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PGT (MATHS)

SETS

1. INTRODUCTION:

What is an object ?

In Mathematical language, everything in this universe, whether living or non-living, is called an object.

What is called a well-defined collection of objects ?

If we consider a collection of objects given in such a way that it is possible to tell beyond doubt whether a given object is in the collection under consideration or not, then such a collection of objects is called a well-defined collection of objects.

2. SET

"A well-defined collection of objects is called a set."

3. ELEMENT

"Each object in a set is called its element."

Examples:

(i) The set of vowels in English alphabet.

(ii) The set of planets in our Solar System.

(iii) The set of days in a week.

(iv) The set of Chief Ministers in India.

(v) The set of natural numbers.

4. NOTATION

Capital letters such as A, B, C, D, … etc. are used to denote sets while small letters such as a, b, c, … are used to denote elements.

Examples:

(i) $\mathrm{A} = \{a, e, i, o, u\}$

(ii) $\mathrm{B} = \{2, 4, 6, 8, 10, \dots\}$

(iii) $\mathrm{C} = \{1, 2, 3, 4, 5, \dots\}$

5. SOME STANDARD NOTATIONS

(i) N *= The set of all natural numbers.*

(ii) Z *= The set of all Integers.*

(iii) Q *= The set of all Rational numbers.*

(iv) R *= The set of all Real numbers.*

(v) Z_+ *= The set of all positive Integers.*

(vi) Q_+= The set of all positive Rational numbers.

(vii) R_+= The set of all positive Real numbers.

6. NOTATION OF BELONGINGNESS OF AN ELEMENT

If x is an element of a set A, then we write it in symbolic form as $x \in A$, which is read as x belongs to A.

And if x does not belong to A, then we write $x \notin A$

Example:

If $A = \{a, e, i, o, u\}$, then we may write

$a \in A,\ e \in A,\ i \in A,\ o \in A,\ u \in A$

and $b \notin A,\quad c \notin A,\quad d \notin A,\quad f \notin A$ etc.

7. METHOD OF DESCRIBING A SET

There are two methods of describing a set:

(i) Tabular Form or Roster Form

(ii) Set builder Form or Rule Form

8. TABULAR FORM/ROSTER FORM

In Tabular Form,

(i) All the elements of a set are listed, the elements are separated by commas and are enclosed within braces { }.

(ii) Identical elements of the set are written only once.

(iii) The order of the element within the braces is immaterial.

Examples:

(i) If A is the set of vowels in English alphabet, then we write it in Roster Form as

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

(ii) If B is the set of Prime numbers less than 20, then we write

$B = \{2, 3, 5, 7, 11, 13, 17, 19\}$

(iii) If C is the set of letters of the word "MISSISSIPPI", then we write

$C = \{M, I, S. P\}$

9. SET BUILDER FORM/RULE FORM

This form is used in those cases, where all the elements of a set, possess a single common property, which is not possessed by any element outside the set.

Examples:

(i) The set builder form of the $A = \{a, e, i, o, u\}$ *is*

$A = \{x : x \text{ is a vowel in English alphabet}\}$

This is read as

" A is the set of all x *such that* x *is a vowel of English alphabet"*

In the above representation, the braces { } stands for " the set of all " and the colon ' : ' stands for "such that ".

(ii) The set builder form of the $B = \{4, 5, 6, 7, 8, 9\}$ *is*

$B = \{y : y \in N \text{ and } 4 \leq y \leq 9\}$

(iii) The set builder form of the $C = \{2, 4, 6, 8, 10\}$ *is*

$C = \{z : z = 2n, n \in N \text{ and } n \leq 5\}$

(iv) The set builder form of the $D = \{2, 4, 8, 16, 32, 64\}$ *is*

$D = \{x : x = 2^n, n \in N \text{ and } n \leq 6\}$

(v) The set builder form of the $H = \left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ *is*

$H = \left\{x : x = \frac{n}{n+1}, n \in N \text{ and } n \leq 6\right\}$