2   **Sets**
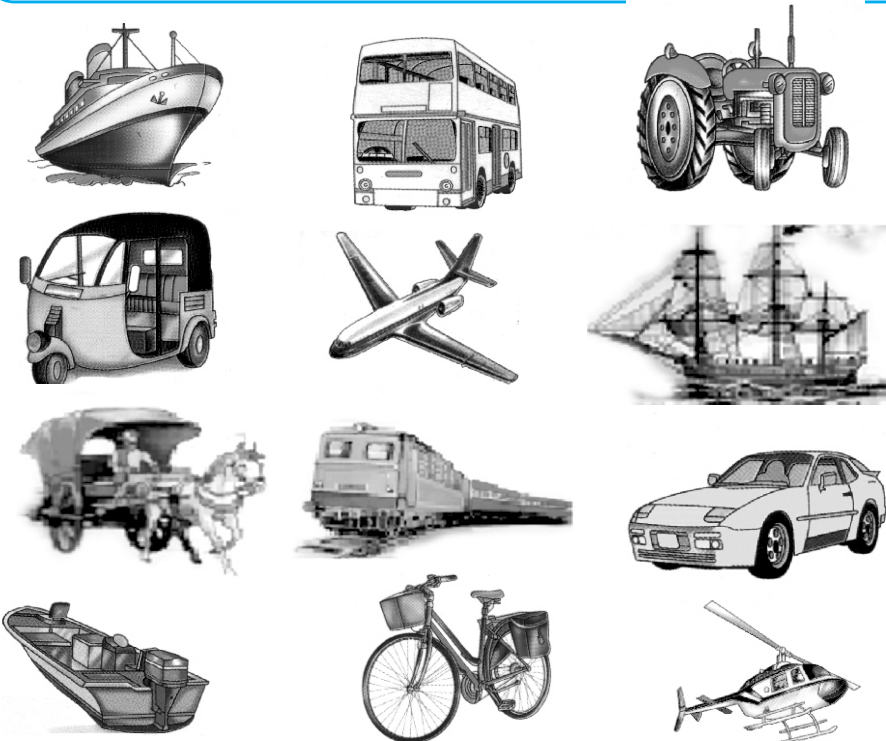
After studying this chapter you will achieve the competency of :
* grouping materials with the same characteristics.
* identifying definite groups and indefinite groups.
* identifying sets.
* identifying the elements of a set.
* representing sets in Venn diagrams.
* applying the concept of sets in day- to- day activities.

2.1 Grouping of materials.

A few vehicles you have seen and are familiar which are given in the picture. Separate them into three groups as you wish and name the groups.

> Grouping of materials may be done as follows,
> * shape
> * colour
> * kind
> * nature (smooth, rough)
> * solid, liquid, gas

The above vehicles can be separated into three groups, as vehicles travelling on the land, vehicles sailing in water and vehicles flying in the air.

Activity 2.1

Ask the following two questions from five of your friends. Note down the answers.

(01) What are the even numbers between 5 and 15 ?

(02) Name three kinds of fruits you like most?

* Examine the answers given by your friends.
* Which question gets a precise answer?
* What can you say about the answer you get for the second question?

How many tall children are there in your class?

When you say tall children, we cannot specify them exactly. If you say that the children in the class whose height is above 100 cm, then that group can be selected precisely.

Certain groups can be selected definitely and there are groups which are not definite.

(1)   Separate the materials gold, silver, pearls, gems, pebbles, sand, tar, iron, glass and mercury into two precise groups as metals and non - metals and write them in the relevant circles.
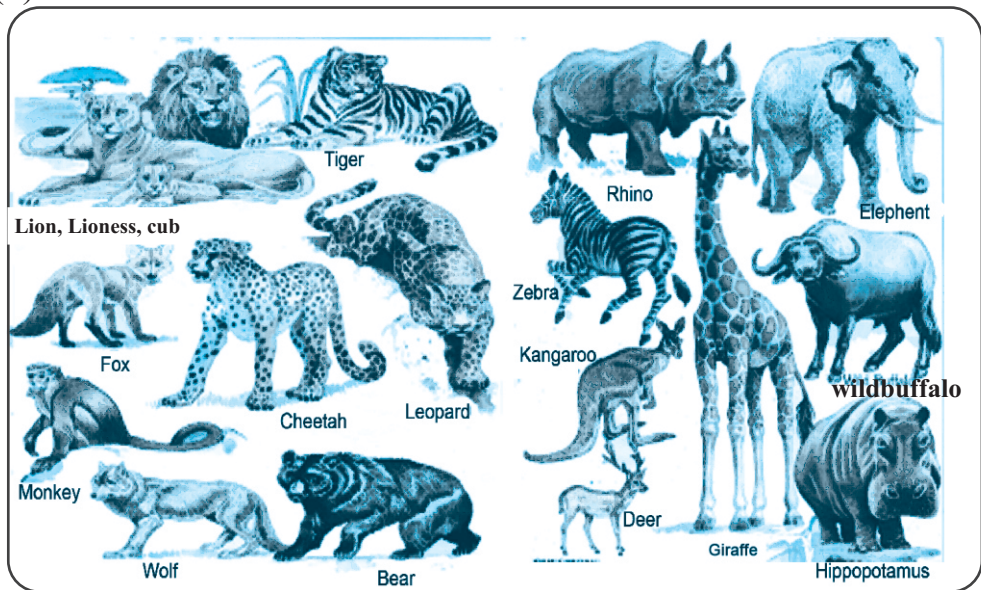
Metals   Non -metals
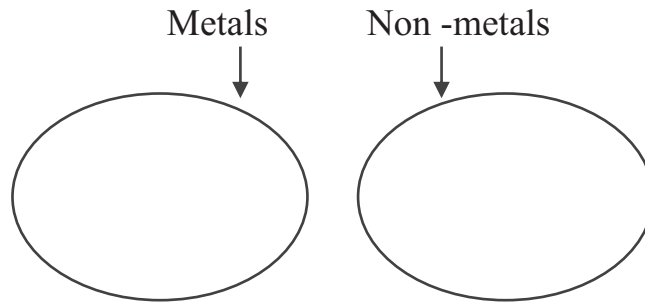
(2)   Separate the food items apple, grape, rambutan, rose apple, gotukola, orange, drumstick and bean into two groups and write two names to identify the groups.

(3)   Write all the numbers from 11 to 22. From the numbers you wrote, separate and write,

    (a)   the group of numbers divisible by three without a remainder.
    (b)   the group of numbers not divisible by three.

(4)   Separate and write the numbers 7, 15, 8, 4, 5, 12, 9, 20, 13 into the following groups.

    (i)   numbers less than 11
    (ii)   prime numbers

(5)   Fill in the blanks in the following table.

Group	Can be selected definitely/ Cannot be selected definitely
i. Clever pupils in the class ii. Important people in the village iii. Girls in the class iv. Children of low weight v. Vowels in the English alphabet vi. .... vii.	.... Cannot .... Can Cannot

(6)

Tiger

Lion, Lioness, cub

Rhino

Elephent

Zebra

Fox

Kangaroo

wildbuffalo

Cheetah   Leopard

Monkey

Deer

Wolf   Bear

Giraffe

Hippopotamus

Separate the animals in the above picture into precise groups as you wish and name the groups.

(7)   Write the whole numbers from 1 to 10.
        Write four groups which can be selected precisely from the numbers you have written.

2.2 Sets

Groups that can be identified according to definite characteristics are defined as **sets**.

"Red flowers" is a set while beautiful flowers is not a set. why?

A set can be represented in the following ways:
1. by a description
2. by listing
3. by a venn diagram.

✸ Representing of a set as a description

"The set of all prime numbers between 1 and 10" is usually written within double brackets as,
{Prime numbers between 1 and 10.}   This is called representing of a set as a description

✸ Representation of a set by listing

The set,

 {Prime numbers between 1 and 10.} has the elements 2, 3, 5, 7.

These elements can be listed as   {2, 3, 5, 7}

Objects belonging to a set are known as **elements.**

A set is named by a "Capital English letter". P = {2, 3, 5, 7}

Let us understand the following examples of writing a set by listing the elements.

Example 1

The statement D = "counting numbers divisible by five," when listed as a set, is written as;

D = {5, 10, 15, 20, 25, 30, ...}

> Dots after thirty means the set is infinite.

Example 2

The set 'L' is given in a description as,
L = {Letters of the word "MAHARAGAMA"} When listed, it is written as,

L = {M, A, H, R, G}

> An element of a set is written only once because the elements of a set have to be distinct.

When a set is written,

★   double brackets are used.
★   what belongs to the set is stated as a description or the elements are listed.
★   the punctuation mark (,) is used to separate the elements of a set.
★   a set is named by a capital letter of the English alphabet.
★   an element is written only once in a set.

Let us consider the set P = {2, 3, 5, 7, 11, 13}
This can be represented by a closed figure as,

P

```
      3
  5
     2   7
 11
      13
```
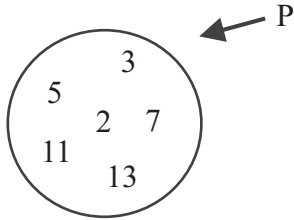
Repersenting a set by such a closed figure was first introduced by the English Logician **John Venn**, who was serving in the Cambridge university.

Hence these figures are named as Venn Diagrams.

(John Venn)
1834 - 1923

Example 3

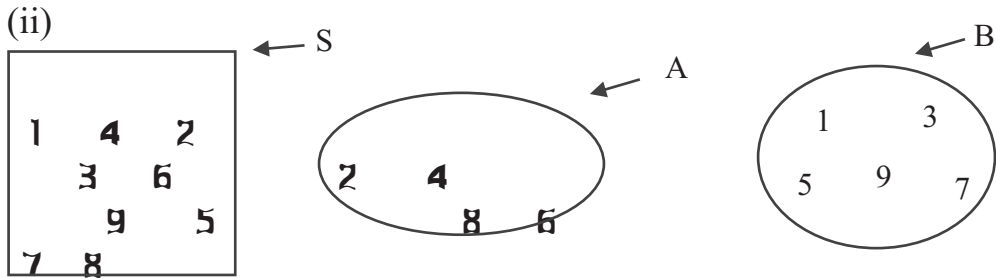S = {Whole numbers from 1 to 9}
A = {Even numbers from 1 to 9}
B = {Odd numbers from 1 to 9}

Represent each of the above sets,
(i) as a list of elements,

(i)   S =   {1, 2, 3, 4, 5, 6, 7, 8, 9}

A =   {2, 4, 6, 8}

B =   {1, 3, 5, 7, 9}

(ii)

The set A and the set B are within the set S.

Exercise 2.2

(1)   Copy the following and connect the set given by a description

(i) {Standard units of measure}

(a) {mammoty, plough, yoke, plank}

(ii) {Musical instruments}

(b) {a , e , i , o , u}

(iii) {Farmer's instruments}

(c) {metre, kilogram,second}

(iv) {Ancient Kingdoms of Sri Lanka}

(d) {1, 4, 9}

(v) {Vowels of the English alphabet}

(e) {violin, guitar, drum}

(vi) {Square numbers less than 10}

(f) {Anuradhapura, Kandy, Yapahuwa,Dambadeniya, Polonnaruwa}

(2) Write the numbers of these statements which cannot be considered as sets out of the following statements.

(i) The eight directions

(ii) Triangles

(iii) Large cities of Sri Lanka

(iv) Colours of the rainbow

(v) Days of the week

(vi) Furniture at home

(vii) Popular singers

(viii) Birds
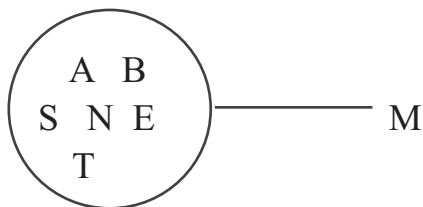
(ix) Poor people

(x) Long rivers in India

(xi) Elders

(3) List the elements of each of the following sets.

(i) A = {Whole numbers between 0 and 6}
(ii) B = {Geometrical plane figures}
(iii) C = {Letters of the word "රත්මලාන"}
(iv) D = { Letters of the word **"KAHATAGASDIGILIYA"**}

(4) (i) Write the set of letters of the word " mathematics" and name it as L.

(ii) Represent L by a Venn diagram.

(5)

Write the set M as,

      (i)   a description

      (ii)   a list of elements

(6)   Represent the set of digits of the number 50250,
      (i) as a list of elements
      (ii) in a Venn Diagram

(7)   Draw a Venn diagram which represents the short names of the pupils in your class who are in the same row or group as you.

(8)   Write the set of letters of the word "extraordinary". Write the set of vowels in it and discuss the relation between the two sets. Can both these sets be represented in the same Venn diagram ?

Summary

★   A collection of objects which can be identified distinctly is known as a set.

★   A set can be represented as a description, as a list of elements and in a Venn diagram.

★   An element is written only once in a set.