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SETS

PERIOD 1

SUBJECT : MATHEMATICS
CHAPTER NUMBER: 6
CHAPTER NAME : SETS

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Learning outcome

Students will be able to know about sets and representation of a set.

Introduction

A **set** is a collection of objects, things or symbols which are **clearly defined**. The individual objects in a set are called the **members** or **elements** of the set.

Representation of a set

(Roster Method)

The set can be defined by listing all its elements, separated by commas and enclosed within braces. This is called the roster method.

Examples:

$V = \{a, e, i, o, u\}$

$B = \{2, 4, 6, 8, 10\}$

$X = \{a, b, c, d, e\}$

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Set Builder Notation

The set can be defined by describing the elements using mathematical statements. This is called the set-builder notation.

Examples:

$C = \{x : x \text{ is an integer}, x > -3 \}$

This is read as: "C is the set of elements x such that x is an integer greater than –3."

$D = \{x: x \text{ is the capital city of a state in the USA}\}$

Symbol ∈ and ∉

We should describe a certain property which all the elements *x*, in a set, have in common so that we can know whether a particular thing belongs to the set.

We relate a member and a set using the symbol ∈. If an object *x* is an element of set *A*, we write $x \in A$. If an object *z* is not an element of set *A*, we write $z \notin A$.

∈ denotes "**is an element of**" or "is a member of" or "belongs to"

∉ denotes "**is not an element of**" or "is not a member of" or "does not belong to"

Example: If $A = \{1, 3, 5\}$ then $1 \in A$ and $2 \notin A$

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Exercise- 6(A)

(*i*) $A_1 = \{x : 2x + 3 = 11\}$

$\therefore \quad 2x + 3 = 11$

$\Rightarrow \quad 2x = 11 - 3$

$\Rightarrow \quad 2x = 8$

$\Rightarrow \quad x = \frac{8}{2} \Rightarrow x = 4$

$\therefore$ Given set in roster (Tabular) form is

$A_1 = \{4\}$

(*ii*) $A_2 = \{x : x^2 - 4x - 5 = 0\}$

$\therefore \quad x^2 - 4x - 5 = 0$

$\Rightarrow \quad x^2 - 5x + x - 5 = 0$

$\Rightarrow \quad x(x - 5) + 1(x - 5) = 0$

$\Rightarrow \quad (x - 5)(x + 1) = 0$

$\therefore$ Either $x - 5 = 0$ or $x + 1 = 0$

$\Rightarrow x = 5 \quad \Rightarrow x = -1$

$\therefore$ Given set in roster (Tabular) form is

$A_2 = \{5, -1\}$

(*iii*) $A_3 = \{x : x \in Z, -3 \leq x < 4\}$

$\because \quad -3 \leq x < 4$

$\therefore \quad x = -3, -2, -1, 0, 1, 2, 3$

$\therefore$ Given set in roster (Tabular) form is

$A_3 = \{-3, -2, -1, 0, 1, 2, 3\}$

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set-builder (Rule Method) form :

(*i*) $B_1 = \{6, 9, 12, 15, ...\}$
$= \{x : x = 3n + 3; n \in N\}$

(*ii*) $B_2 = \{11, 13, 17, 19\}$
$= \{x : x$ is a prime number between 10 and 20$\}$

(*ii*) $B_3 = \left\{\frac{1}{3}, \frac{3}{5}, \frac{5}{7}, \frac{7}{9}, \frac{9}{11}, ...\right\}$

$= \left\{x : x = \frac{n}{n+2}\right.$, where n is an odd natural number$\}$

(*iv*) $B_4 = \{8, 27, 64, 125, 216\}$
$= \{x : x = n^3 ; n \in N$ and $2 \le n \le 6\}$

(*v*) $B_5 = \{-5, -4, -3, -2, -1\}$
$= \{x : x \in Z, -5 \le x \le -1\}$

(*vi*) $B_6 = \{...., -6, -3, 0, 3, 6, ...\}$
$= \{x : x = 3n, n \in Z\}$

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Exercise- 6(A)

3) (i) Is {1, 2, 4, 16, 64} = {x : x is a factor of 32} ? Give reason.

(ii) Is {x : x is a factor of 27} ≠ {3, 9, 27, 54} ? Give reason.

(iii) Write the set of even factors of 124.

(iv) Write the set of odd factors of 72.

Sol: (i) No, {1, 2, 4, 16, 64} ≠ {x : x is factor of 32}

Because 64 is not a factor of 32

(ii) Yes, {x : x is a factor of 27} + {3, 9, 27, 54}

Because 54 is not a factor of 27

(iii) 1 x 124 = 124

2 x 62 = 124

4 x 31 = 124

Factors of 124 = 1, 2, 4, 31, 62, 124

Set of even factors of 124 = {2, 4, 62, 124}

(iv) 1 x 72 = 72

2 x 36 = 72

3 x 24 = 72

4 x 18 = 72

6 x 12 = 72

8 x 9 = 72

Factors of 72 = 1, 2, 3, 4, 6, 8, 9, 12, 18, 24, 36, 72

Set of odd factors of 72 = {1, 3, 9}

Home assignment

Exercise 6(A)

AHA

1. Explain with an example of roster form of sets.

2. Explain with an example of set builder form of sets.

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THANKING YOU

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