectives

To enable students to:

- recognise the importance of negative numbers
- recognise + and – integers on a number line

Starter activity

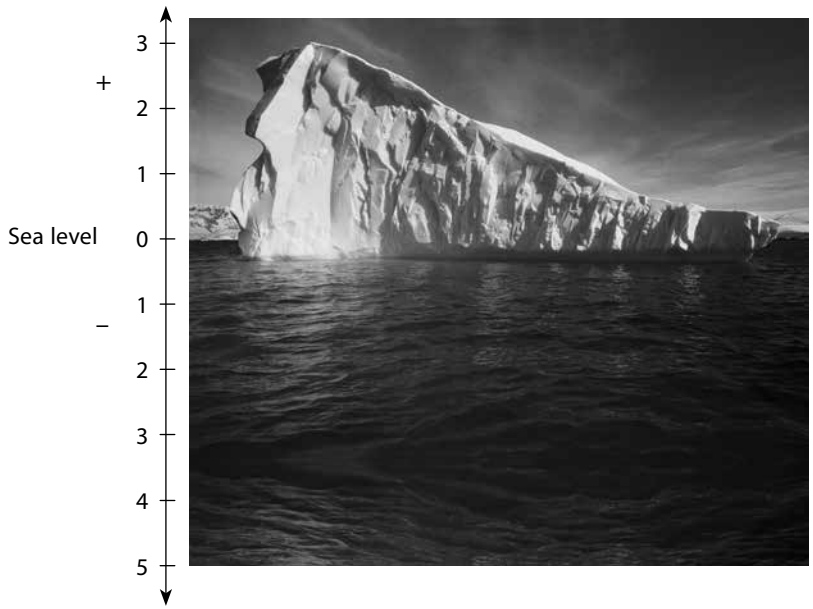
The students will be asked to answer the following questions:

- What are whole numbers?
- Which is the smallest whole number?
- Which is the largest whole number?
- What are natural numbers?
- Name the prime numbers that lie between 20 and 30.

Main lesson

Example 1

A picture of an iceberg will be drawn on the board showing only $\frac{3}{8}$ of the floating ice mass above the sea level. What fraction is hidden from view?



Sea level represented by zero.

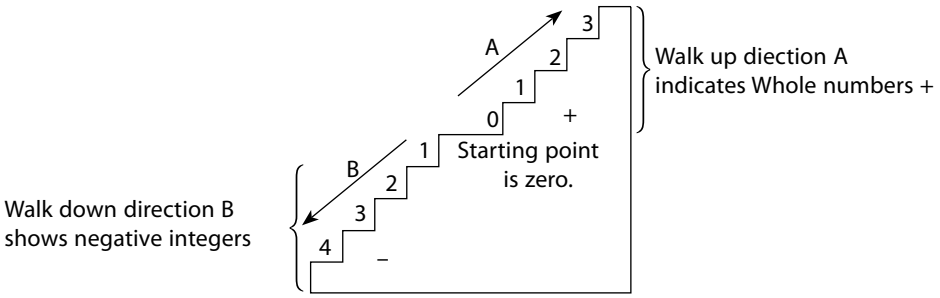
The part of the iceberg above sea level is represented by positive numbers.

The part of the iceberg below sea level (hidden) is represented by negative number.

Above sea level +3
Below sea level –5

Example 2

A staircase will be drawn on the board to give a clear concept of integers i.e. + and – numbers



From the given examples, the students will be able to understand that the set of whole numbers {0, 1, 2, 3, …} cannot be used to indicate numbers in the opposite direction. We need a new set of numbers which corresponds to this. The minus sign is used for these new numbers which are written as:

–1, –2, –3, –4, …

Explain to the students that: the set of positive integers, the set of negative integers, along with zero form the set of integers.

Zero is neither positive nor negative.

Individual work

Questions 1 and 2 of Exercise 3b on pages 44 and 45 of the textbook will be given.

Recapitulation

Any problems faced by the students will be discussed.

Topic: Ordering of integers and absolute or numerical value
Time: 1 period

Objectives

To enable students to:

- order integers
- define the absolute or numerical value of an integer

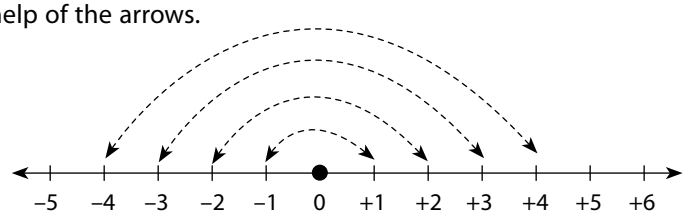
Starter Activity

- Rehan got a –5 marks in Science as he forgot to do his homework. How will you represent this number on a number line?
- Asim loses Rs 10. How would it be represented in mathematical terms?

Main lesson

Ordering of integers will be explained to the students that integers increase to the right of zero and decrease to the left of it. All the negative integers lie to the left of the positive integers, therefore, every positive integer is greater than every negative integer.

A number line will be drawn on the board to explain the absolute value of an integer corresponding to each positive integer with the help of the arrows.



A negative integer is equidistance from zero i.e. a positive integer will match with one negative integer, equidistant from zero.

The absolute value of -6 is 6 as it is 6 places away from zero. Two vertical bars on either side of the integer are drawn to show its absolute value.

Example 1

$|-6| = 6$

The absolute value of 6 is always 6 as it is 6 places away from zero.

Example 2

$|-8| + |-4| = 8 + 4 = 12$
$|3| + |-3| = 3 + 3 = 6$
$|3| - |-3| = 3 + 3 = 0$

Practise session

Fill in the blanks by using the symbol > or <.

a) 15 _____ 13
b) 1 _____ 0
c) –1 _____ 1
d) –11 _____ –9
e) –5 _____ 2
f) 0 _____ –50

Individual work

Questions 1–4 of Exercise 3c on page 46 of the textbook will be done.
Questions 1–2 of Exercise 3d on page 48 of the textbook will be done.

Recapitulation

Any problems faced by the students will be discussed.

Homework

Questions 5, 6, 7 of Exercise 3c on page 46 of the textbook will be given as homework.
Questions 3 and 4 of Exercise 3d on page 48 will be given as homework.

Topic: Addition and subtraction of integers
Time: 2 periods

Objectives

To enable students to:

- add and subtract integers using a number line
- solve every day life problems

Starter Activity

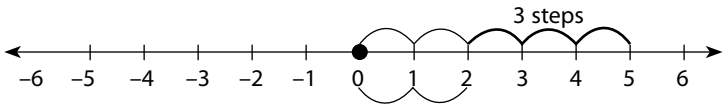
1. 3 + 2 =
2. 27 – 13 =
3. 10 – 9 =
4. 343 + 249 =
5. 272 × 4 =

Main lesson

Example 1

Add 5 + (–3)

A number line will be drawn on the board to show



Step 1

Start from 5 on the number line (5 steps) to the right of zero.

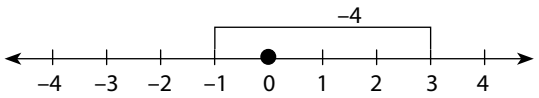
Step 2

Move 3 steps to the left, the arrow lands on 2.

5 + (–3) = 5 – 3 = 2

Example 2

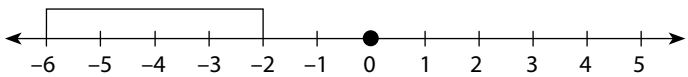
Add 3 + (–4)



3 + (–4) = – (4 – 3) = –1

Example 3

Add (–4) + (–2)



(–4) + (–2) = – (4 + 2) = –6

Practise session

On a number line, show the following.

1. (–5) + (2)
2. (–3) + (–4)
3. + 7 + (–2)

Rules for addition and subtraction will be explained with the help of the examples.

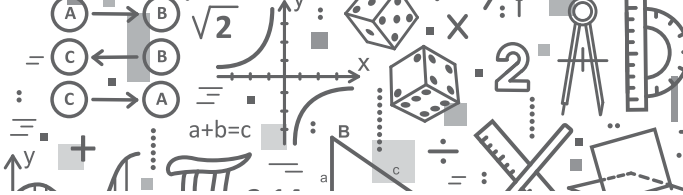
Rules for addition

1. For any two negative integers
   Add –3 and –7 (–3) + (–7)
   = – (3 + 7) = –10
2. For a positive integer and a negative integer
   Add –3 and +7 = (–3) + (7)
   7 is greater than 3 + (7 – 3) = +4
   Add –7 and 3, (–7) + (3)
   7 is greater – (7 – 3) = –4

Rules for subtraction

Example 1

6 – (–4) (change the sign of the integer to be subtracted)
6 + 4 = 10 (or add the additive inverse of –4)
Additive inverse of –4 is + 4.



Example 2

–5 – (–3)
–5 + 3 = – (5 – 3) = –2

Example 3

Subtract –15 from 9
9 – (–15) = 9 + 15
9 + 15 = 24

Practise session

Write the following on the board and call students one by one to solve them:

a) 4 – 5 b) –3 – 8 c) 6 – 4
d) –6 + 2 e) –8 + 9

Individual work

Questions 1-5 of Exercise 3e on page 53 of the textbook will be given.

Homework

A worksheet based on addition and subtraction, and simple word problems will be given.

Recapitulation

Any problems faced by the students will be discussed.

Topic: Multiplication and division of integers
Time: 1 period

Objective

To enable students to multiply and divide integers.

Starter activity

1. If the cost of one book is Rs 5, what will be the cost of 15 such books?
2. If the cost of 5 books is Rs 25, what will be the cost of one such book, 8 books, and 20 books?
3. 3 dozen articles cost Rs 180. Find the cost of 9 such articles.
4. There are 4 sets of books with 7 books in each set. Find the total number of books.

Main lesson

Multiplication and division of integers with positive and negative signs will be explained to the students with the help of the examples.

Example 1

(+3) × (+2)

++ ++ ++ = + + + + + +
Put in 3 sets of +2 +6

Example 2

(+3) × (–2)

– – – – – – = – – – – – –

Put in 3 sets of –2 –6

Example 3

(–3) × (–2)

Take away 3 sets of –2 (dish is empty now)

We first put in 6 neutral pairs

Now remove 3 sets of –2

+6

More examples

3 × 4 = 12

–3 × –4 = 12

For division it is the same.

12 ÷ 4 = 3 i.e. $+12 \div +4 = +\left(\frac{12}{4}\right)$

–12 ÷ –4 = 3 i.e. $-12 \div -4 = \left(\frac{-12}{-4}\right) = \left(\frac{12}{4}\right)$

For two integers with one positive and one negative sign:

+3 × (–4) = – (3 × 4) i.e. –12

$+12 \div (-3) = -\left(\frac{12}{3}\right) = -4$

0 × –3 = 0

0 ÷ –3 or +3 = 0

Explain to the students that when more than two negative integers are multiplied, if the number of integers is even then the product will be positive, and if the number of integers is odd then the product will be negative.

Example 1

–3 × –4 × –2 × –5 (number of integers 4 i.e. even)

+ (3 × 4) × + (2 × 5)

+ (12 × 10) = 120

Example 2

–3 × –4 × –5 (number of integers 3 i.e. odd)

+ (3 × 4) × (–5)

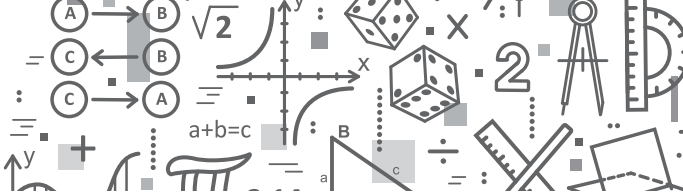
+ 12 × –5 = – (12 × 5)

= –60

The properties of multiplication will be explained with the help of the following examples:

- 3 × –6 = –18
  –6 × 3 = –18
  –3 × (5 × 4) = (–3 × 5) 4 = –60

  } Order does not matter, the product will be the same.



- $-8 \times 0 = 0$
  $8 \times 0 = 0$
  $3 \times 8 \times 0$
  } Any integer multiplied by zero gives zero.

- $-8 \times 1 = -8$
  $8 \times 1 = 8$
  } Any integer multiplied by 1 is the integer itself.

Distributive property will be explained by giving the following example:

- $3 \times (4 + 5) = (3 \times 4) + (3 \times 5)$
  $3 \times (9) = 12 + 5$
  $27 = 27$
- $3 \times (7 - 5) = (3 \times 7) - (3 \times 5)$
  $3 \times (2) = 21 - 15$
  $6 = 6$

Practise session

A few questions to be written on the board and solved by the students in turns:

a) -8×3
b) $8 \div (-4)$
c) $-9 \div (-3)$
d) 12×-3
e) $-3 \times -2 \times 0$
f) $21 \div (-7)$
g) $-20 \div (-2) \div (-5)$
h) $-75 \div (-5) \times (-6)$

Individual work

Questions 1–4 of Exercise 3f on page 55 of the textbook will be done in the class.

Homework

Activity given on page 56 of the textbook will be given.

Recapitulation

Any problems faced by the students will be discussed.

Topic: Simplifications
Time: 2 periods

Objectives

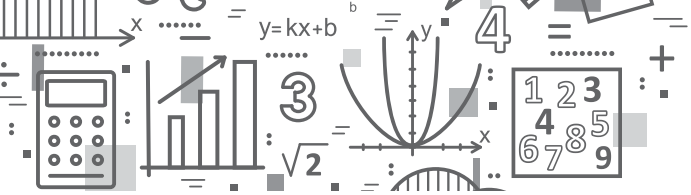
To enable students to:

- simplify mathematical expressions using BODMAS rule and recognise the order of operations in simplifying combined operations
- solve word problems applying the BODMAS rule

Starter activity

Write a few sums on the board and ask the students to solve them.

1. $13 + 8, \frac{4}{7} + \frac{2}{7}, \frac{5}{8} - \frac{3}{4}$, etc.
2. $7 - 14 + 11, \frac{6}{11} \times \frac{2}{3}$ etc.



Write another sum with mixed operations and ask the students how it should be solved.

3. $\left(\frac{5}{6} - \frac{1}{2}\right) + \frac{4}{5} \div \frac{4}{5}$ of $1\frac{17}{25}$

Main lesson

To simplify sums involving combined operations, we apply the BODMAS rule.

Explain the BODMAS terms:

B→ stands for brackets.
Introduce and explain types of brackets. (refer to textbook pg 57)
O→ stands for 'order/exponent/index'
D→ stands for division
M→ stands for multiplication
A→ stands for addition
S→ stands for subtraction

Solve the example on the board

$\left(\frac{5}{6} - \frac{1}{2}\right) + \frac{4}{5} \div \frac{5}{7} \times 1\frac{17}{25}$

Step 1 (Open brackets)

Simplify within the bracket to remove it.

$\left(\frac{5-3}{6}\right) + \frac{4}{5} \div \frac{5}{7} \times \frac{42}{25}$

$\frac{2}{6} + \frac{4}{5} \div \frac{5}{7} \times \frac{42}{25}$

Step 2

Multiply $\left(\frac{5}{7} \times \frac{42}{25}\right)$

$\frac{1}{3} + \frac{4}{5} \div \frac{\cancel{5}^{1}}{\cancel{7}_{1}} \times \frac{\cancel{42}^{6}}{\cancel{25}_{5}} = \frac{1}{3} + \frac{4}{5} \div \frac{6}{5}$

Step 3

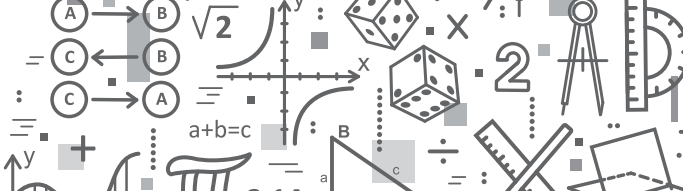
Divide $\left(\frac{4}{5} \div \frac{6}{5}\right)$

$\frac{1}{3} + \frac{\cancel{4}^{2}}{\cancel{5}} \times \frac{\cancel{5}^{1}}{\cancel{6}_{3}}$ (Division is changed to multiplication and the fraction after the division sign is inverted)

$\frac{1}{3} + \frac{2}{3} = \frac{3}{3} = 1$

Explain the students the concept of 'perfect square'. It will be explained that when a number multiplies by itself, the product is a square number. Use the following examples:

- $8 \times 8 = 8^2 = 64$
- $5 \times 5 = 5^2 = 25$



Practise session

Solve a few more sums on the board with the help of students.

$\frac{5}{8} \times \frac{2}{3} + \frac{7}{12} \div \left(\frac{7}{8} + \frac{1}{6}\right) \text{ of } \frac{3}{5}$

$\frac{5}{8} \times \frac{2}{3} + \frac{7}{12} \div \left(\frac{21+4}{24}\right) \text{ of } \frac{3}{5}$ open brackets

$\frac{5}{8} \times \frac{2}{3} + \frac{7}{12} \div \frac{\cancel{25}^{5}}{\cancel{24}_{8}} \text{ of } \frac{\cancel{3}^{1}}{\cancel{5}}$ simplify of

$\frac{5}{8} \times \frac{2}{3} + \frac{7}{12} \div \frac{5}{8}$

$= \frac{5}{\cancel{8}_{4}} \times \frac{\cancel{2}^{1}}{3} + \frac{7}{\cancel{12}_{3}} \times \frac{\cancel{8}^{2}}{5}$ (divide + multiply)

$= \frac{5}{12} + \frac{14}{15}$ (add)

$= \frac{25+56}{60}$

$= \frac{81}{60} = 1\frac{\cancel{21}^{7}}{\cancel{60}_{20}}$

$= 1\frac{7}{20}$ Answer

Explain the rules for brackets (refer to pages 57 and 58 of the textbook) with the help of examples on the board. Solve the examples with student participation.

Individual work

A few sums from question 1, Exercise 3g, and questions 2, 3, 6, and 8 will be given as classwork.

Homework

Complete Exercise 3g. More word problems may be given.

Recapitulation

Revise the BODMAS rule and the rule for opening brackets.

UNIT 4 RATIO AND RATE

Topic: Ratio and rate
Time: 1 period

Objectives

To enable students to:

- understand and calculate ratio
- describe the relationship between ratio and fractions
- solve real-life problems involving ratios

Starter activity

Two pencils measuring 15 cm and 5 cm, will be drawn on the board. The students will be asked the following questions.

red pencil
15 cm

green pencil
5 cm

1. How much longer is the red pencil than the green pencil?
2. How much shorter is the green pencil than the red pencil?

Main lesson

The red pencil is 10 cm longer than the green pencil.
The green pencil is 10 cm shorter than the red pencil.

15 : 5 or $\frac{15}{5} = \frac{3}{1}$

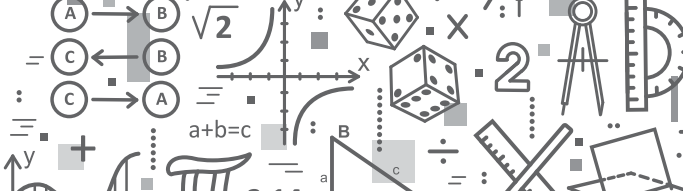
or we can say that the red pencil is 3 times longer than the green pencil.

We can also say that the ratio of the length of the red pencil to that of the green pencil is
15 : 5 = 3 : 1

Explain that ratio can be written in the form of the fraction e.g. $\frac{15}{5}$ also.

When a ratio is written as a fraction, we can write the fraction in its lowest term as:

$\frac{15}{5} = \frac{3}{1}$



It will be explained to the students that 15 and 5 are called the terms of the ratio. The first term that is 15 is called the **antecedent** and 5 is the **consequent**. Order matters in writing a ratio, 15 : 5 is not the same as 5 :15.

From the above example, children will be able to understand that 'a ratio expresses a relationship between two quantities of the same kind.' It does not have a unit.

The following examples will be explained to the students.

Example 1

Express the following ratios in their simplest form.

$5\frac{2}{3} : 2\frac{1}{6}$

$= \frac{17}{3} : \frac{13}{6}$

If the denominators of the given ratios are different, the LCM is calculated to make the denominators equal.

- LCM of 3 and 6 is 6.
- Multiply both the fractions by 6.

$\frac{17}{\cancel{3}} \times \cancel{6}^{2} : \frac{13}{\cancel{6}} \times \cancel{6}^{1}$

34 : 13

Example 2

Sarah scores $\frac{15}{25}$ in English and $\frac{40}{50}$ in Maths. In which subject did she score better marks? Find the ratio between the two subjects.

English : Maths

$\frac{15}{20} : \frac{40}{50}$

The denominators are different.

LCM of 20 and 50 is 100

$\frac{15}{\cancel{20}_{1}} \times \cancel{100}^{5} : \frac{40}{\cancel{50}_{1}} \times \cancel{100}^{2}$

75 : 80

Sarah's marks in Maths are better than her marks in English

Example 3

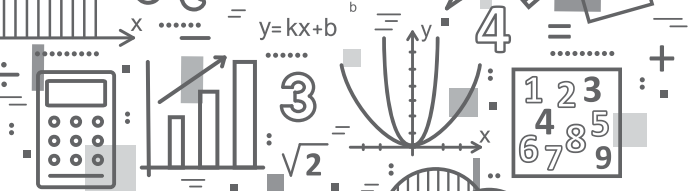
Ali walks 2 km a day while his sister walks 800 m a day. Find the ratio of their walks.

2 km = 2000 m (first convert km into m)

Ali : Sister

$2\cancel{000} : 8\cancel{00}$ or $\frac{\overset{5}{\cancel{2000}}}{\underset{2}{\cancel{800}}}$

5 : 2



Practise session

The following questions will be given for the students to solve.

1. There are 40 eggs out of which 6 are broken. Find the ratio of the unbroken eggs to the broken ones.
2. Express the following ratios in their simplest form:
   a) 24 : 42 b) 0.84 : 1.12 c) 144 : 128
   d) 35 mints : 1 hr e) 25 cm : 1.25 m f) $8\frac{3}{4} : 3\frac{1}{8}$

Individual work

The students will solve questions 1 to 5 of Exercise 4a from the textbook.

Give the following worksheet to be solved in class.

Worksheet

Books in the school library

Type	History	English Fiction	Science	Biography	Sports	Hobbies
Number	460	800	380	340	593	160

Write a ratio as a fraction in its lowest term to compare the number in the table.

a) ratio of History books to Biography
b) ratio of Sports books to Hobbies
c) ratio of Science books to History
d) ratio of Fiction books to Science

Homework

Questions 6 and 7 of Exercise 4a will be given as homework.

Topic: Dividing amount according to the given ratios
Time: 1 period

Objective

To enable students to divide the amount in a given ratio.

Main lesson

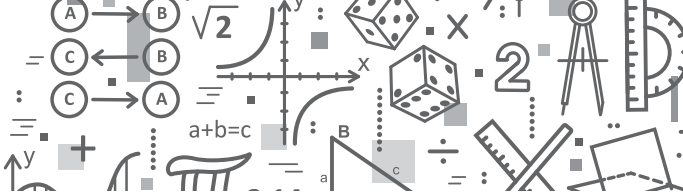
Example 1

Wajid has Rs 3000. He wants to divide it among his two brothers Shahid and Sajid in the ratio of 3 : 5. How much did each get?

Step 1: Sum of the Share = 3 + 5 = 8
(divide Rs 3000 into 8 shares)

Step 2: Shahid's share $\frac{3}{\cancel{8}}$ of $\overset{375}{\cancel{3000}} = 1125$

Step 3: Sajid's share $\frac{5}{\cancel{8}}$ of $\overset{375}{\cancel{3000}} = 1875$



Example 2

Divide 1 km in the ratio of 4 : 6.

Step 1: Change 1 km to metre.
1 km = 1000 m

Step 2: Sum of the ratio = 4 + 6 = 10

Step 3: $\frac{4}{10}$ of 1000 = 400 m

$\frac{6}{10}$ of 1000 = 600 m

Practise session

1. Divide each of the following quantities according to the given ratios:
   a) 900 in the ratio of 7 : 8
   b) 5 hrs in the ratio of 7 : 5
   c) 2 km in the ratio of 12 : 8
2. Divide Rs 3360 in the following ratios:
   a) 5 : 9 b) 3 : 13 c) 7 : 17

Individual work

The students will be asked to solve questions 1 to 4 from Exercise 4b.

Homework

1. Express the following ratios in their simplest form:
   a) 8 : 12 : 24 b) 56 : 70 : 112
   c) $4\frac{1}{3} : 5\frac{2}{5}$ d) $\frac{9}{20} : \frac{3}{5}$
2. Questions 5 and 6 of Exercise 4b as homework.

Topic: Continued ratio and rate
Time: 1 period

Objectives

To enable students to:
- Understand and calculate continued ratio
- Understand and calculate rate

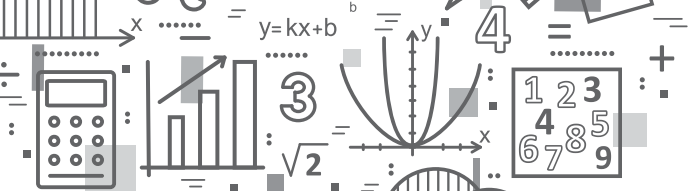
Starter activities

Activity 1

The students will be given the following example:

The ratio of bananas to strawberries in a fruit bowl is 2 : 3 and the ratio of strawberries to grapes is 3 : 4. What is the continued ratio of the fruits in the bowl?

The students will be asked the following questions
1. How is this example different from what we have learnt before?
2. How many quantities are compared?
3. How many more grapes are than the bananas?



Activity 2

The students will be asked the following questions.

1. If one pack of juice box costs Rs 25, what will be the cost of 10 juice boxes?
2. If a dozen bananas costs Rs 120, what will be the cost of one banana?

Main lesson

Refer to pages 67 and 68 of the textbook.
The teacher should explain the following with examples:

- The difference between ratio and continued ratio
- How to calculate continued ratio
- The difference between rate and unit rate
- The calculation of unit rate

Practise session

(a) Sarah, Ali, and Ahmed collected money to buy a birthday present for their mother. The amount of money Sarah and Ali collected were 4 : 3, and the amount of money Ali and Ahmed collected were in the ratio 5 : 6. What is the continued ratio of the money they collected?
(b) Aliya types 36000 words in 30 minutes. How many words can she type in a minute?
(c) Company A charges 0.94 rupees per 30 seconds whereas the company B charges 1.69 per minute for a phone call. Which network company charges more per minute?

Individual work

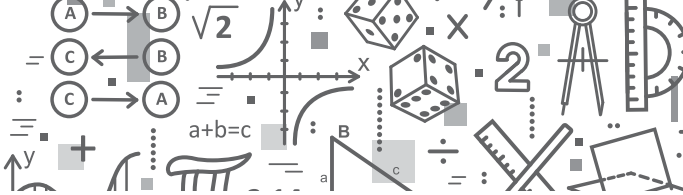
Question 7, 8, 10, 11, and 12 of Ex 4b on page 70 will be given as classwork.

Homework

Question 9, 13, and 14 of Ex 4b on page 70 will be given as homework.

Recapitulation

Any problems faced by the students will be discussed.



UNIT 5 FINANCIAL ARITHMETIC

Topic: Financial arithmetic
Time: 3 periods

Objectives

To enable students to:

- identify and define percentage
- express one quantity as a percentage of another quantity
- convert common decimal fractions into percentage
- convert a percentage into a fraction
- increase or decrease percentage of a quantity
- manipulate percentages and solve real-life problems involving percentages

Starter activity

A chart will be displayed with a square divided into a hundred equal parts, 25 shaded blue and 17 shaded red. The teacher can then ask the students questions like:

1. How many blocks out of a hundred are shaded blue?
2. How many of the blocks are shaded red?
3. How do we write these shaded parts as fractions?

   $\frac{25}{100}, \frac{17}{100}$ etc.

The students will be asked if they have seen, while shopping with their parents, at malls or shopping centres, banners or announcements like the ones given below.

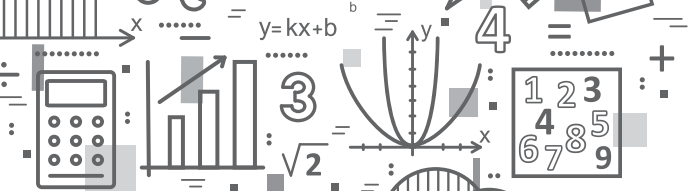
Sale upto 50% off, 40% discount on all items, Buy a pack of 3 and save 10% etc.
Ask them what they understand by 50%, 40%, 10% etc.

Display some flash cards showing discount announcement and ask questions to the students regarding these discount offers.

Main lesson

Refer to the textbook pages 71 to 77 and explain the following:

- The meaning of percentage
- The symbol used to represent percentage %
- Percentage as a part of a whole
- Converting percentage into common and decimal fractions
- Converting common fractions and decimal fractions into percentage emphasis on the symbol % to represent percent
- Increase or decrease of a quantity by a given percent
- Solving real-life problems involving percentage



Practise session

Write questions like the ones given below on the board and ask the students to come in turns and solve them.

- Write as a common fraction: 45%, 30%, 29%, 75% etc.
- Write as a decimal fraction: 45%, 30%, 29%, 75% etc.
- Write as a percentage: $\frac{14}{100}$, $\frac{16}{25}$, $\frac{18}{50}$, –27, –05 etc.

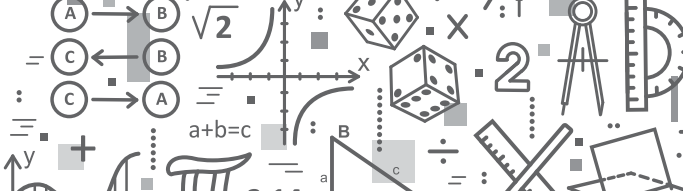
Individual work

Exercises 5a, 5b, and 5c from the textbook will be given.

Homework

Complete the table:

Fraction	$\frac{14}{28}$			$\frac{40}{50}$	
Decimal		15			
Percentage			85%		36%



UNIT 6 INTRODUCTION TO ALGEBRA

Topic: Algebra
Time: 4 periods

Objectives

To enable students to:

- understand the language of algebra (use of letters of the alphabets to represent numbers)
- perform the four basic operations i.e. addition, subtraction, multiplication and division of algebraic expressions.
- substitute numbers for letters of the alphabet in expressions and formula and evaluate
- manipulate simple algebraic expressions

Starter activity

Some numerical expressions will be written on the board and students will be asked to solve them.

3 + 4, 7 + 1, 9 + 5, etc.

The teacher will then write some algebraic expression and the answers of the students will be checked.

$x + 4$, $7 - x$, $2x + 5$ etc.

Main lesson

Using the textbook pages 81 to 91, the teacher will explain:

- Difference between numerical and algebraic expressions
- Mathematical and open sentences
- Variables and constants
- Coefficients, variables, and exponents (numerical and literal coefficients)
- Algebraic expressions (like and unlike terms)
- Addition & subtractions of like terms (rules of signs), horizontal and vertical method will be explained
- Evaluation of algebraic expression by substitution

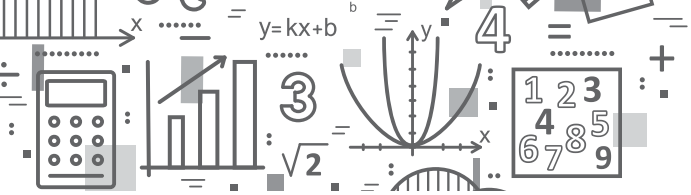
Practise session

Worksheets will be given and students will solve them with the help of the teacher as well as other class fellows.

Worksheet

Write as algebraic sentences:

i) the integer one more than x
ii) the integer one less than x
iii) a plus 25 equals 12 times b
iv) one half of a number is equal to 17
v) the sum of $3x$ and $2y$ divided by z



Activity

Think of a number

Add three to it.

Double the result.

Take away four

Halve the result.

Take away the number you first thought of. What is the answer?

Individual work

Exercises 6a, 6b, 6c, 6d, and 6e will be done.

Homework

Some sums other than the textbook will be given as homework.

1. Simplify:
   a) $a + 17a + 5a$
   b) $31p - 14p + 7p$
   c) $9x - 4y + 3x + 7y$
   d) $4a + 5b + 2c - 3a - 2b - 2c$
   e) $a \times 3a$
   f) $2ab \times ab \times -3ab$
   g) $2a^2b \div ab$

2. If $a = 5$ find the value of
   a) $a^2 - a$
   b) if $x = -3$, $y = 4$ find the value of $-xy$

Recapitulation

Rules of addition and subtraction.

Rules of multiplication and division will be reviewed.

A short test will be conducted to check the understanding and application of the students.

Topic: Number sequence
Time: 1 period

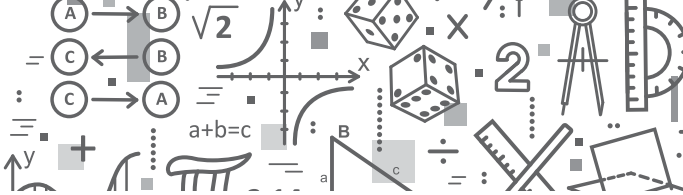
Objectives

To enable students to:

- Recognise patterns from number sequences
- Continue a number sequence

Starter activity

Some number sequence will be written on the board and the students will be asked to solve them.
2, 4, 6, 8, __, __, ___.
–10, –5, 0, 5, __, __, __.
1, 3, 5, __, ___, ___.



Main lesson

Using the textbook pages 91 to 93, the teacher will explain:

- What the words 'term' and 'rule' refers to in number pattern
- The difference between term to term rule and position to term rule using examples
- How to find out the value of the nth term.

Practice session

a) State the rule of the following sequence and write the next three terms.
   i) 5, 7, 9, 11, …
   ii) 3, 6, 9, 12, ….
   iii) 42, 49 56, …

b) At a flower shop, there were 17 flowers sold on the first day, 22 flowers sold on the second day, and 27 flowers on the third day. How many flowers will the shop sell on its 7th and 8th day?

Individual work

Questions 1, 2, and 5 of Exercise 6f on page 93 will be given as class work.

Homework

Question 3 and 4 of Exercise 6f on page 93 will be given as homework.

Recapitulation

Any problems faced by the students will be discussed.

UNIT 7 LINEAR EQUATIONS

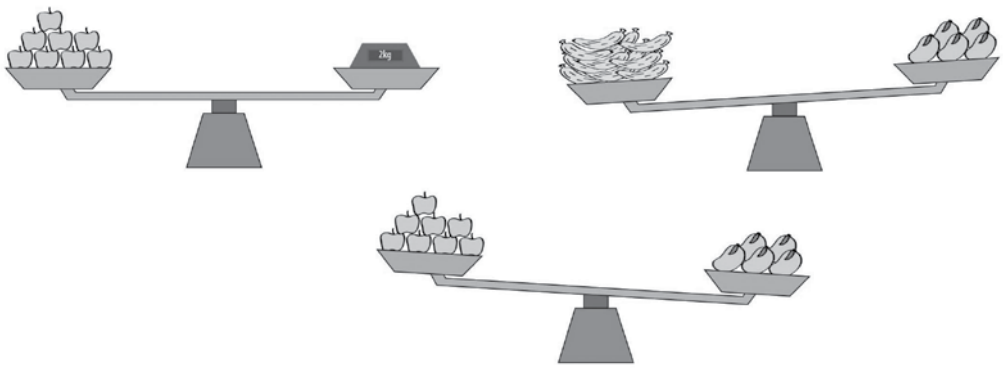
Topic: Linear equations
Time: 4 periods

Objectives

To enable students to:

- define an algebraic equation
- differentiate between an expression and an equation
- solve simple linear equations
- form equations from real-life situations and solve

Starter activity



Look at the figures and then answer these questions.

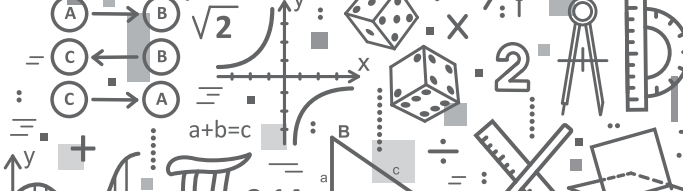
1. What is the weight of 8 apples?
2. Is the weight of 12 bananas equal to the weight of 5 mangoes?
3. Is the weight of 5 mangoes more than 8 apples?
4. Is the weight of 5 mangoes less than the weight of 12 bananas?
5. How do we write the same statements in an algebraic form using the symbols =, ≠, < or >.

Main lesson

The answers to the preceding questions:

1. The weight of 8 apples is 2 kg.
2. The weight of 12 bananas is not equal to the weight of 5 mangoes etc. are grammatical statements but we can write these statements using the symbols as shown below.

   = to mean equal
   ≠ not equal to
   < less than (read left to right)
   > greater than (read left to right)



If we use the variables a, b, and m for apples, bananas, and mangoes respectively we can write the above sentences as:

a) $8a = 2$
b) $12b \neq 5\ m$
c) $5m > 8a$
d) $5m < 12b$

The above four examples are called statements or sentences but only the first one uses the equal sign. This algebraic statement is called an equation.

The statement b, c, and d do not use the equal sign and are therefore called inequalities.

Using the textbook (pages 95 to102), define 'equation' and 'linear equation'.

- An equation is an algebraic statement consisting of two expressions connected by an equal sign. Give more examples of equations.
- Variables are called unknowns in an equation.
- Difference between an expression and an equation
- Solve simple linear equations
- Give rules for solving equations adding, subtracting, multiplying and dividing both sides, with examples
- Transform real-life problems into an equation form and solve

Practise session

Solve the following examples with student participation.

a) $g - 10 = -5$
b) $x + 4 = 7$
c) $3c = -66$
d) $\frac{5a}{3} = 15$
e) $3x - 4 = 8$
f) $10x - 59 = 11$

Individual work

Exercise 9a, 9b, 9c, 9d and 9e from the textbook.

Homework

Give word problems based on real-life situations.

Recapitulation

Revise the rules for solving equations. Supervise the students who have grasped the concept, help the slower students.

UNIT 8 GEOMETRY: LINES AND ANGLES

Topic: Three-dimensional solids
Time: 1 period

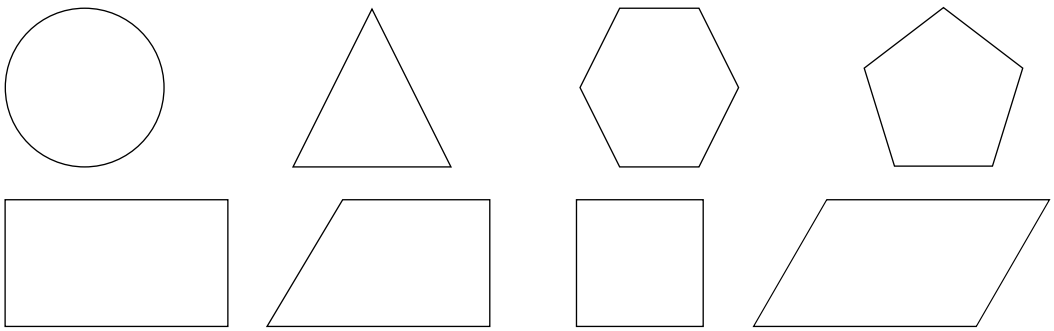
Objectives

To enable students to:

- recognise three dimensional objects
- determine the volume of a solid cube and cuboid

Starter activities

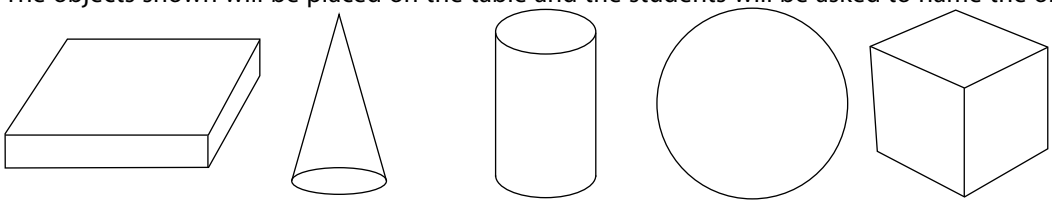
Some 2D shape figures will be drawn on the board and students will be asked to write the names of each figure.



Next, explain to the students that these figure have a length and breadth. They can be drawn on a paper or the board. They have no thickness and are called 2D (two dimensional) figures.

Main lesson

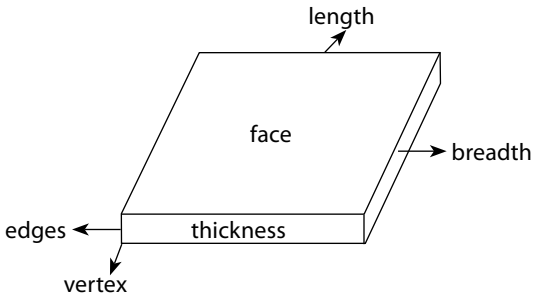
The objects shown will be placed on the table and the students will be asked to name the objects.



Cuboid Cone Cylinder Sphere cube

A cuboid will be drawn on the board to show its length, breadth and thickness.

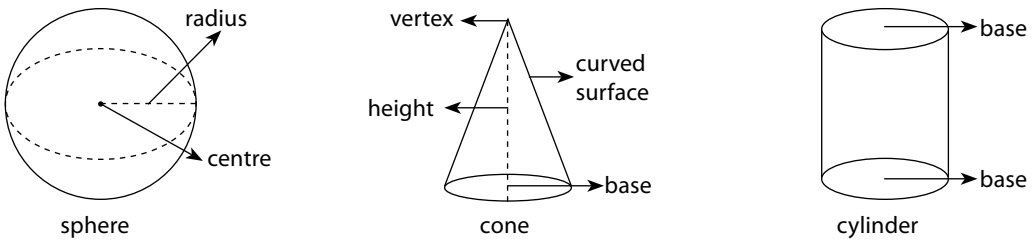
Objects with length, breadth and a thickness are called 3D (three dimensional) objects.



Edge, vertex, height (thickness), face, length and breadth will be shown with the help of real objects. The students will be asked to count the number of edges, vertices and faces. In the cuboid shown, there are:

12 edges, 8 vertices and 6 faces.

Shapes of a cone, a cylinder and a sphere will be drawn on the board and their parts will be discussed.



Practise session

The students will be asked to draw a few three dimensional figures that they come across in real-life.

Individual work

The students will be asked to bring these things and fill in the given table.

Objects	Edges	Vertices	Faces	Shape of faces	Name of shape
a shoebox					
a tea box					
a football					
an ice cream cone					
a juice can					
a dice					

Recapitulation

Any problems faced by the students will be discussed.

Homework (Project)

The students will be asked to make 3D objects with the help of 2D paper cut-outs.

Topic: Line segment
Time: 2 periods

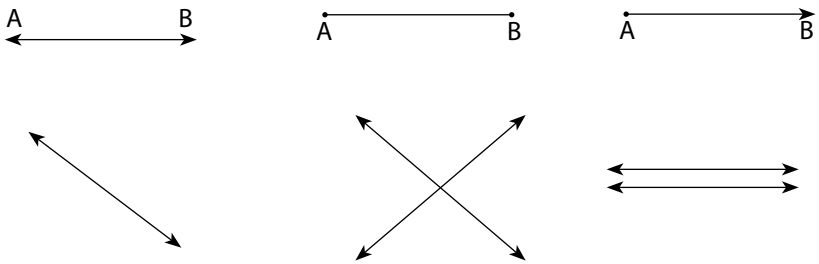
Objectives

To enable students to:

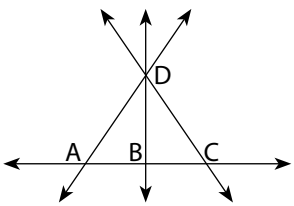
- add and subtract measures of two or more line segments.
- bisect a given line segment
- draw a perpendicular to a line segment

Starter activity

A few lines will be drawn on the board and the students will be asked to name them.



Use this figure and name 4 lines, 6 segments, 5 rays and 5 angles.



Main lesson

Explain to the students how to draw a line segment when a measurement is given.

Method 1

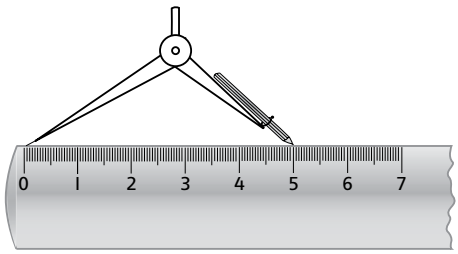
Draw a line segment AB of 5 cm with a ruler.

The teacher will mark a point A on the board. Place the ruler such that the zero mark coincides with A. Next, mark another point B coinciding with 5 cm on the ruler. Join the two points A and B by moving the pencil along with the straight edge of the ruler so that AB = 5 cm.

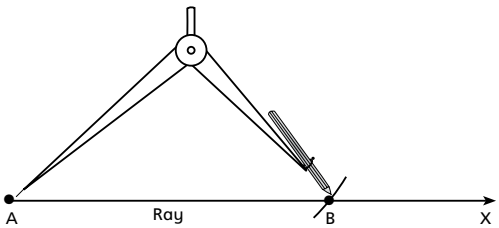
Method 2

Draw a line segment with the help of a ruler and a compass.

- A ray AX will be drawn on the board.
- Place the needle of the compass at the zero mark of the ruler and open the compass wide enough so that the tip of the pencil falls on 5 cm.
- Place the needle tip on A and draw an arc to cut AX at B, so that AB = 5 cm.



Ruler



Explain the students how to add measures of two line segments using the following example.
Given PQ = 4 cm and RS = 3 cm, draw XY such that XY = PQ + RS

PQ + RS = XY
4 + 3 = 7 cm
XY = 7 cm

After finding the length of XY, the students will be asked to follow method 2 to draw XY.

Practise session

The students will be asked to solve the examples given on pages 110 and 111 of the textbook.

Individual work

The students will be asked to draw line segments of various measurements.

Homework

A worksheet will be given to measure the given line segments.

UNIT 9 PRACTICAL GEOMETRY

Topic: Bisecting a line segment and drawing a perpendicular to a given line from a point on it

Time: 2 periods

Objectives

To enable students to:

- bisect a line segment
- draw a perpendicular

Starter activity

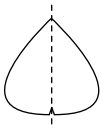
The following questions will be asked to make the concept of bisector and perpendicular clearer.

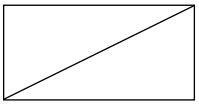
- What does mono mean?
- What is the meaning of bi, tri, tetra… etc?
- What do you understand by perpendicular?
- Name the objects in your classroom that are perpendicular to the (a) floor, (b) roof of your class.

Main lesson

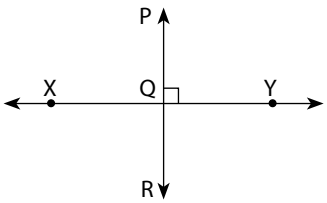
A few pictures will be drawn on the board to clarify the concept of bisector and perpendicular.

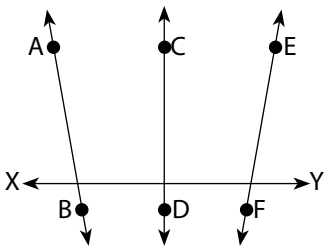
Bisector means dividing into two equal parts.



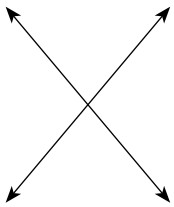


Line PR and XY intersect to form a right angle (90°)
Lines PR and XY are perpendicular.
The sign ⊥ denotes a perpendicular.





Which of the above lines are perpendicular?



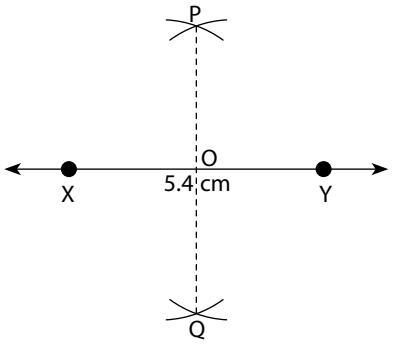
Are these lines perpendicular to each other?

Bisecting a line segment

Draw a line segment XY of 5.4 cm and bisect.

Method

- A line segment $\overline{XY}$ of 5.4 cm will be drawn on the board.
- Taking a radius of more than half of $\overline{XY}$, two arcs will be drawn from point X, one above $\overline{XY}$ and the other below $\overline{XY}$.
- With the same radius from point Y, two more arcs will be drawn cutting the previous arcs at P and Q respectively.
- Join P and Q with a dotted line cutting $\overline{XY}$ at O.
- $\overline{XY}$ is bisected at O
  $\overline{XO} = \overline{OY} = 2.7$ cm



The students will be asked to do the same in their exercise books.

Drawing a perpendicular to a given line from a point on it

Construct a perpendicular on $\overleftrightarrow{XY}$ from the point Q.

Method 1

Construction will be explained on the board.

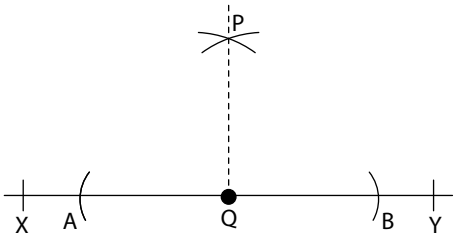
Step 1: A line $\overleftrightarrow{XY}$ will be drawn on the board.

Step 2: A point Q will be marked on $\overleftrightarrow{XY}$.

Step 3: Taking Q as centre or placing the needle of the compass on Q, draw two arcs on either side of Q to cut XY at A and B.

Step 4: Place the needle of the compass first on A then on B, and draw two more arcs cutting each other at P.

Step 5: Join Q and P with a dotted line PQ is perpendicular to $\overleftrightarrow{XY}$.



Method 2

Drawing a perpendicular to a given line from a point outside it

Step 1: Draw a line $\overleftrightarrow{AB}$ of any length.

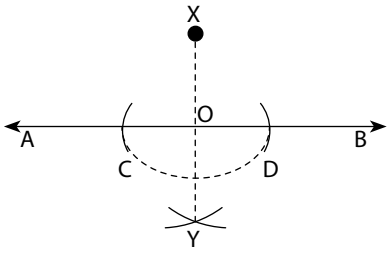
Step 2: Mark a point X outside $\overleftrightarrow{AB}$.

Step 3: Place the needle of the compass at X and draw two arcs cutting AB at C and D.

Step 4: With C as centre and the radius equal to CD, draw an arc above or below AB.

Step 5: With D as centre and the radius equal to CD, draw another arc cutting the previous arc at Y.

Step 6: Join XY with a dotted line cutting AB at O. XO is perpendicular to AB.



Individual Work

Exercise 9a on page 123 will be given as classwork.

Homework

Questions 4, 5, and 6 of Exercise 9b on page 132 will be given as homework.

Recapitulation

Any problems faced by the students will be discussed.

Topic: Constructing and bisecting angles
Time: 2 periods

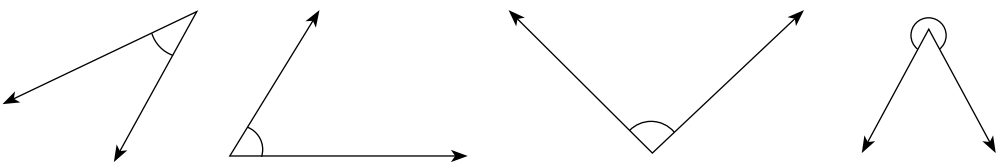
Objectives

To enable students to:

- draw an angle with the help of a protractor
- to construct an angle with help of a compass and a ruler
- to distinguish between acute, obtuse, straight and reflex angles
- to divide an angle into two equal angles and into 4 equal angles

Starter activities

1. Some angles will be drawn on the board and students will be asked to name them.



2. Draw the following angles with the help of a ruler and protractor:
   60°, 75°, 130°, 220°

Main lesson

Refer to pages 123-128 of the textbook.

Construction of angles without using a protractor

- The students will be shown how to construct angles of 70°, 140°, 60°, 120° and 90° with a compass and ruler.
- Bisector of angles using a compass and ruler will also be explained to the students on the board.
- The teachers should check up on groups of students to ensure each student understood the construction and is able to do so independently.

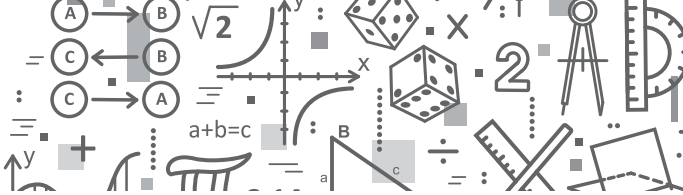
Practise session

Construct the following angles without using a protractor and the bisect them.

70°, 90°, 128°

Individual work

Exercise 9b, questions 1 and 2 will be done in the class.



Homework

Exercise 9b, question 3 will be given as homework.

Recapitulation

Any problems faced by the students will be discussed. They could be asked to make up questions for their partners.

Topic: Reflective symmetry

Time: 1 period

Objectives

To enable students to:

- reflect an object
- find the line of reflection using construction

Starter activity

The teacher should have some cut-outs of symmetrical figures. A small mirror will be brought to class and the symmetrical figures will be folded in half.

The students will be asked to place the folded figures over the mirror in such a way that it forms a complete symmetrical shape.

The teacher will have a discussion over the reflection of objects and figures with the students.

Main lesson

Refer to pages 128-131 of the textbook.

The teacher will explain the construction of line of reflective symmetry on board using examples given in the book.

Practice session

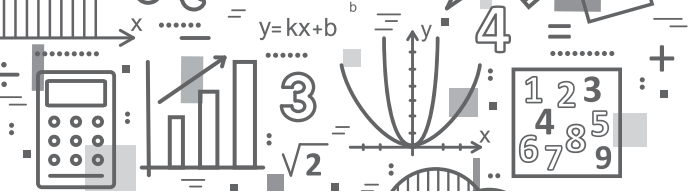
Ask the students to find the line of symmetry of all the alphabets in English language.

Individual work

Questions 7 and 8 of Ex 9b on pages 132 and 133 will be given as classwork.

Recapitulation

Any problems faced by the students will be discussed. They will be asked to solve worksheet and discuss in class.



UNIT 10 AREA AND PERIMETER

Topic: Area and perimeter
Time: 2 periods

Objective

To enable students to calculate or determine the area and perimeter of various shapes.

Starter activity

1. What is perimeter?
2. What is the perimeter of your maths book? Measure the sides and calculate it.
3. What is the approximate length of your classroom?
4. What is the perimeter of the mango leaf given to you?

Main lesson

The perimeter of a shape or figure is the distance around the figure.

For a rectangular shape or figure, we can use the formula, $2(l + b)$, where 'l' stands for length and 'b' stands for breadth because opposite sides are equal and congruent.

A square has all four sides equal, therefore the formula, side × 4 is used.

Distances and lengths are measured in mm, cm, m, and km.

Example 1

Find the perimeter of a room which is 6 m long and 4.8 m wide.

length = 6 m, breadth = 4.8 m
P = $2(l + b)$
= 2(6 + 4.8)
= 2(10.8)
P = 21.6 m

Example 2

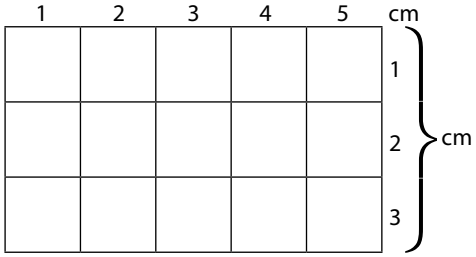
Find the perimeter of a square boundary with each side = 6.5 m.

P = 4 × length
4 × 6.5
P = 26 m

Example 3

Find the area of a rectangle whose length is 5 cm and breadth is 3 cm.

Area will be explained to the students by drawing a rectangle on the board.



Area = $l \times b$
5 cm × 3 cm
= 5 × 3 × cm × cm
Area = 15 cm

Example 4

Find the area of a square board with each side measuring 15.4 cm.

Length = 15.4 cm
A = $l \times l = l^2$
A = 15.4 × 15.4
= 237.16 cm^2

Example 5

Square tiles with sides of 25 cm are used to tile a kitchen that measures 15 m by 10 m. How many such tiles are needed?

Area of the kitchen = 15 m × 10 m = 150 m
Since the length of the tile is in cm, we will convert 150 m^2 into cm.

100 cm = 1 m
1 m^2 = 100 × 100 = 10000 cm

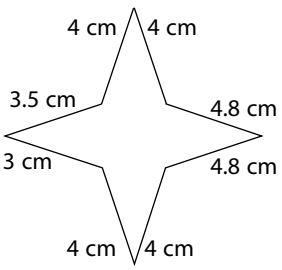
or

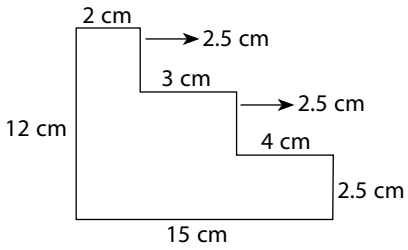
15 m = 15 × 100 = 1500 cm
10 m = 10 × 100 = 1000 cm
Area in cm = 1 500 000 cm^2

Length of the tile 25 cm
Area of tile = 25 × 25 = 625 cm
Tiles required = $\frac{1\ 500\ 000}{625}$ = 2400
Number of tiles required = 2400

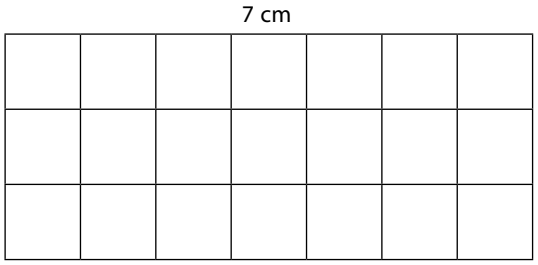
Practise session

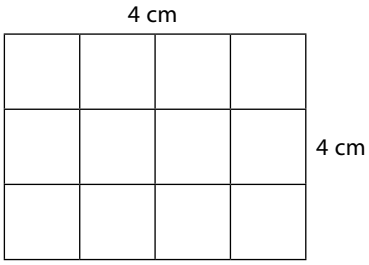
Find the perimeter of these shapes:





Find the area of these shapes:





Individual work

Exercise 10a, questions 1–5 on pages 137 and 138 will be done in the class.

Homework

Exercise 10a, questions 6 and 7 will be given as homework.

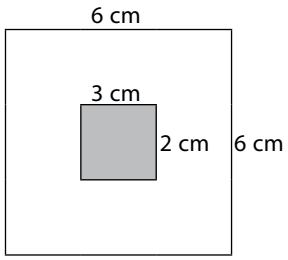
Topic: Area of a path of a rectangle or square
Time: 1 period

Objective

To enable students to determine the area of shaded and unshaded parts.

Starter activities

Draw a 6 × 6 cm square. In the centre of this square draw a rectangle 3 cm by 2 cm and colour it. Find the area of the part not coloured.



Area of the square $l \times l$
$A = 6 \times 6 = 36$ cm^2
Area of the coloured rectangle: 3 cm × 2 cm = 6 cm^2
Area of un-coloured part: 36 cm^2 – 6 cm^2 = 30 cm^2

Main lesson

Calculating the area of a path inside the rectangle

PQRS is a rectangle where PQ = 75 m and PS = 48 m

A path is constructed inside the rectangle. The width of the part is 3 m wide all round. Find the area of the path.

Solution

- When the path is inside, subtract twice the width of the path.
- If the path is outside the rectangle or square, add twice the width of the path.

Width of the path 3 m
Twice 3 m = 6 m
Length of PQ = 75 m
= 75 – 6 = 69 m

Breadth 48 m
= 48 – 6 = 42 m
Area of the path: $75 \times 48 - (69 \times 42)$ m^2
= 3600 – 2898 = 702 m^2
Area of the path is therefore, 702 m^2

Practise session

Figures will be drawn on the board to calculate the areas of shaded and unshaded regions.

Individual work

Exercise 10b, questions 1 to 3 will be done in class.

Homework

Exercise 10b, questions 4 and 5 will be given as homework.

Topic: Area of polygons (triangle, trapezium, and parallelogram)
Time: 2 periods

Objectives

To enable students to:

- determine the area of different types of polygons
- deduce formulae

Starter activity

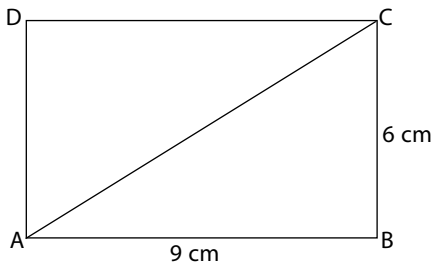
1. How are parallelogram different from rectangles?
2. How can we deduce the formula of triangle?
3. Can you think of any other units of length?

Main lesson

Example 1

To find the area of a triangle, draw a rectangle on the board and explain how the formula for the area of the triangle has been deduced.

The diagonal AC divides the rectangle into two equal triangles.

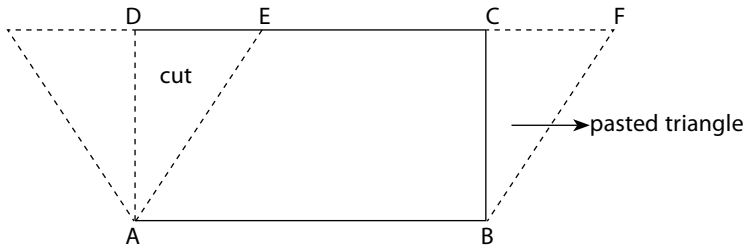


Area of the rectangle ABCD = $l \times b$
A single triangle is half of the rectangle
$l \times \frac{b}{2}$ or l = base of triangle
Width is the height of the triangle
$\frac{1}{2} \times b \times h$

Area of triangle ABC = ADC = $\frac{1}{2} \times 9 \times 6 = 27$ cm^2
Area of rectangle = $l \times b = 9 \times 6 = 54$ cm^2
27 cm^2 is half of 54 cm^2

Example 2

To find the area of parallelogram, a rectangle will be drawn on the board.

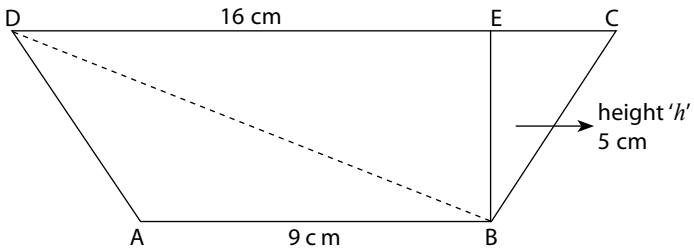


Cut the triangle ADE and paste it on the other side with BC to form triangle BCF.
ABFE is a new quadrilateral called parallelogram.
Area of parallelogram = Area of rectangle = $l \times b$

Area of parallelogram = sum of the area of two triangles
Area of parallelogram = base × height = $b \times h$ (cm^2)

Example 3

Area of a trapezium will be explained in the same way by drawing the figure on the board.



DBA and DBC are two triangles
BE = height

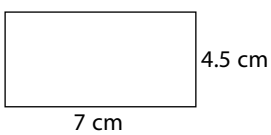
Area of trapezium = (sum of the parallel sides) $\times \frac{h}{2}$

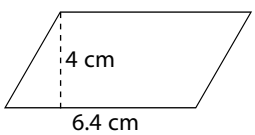
$\frac{(16 + 9)}{2 \times 6}$

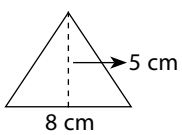
$\frac{25}{2} \times 6 = 75$ cm^2

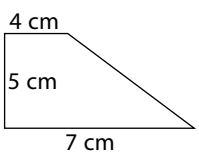
Practise session

Calculate the area of these quadrilaterals.









Individual work (Period 1)

Exercise 10c, questions 1 to 5 will be done in class.

Homework

A few questions will be given to be done as homework.

Individual work (Period 2)

Exercise 10d, questions 1 to 3 will be done in class.

Homework

Exercise 10d, questions 4 and 5 will be given as homework.

Topic: Area of composite shapes
Time: 1 period

Objective

To enable students to determine the area of a composite shape.

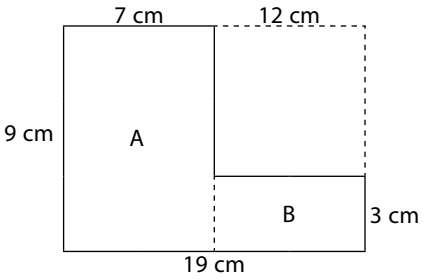
Starter activity

Find the area of the following shape:

Example 6

Divide this shape into two rectangles as shown using dotted lines.

Area of shape 'A' 9 cm × 7 cm = 63 cm^2
Area of shape 'B' 12 cm × 3 cm = 36 cm^2
Total area: 63 cm^2 × 36 cm^2= 99 cm^2



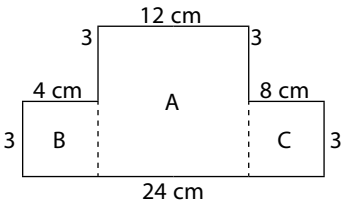
Example 7

Find the area and perimeter of the given figure.

Step 1

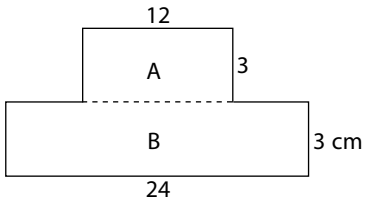
Divide this figure into 3 rectangles.

Area = $l \times b$
Area of 'A' = 12 cm × 6 cm = 72 cm^2
Area of 'B' = 4 cm × 3 cm = 12 cm^2
Area of 'C' = 8 cm × 3 cm = 24 cm^2
Total area = 72 cm^2 + 12 cm^2 + 24 cm^2 = 108 cm^2



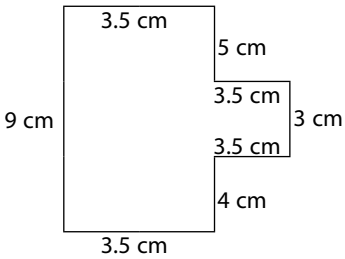
The same figure divided into 2 rectangles.

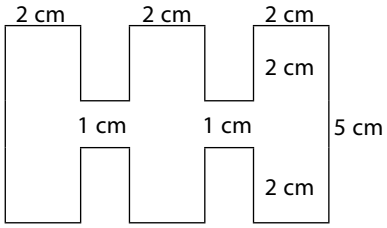
Area of 'A' = 12 × 3 = 36 cm^2
Area of 'B' = 24 × 3 = 72 cm^2
Total area = 36 + 72 = 108 cm^2



Practise session

Find the area of these figures.





Individual work

Exercise 11b, question 6 will be done in class.

UNIT 11 VOLUME AND SURFACE AREA

Topic: Volume and surface area of 3D shape
Time: 1 period

Objective

To enable students to determine the volume and surface area of cube and cuboid.

Starter activity

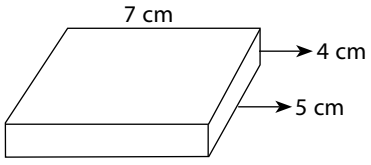
Volume will be defined to the students by filling some shapes like a juice can (a cylinder) or a lunch box (a cuboid) with water. The amount of water which either shape will hold can be poured into a measuring cylinder to find the volume.

The formula for calculating the volume will be explained.

- Volume (V) = length × breadth × height
- Volume of cube is ($l \times b \times h$) cm^3

Main lesson

Find the volume of the following shapes using the formulae.



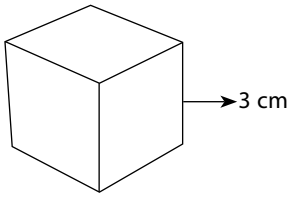


Figure 1 is a cuboid.

$V = l \times b \times h$
$V = 7\ cm \times 5\ cm \times 4\ cm = 140\ cm^3$

Figure 2 is a cube.

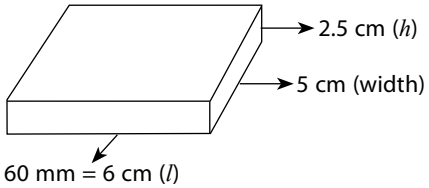
(three edges)$^3 = 3 \times 3 \times 3 = 27\ cm^3$

Practise session

a) Find the volume of a cubical box whose side or edge is 4.5 cm.

b) Find the volume of a box whose dimensions are 60 mm, 5 cm and 2.5 cm.

Draw the box to show its dimensions.



Individual work

Exercise 11a, questions 1 and 2 on page 149 will be done in class.

Homework

Students will be asked to calculate the volume of their pencil box and a match box.

Recapitulation

Any problems faced by the students will be discussed to clarify the concepts taught.

Topic: Total surface area of cubes and cuboids
Time: 1 period

Objective

To enable students to determine the total surface area of cubes and cuboids

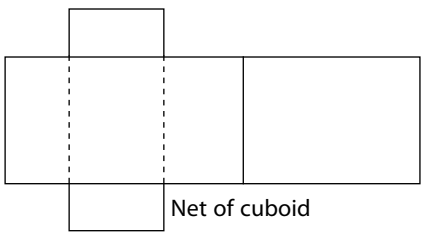
Starter activity

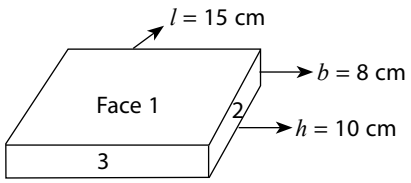
A cake or paper box will be shown to the class. The teacher will carefully open the glued ends and display the net of the box to the class. The students may be asked the following questions.

1. What are nets?
2. What is the total area of the entire box? Discuss the answers students give.

Main lesson

A cardboard cuboid and cube will be made and cut along the edges as drawn below.





A cuboid has 6 faces. Opposite faces are equal and congruent.

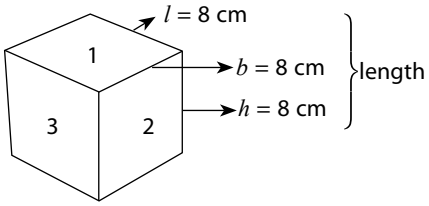
Face-1: A = $l \times b$ = 15 cm × 8 cm = 120 cm^2
Face-2: A = $b \times h$ = 8 cm × 10 cm = 80 cm^2
Face-3: A = $l \times h$ = 15 cm ÷ 10 cm = 150 cm^2
Total surface area = 2(120 + 80 + 150) cm^2 = 2(350) cm^2
Total surface area = 700 cm^2

The formula for total surface area of a cuboid is 2 ($l \times b + b \times h + l \times h$)

A cube will be drawn on the board so that it indicates that all the faces of a cube are equal and congruent.

For a cube: length = breadth = height

Total surface area = 2(3 × length × length)
6(length)^2 = 6(8)^2
= 6(64) = 384 cm^2



Practise session

a) Find the area of a box 8 cm long, 3.5 cm wide and height 6 cm.
b) Find the area of a cube with a length of 12 cm.
c) The length, breadth and height of a cupboard is 6 m, 4.5 m and 3.8 m respectively.
   i) Find its surface area.
   ii) Find the cost of painting it at the rate of 15 m^2.

Surface area = 2 (6 × 4.5 + 4.5 × 3.8 + 6 × 3.8)
= (27.0 + 17.10 + 16.8)
= 60.90 m^2
Cost of painting l m^2 is Rs 15
Cost of painting 60.90 m^2:
60.90 × 15 = Rs 913.50

Individual work

Students will be asked to do exercise 12b, questions 1 to 5.

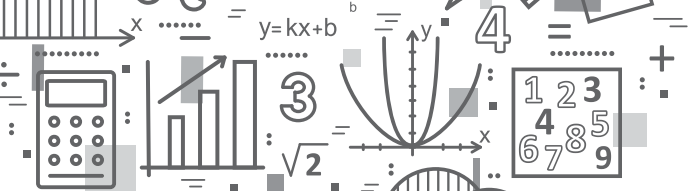
Homework

Questions 6 and 7 of Exercise 11b, and a worksheet based on surface area of cubes and cuboids will be given.

Note: As the exercise is lengthy one more period will be required to complete it.

Recapitulation

Any problems faced by the students will be discussed.



UNIT 12 DATA HANDLING

Topic: Data handling
Time: 3–4 periods

Objectives

to enable students to:
- collect data
- classify and tabulate data
- read and interpret tables and graphs
- construct bar graphs, and pie charts

Starter activities

Students will be divided into 4 to 5 groups with 6 to 8 students in each group and will be given the task of collecting information on the following. (Let the group leader record the information in a tabular form).

i) Means of transport used for school, a) school van b) public transport c) private car or
ii) Favourite sport: cricket, football, hockey etc.

The information collected will be written on the board by the teacher and questions like the ones given below will be asked.

1. Which is the most common means of transport?
2. Which is the most popular sport?

Main lesson

Refer to pages 159 to 165 of the textbook.

- Define data and ways of collecting data
- Importance of grouping the data
- Formation of frequency table
- Construction of simple bar graph, multiple bar graphs, pie charts
- How to interpret the data and draw conclusions

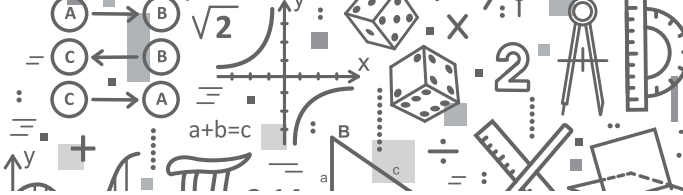
Practise session

A frequency table will be drawn on the board and the students will be asked a few questions:

- What are tally marks?
- How many tally marks are in the second group?
- What is the frequency of the 3rd group?
- What is the total frequncey?

Individual work

Exercises 12b and12c will be given from the textbook.



Homework

The students will be asked to collect information from friends, and neighbours on various topics like: the best TV channel, the most popular newspaper etc., and will draw a bar chart.

Get information on rainfall during a year, in a city or a country and draw a pie chart.

Recapitulation

Definitions of terms used in information handling will be revised.

Problems faced during the formation and collection of data will be discussed.

Topic: Mean, median, mode

Time: 2 periods

Objectives

To enable students to:

- calculate mean, median, and mode for ungrouped data
- solve real life problems associated to mean, median, mode

Starter activity

The teacher will ask the height of each student and write all of them on the board. The students will be asked the following questions:

1. What is the average (mean) height of the class?
2. What is the median height?
3. Which height is the most common in class?

Main lesson

Refer to pages 156-158 of the textbook.
The teacher will explain, using examples, the following:

- Mean refers to the average of a data set
- Media is the center value of a data set
- Mode is the most common value within the data set.

Practice session

(a) Find the mean of the following data set:
35, 42, 33, 27, 29, 31, 28

(b) Find the median of the following data set:
1.23, 1.75, 3.42, 2.22, 4.01, 3.99, 2.59

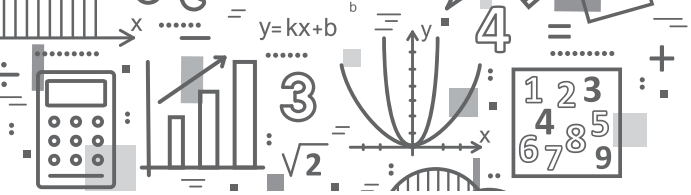
(c) Find the mode of the following data set:
61, 68, 77, 74, 56, 45, 77, 90, 74, 77

Individual work

Questions 1 to 6 of Ex 12a on pages 158 and 159 of the textbook will be given as classwork.

Homework

Questions 7 and 8 of Ex 12a on page 159 will be given as homework.



Recapitulation

Any problems faced by the students will be discussed in class.

Topic: Probability

Time: 1 period

Objective

To enable students to calculate the probability of events

Starter activity

The teacher will bring a dice to the classroom. The teacher will roll the dice and ask the students the number that will most likely roll. The following questions will be asked:

1. What are the chances of getting a six?
2. What are the chances of getting a two?
3. What are the chances of getting a seven?

The answers students provide will be discussed in class.

Main lesson

Refer to pages 168 to 170 of the textbook.
The teacher will explain the following using examples:

- Probability and its importance
- Terms such as sample space, experiment, equally likely, and not equally likely
- The calculation for probability

Individual work

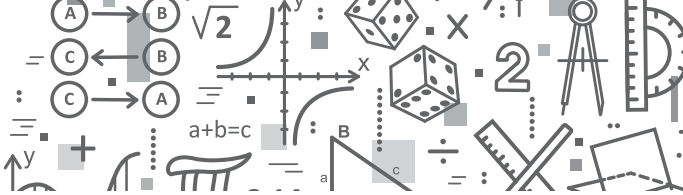
Questions 1 to 3 of Ex 12d on page 170 will be given as classroom.

Homework

The students will be given worksheets as homework.

Recapitulation

Any problems faced by the students will be discussed in class.



Model Examination Paper
Mathematics

Class VI

Name: _____ **Section:** _____ **Date:** _____

Time: 2 Hours **Maximum Marks:** 100

Read these instructions first:

- Write your name, section, and date clearly in the space provided.
- Answer all questions in Section A, Section B, and Section C.
- Show all your working along with the answer in the space provided.
- Omission of essential working will result in loss of marks.
- At the end of the examination, recheck your work before handing it over.
- The number of marks is given in brackets [ ] at the end of each question.
- This document consists of 10 printed pages.

_____ **For Examiner's Use Only** _____

Section	**A**	**B**	**C**					**Total**
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	
Max. Marks	**20**	**30**	**10**	**10**	**10**	**10**	**10**	**100**
Marks Obtained								
							Percentage	

Invigilated by: _____ **Marked by:** _____ **Checked by:** _____

Section A

Attempt **all** questions **[20 Marks]**

Q1. Each question has four options. Encircle the correct answer.

I. Set of even numbers which can be divided exactly by 3:

A {3, 6, 9, 12}
B {6, 12, 18, 24}
C {9, 15, 21, 27}
D {3, 6, 12, 24}

II. If T = Set of the first six consonents in the English alphabet, then which of the following represent set T?

A {a, e, i, o, u}
B {a, b, c, d, e, f}
C {b, c, d, f, g, h}
D {p, q, r, s, t, u}

III. $(12 \times 7) + (8 \times 7)$ is the same as

A $(12 + 8) \times 7$
B 84×56
C $(12 \times 8) + 7$
D $12 \times 7 \times 8$

IV. 2, 3, and 5 are factor of

A 30
B 15
C 10
D 6

V. Which of the following is not a prime number?

A 67
B 97
C 91
D 53

VI. Order of rotational symmetry of a square is

A 0
B 1
C 2
D 4

VII. When 20 is subtracted from the product of (–15) and (–4), the result is

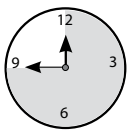
A –40
B –39
C 40
D 80

VIII. Which of the following is the simplest form of 36 : 54?

A 4 : 6
B 2 : 3
C 18 : 27
D 6 : 4

IX. 45 min expressed as a percentage of 1 hour is

A 75%
B 85%
C 65%
D 30%



X. Reduce a price of Rs 2000 by 20%.

A Rs 2400
B Rs 1600
C Rs 1980
D Rs 2020

XI. Which of the following is not equal to $\frac{1}{2}xy$?

A $\frac{xy}{2}$
B $x \times \frac{y}{2}$
C $\frac{1}{2x} \times y$
D $\frac{xy}{2}$

XII. Evaluate: $y = 2x + 3$, if $x = -3$

A 0
B 3
C –3
D 6

XIII. Which of the following statements is true?

A Points on a line can be counted

B Points on a line can not be counted

C A line has two end points

D A line can be represented by small letters

XIV. If a dice is tossed, then the probability that it is an even number is?

A $\frac{5}{6}$

B $\frac{4}{6}$

C $\frac{3}{6}$

D $\frac{2}{6}$

XV. When two angles add up to 90° they are called

A right angles

B complementary angles

C supplementary angles

D adjacent angles

XVI. Into how many equal parts does a bisector divide a line?

A 1

B 2

C 3

D 4

XVII. Interior angles of a triangle add up to

A 90°

B 120°

C 150°

D 180°

XVIII. If each side of a square is 5 cm then its area is

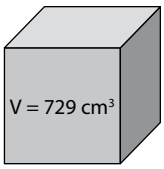
A 10 cm^2

B 25 cm^2

C 25 cm

D 20 cm

XIX. If the volume of a cube is 729 cm^3, then the length of each side is



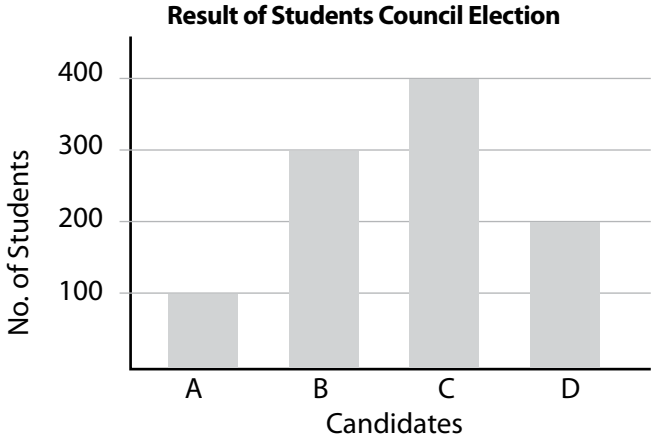
A 121.5 cm

B 9 cm^2

C 243 cm

D 9 cm

XX. The result of elections held in a school for Student's Council is represented by the given bar graph. What is the difference between the maximum and minimum number of votes?



A 400

B 300

C 200

D 100

[Total: /20]

Section B

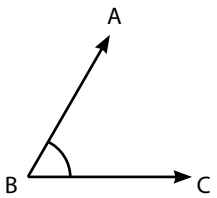
Attempt **all** questions **[30 Marks]**

Q2.

a) Find the ratio of 75 cm and 100 cm. **[/2]**

b) Amina, Fauzia, and Sara shared 90 pencils in the ratio 3 : 2 : 1. How many pencils did Fauzia get? **[/2]**

c) Measure the angle and name it according to its size. **[/2]**

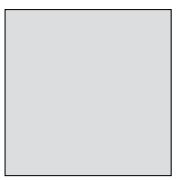


∠ABC = _____

∠ABC is _____

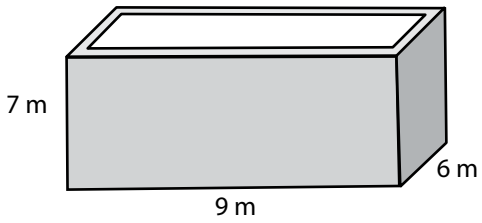
d) How many degrees are there in $2\frac{1}{2}$ right angles? **[/2]**

e) Find the area of a square with each side of 3 m 50 cm. **[/2]**



3 m 50 cm

f) A rectangular water tank has dimensions 9 m, 7 m, and 6 m respectively.
Find the volume of the water tank. **[/2]**



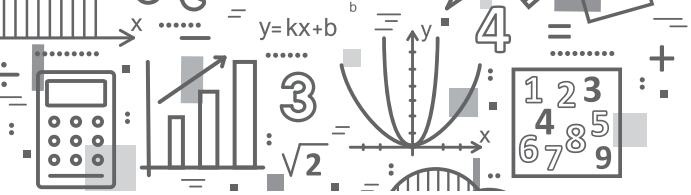
g) $\mathbb{U} = \{3, 6, 9, 12, 15, 18, 21, 24, 27, 30\}$. Draw a Venn diagram to represent: **[/3]**

(i) Set P = $\{x : x$ is a prime number$\}$

(ii) Set A = $\{x : x$ is exactly divisible by 4$\}$

h) Use numbers 4, 5, and 6 to verify the associative property of multiplication. **[/3]**

i) In a certain school there are 750 students. In one week 510 students issued books from the library.
What percentage of students did not issue any book during that week? **[/3]**



j) Simplify: $2x - 8y + z + 3x - y - z$ **[/3]**

k) Solve: $8(x + 1) = x + 15$ **[/3]**

l) The interior angles of a triangle are in the ratio of 1 : 2 : 3. Find the largest angle. **[/3]**

[Total: /30]

Section C

Attempt **all** questions **[50 Marks]**

Q3.

a) Find the HCF of 72, 252, and 600 by expressing each number as powers of their prime factors. Give your answer as a product of prime factors. **[/5]**

b) The lights of three lighthouses flash together after 126 sec, 154 sec, and 198 sec respectively. After how many minutes will they next flash together? **[/5]**

[Total: /10]

==========

Q4.

a) Raza and Ayesha simplified 276 – 132 – (– 310) – 494) and got different answers. Raza's answer is – 328 and Ayesha's answer is – 40. Simplify yourself and check who has calculated correctly. **[/3]**

b) Simplify: $180 \div (-30) \times 100 + (-400)$ **[/3]**

c) Simplify: $-21 - 4 \div [(-15) + 10] \times 100 - 375$ **[/4]**

[Total: /10]

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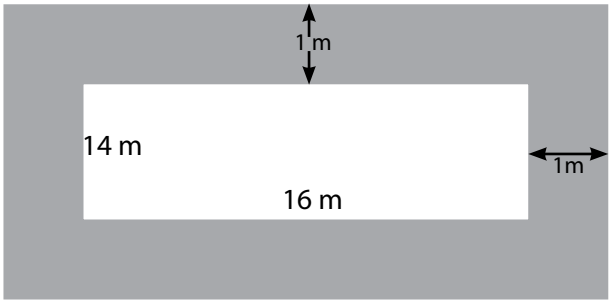
Q5.

a) The length and breadth of a piece of land is 16 m and 14 m respectively. A path of uniform width of 1 m runs around it on the outside. Find the area of the path. **[/5]**



b) Multiply a number by 3, subtract 6, and then multiply the result by 2. The answer is 18.
Find the number. **[/5]**

[Total: /10]

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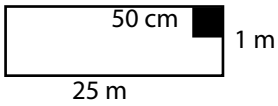
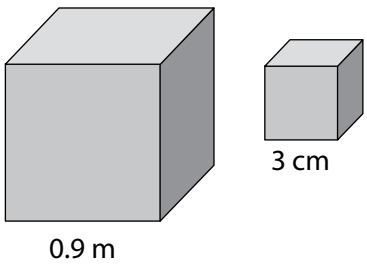
Q6.

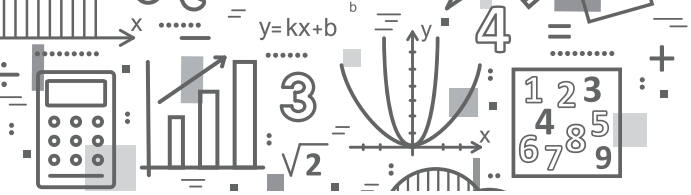
a) How many square tiles of side 50 cm are required to cover a pavement 25 m long and 1 m wide? **[/5]**



b) The length of each side of a solid metal block is 0.9 m. The block is melted to make small cubes with an edge of 3 cm. How many small cubes can be made from the metal block? **[/5]**



[Total: /10]



Q7.

a) Consider the following set of cards. **[/2]**

11	12	13	14	15

i) What is the chance of drawing 12?

i) What is the chance of drawing a number less than 16?

b) The marks obtained in a mathematics test by 15 students are: 21, 27, 19, 30, 25, 25, 28, 26, 25, 28, 22, 19, 33, 7, 10. Find the mean, median, and mode of the data. **[/5]**

c) Construct an angle of 120˚ using a pair of compasses and bisect it. **[/3]**

or

Draw a perpendicular on line $\overline{AB}$ = 8 cm from a point C lying above the line $\overline{AB}$.