

## SET

Set is a collection of definite well defined objects.

Set is denoted by capital letter.

For example:

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

## BINARY OPERATIONS ON A SET

Let,

$G$  a non-empty set

$$G \times G = \{(a, b) : a \in G, b \in G\}.$$

Above line is read as:  $G$  cross  $G$  equal to  $(a, b)$  such that 'a' belongs to ' $G$ ', 'b' belongs to ' $G$ '.

If

$$f : G \times G \rightarrow G,$$

Above line is read as 'f' is such that  $G$  cross  $G$  is equal to  $G$ .

Here 'f' is an operation of 'X' on two groups ' $G$ ' and ' $G$ '.

The output of ' $G \times G$ ' is also a ' $G$ ' so this type of operation is known as Binary Operation on a set  $G$ .

And,

Operation 'f' on ' $G$ ' and ' $G$ ' can be denoted as ' $GfG$ ', or ' $afb$ ' where  $(a \in G, b \in G)$ .

$+$ ,  $\times$ , etc symbols are used in Binary Operations.

Binary Operations examples:-

$$1) \quad a + b \in G, \forall a, b \in G.$$

Above line is read as 'a' plus 'b' belongs to 'G', for all 'a', 'b' belongs to 'G'.

Here,  $\forall$  à for all.

$$2) \quad a * b = G, \forall a, b \in G.$$

$$3) \quad \text{Addition of natural numbers is also a natural number.}$$

Natural number are also known as all non-negative or positive numbers (0,1,2,3,4.....).

If,  $N$  à Set of natural numbers

$$A + b \in N, \forall a, b \in N.$$

Above line is read as 'a' plus 'b' belongs to 'N', for all 'a', 'b'  $\in$  'N'.

$$4) \quad \text{Subtraction is not binary operation on } N \text{ (natural numbers).}$$

$N$  à Set of natural numbers.

$$3 - 5 = -2 \notin N, \text{ whereas } 3, 5 \in N.$$

Above line is read as three minus five is not belongs to 'N', whereas three, five belongs to 'N'.

$$5) \quad \text{Subtraction is binary operation on } I \text{ (integer numbers).}$$

$I \rightarrow$  Set of integer numbers

$$3 - 5 = -2 \in I, \forall a, b \in I.$$

### Related Posts:

1. SET
2. Mathematical induction
3. Relation
4. Net 34
5. prove that-  $AX(B \cap C) = (AXB) \cap (AXC)$
6. Prove that-  $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
7. prove that -  $(A \cap B) \times (C \cap D) = (A \times C) \cap (B \times D)$
8. Show that-  $(P \cap Q) \times (R \cap S) = (P \times R) \cap (Q \times S)$
9. Algebraic structure
10. Group
11. Show that  $\{\dots, -4, -3, -2, -1, 0, 1, 2, 3, 4, \dots\}$  is group
12. Show that  $a*b=b*a$
13. if  $a*c = c*a$  and  $b*c = c*b$ , then  $(a*b)*c = c*(a*b)$
14. Undirected Graph and Incident Matrix
15. Prove the following by using the principle of mathematical induction for all  $n \in \mathbb{N}$ ,  $1^3 + 2^3 + 3^3 + \dots + n^3 = [n(n+1)/2]^2$
16. Prove that  $G = \{-1, 1, i, -i\}$  is a group under multiplication.
17. Hasse diagram for the "less than or equal to" relation on the set  $S = \{0, 1, 2, 3, 4, 5\}$