

A set is a collection of definite well defined objects.

A set is a collection of objects which are distinct from each other.

A set is usually denoted by capital letter, i.e, A, B, S, T, G etc.

A set elements are denoted by small letter, i.e, a, b, s, t etc.

CONSTRUCTION OF SET:

In construction of set, two methods are commonly used-

1) Roster Method (Enumeration): In this method we prepare a list of objects forming the set, writing the elements one after another between a pair of curly brackets.

For example:

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

2) Description Method: In this method we describe the set in symbolic language.

For example:

A set of integer numbers which is divisible by 3 is written as,

$$A = \{x : x \text{ is an integer divisible by } 3\}$$

TYPES OF SET:

1) Singleton set: If a set consisting only 1 element is known as singleton set.

For example:

$$A = \{a\}.$$

2) Finite set: If a set consisting finite number of elements is known as finite set.

For example:

$$A = \{2, 4, 6, 8\}.$$

3) Infinite set: If a set consisting infinite number of elements is known as infinite set.

For example-

The set of all natural numbers.

$$A = \{1, 2, 3, \dots\}$$

4) Equal sets: Two sets A and B consisting of the same elements is known as equal set.

For example:

$$A = \{a, b, c, d\} \text{ and}$$

$$B = \{a, b, c, d\}$$

5) Empty set: If a set consisting no elements is known as empty set or null set or void set.

For example:

$$A = \{ \emptyset \}$$

6) Subset: Suppose A is a given set, and any set B exist exist whose elements are also an element of A, than B is called subset of A.

For example:

$$A = \{1, 2, 3, 4, 5, 6, 7, 8\} \text{ and } B = \{2, 4, 6, 8\}$$

Than, $B \subseteq A$. (read as B is the subset of A)

Now take another example;

$$A = \{1, 2, 3, 4, 5, 6, 7, 8\} \text{ and } B = \{1, 2, 3, 4, 5, 6, 7, 8\}$$

Than, $B \subseteq A$. (read as B is the subset of A)

7) Proper Subset: If B is the subset of A, and $B \neq A$, then B is proper subset of A.

For example:

$A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and $B = \{2, 4, 6, 8\}$

Then, $B \subset A$. (read as B is the proper subset of A)

8) Power set: The set of all subset of a set A, is known as power set of A.

For example:

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

Then

Power set, $P(A) = \{\{\emptyset\}, \{a\}, \{b\}, \{c\}, \{d\}, \{ab\}, \{ac\}, \{ad\}, \{bc\}, \{bd\}, \{cd\}, \{abc\}\}$

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1. Mathematical induction
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4. prove that- $A \times (B \cap C) = (A \times B) \cap (A \times C)$
5. Prove that- $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
6. prove that - $(A \cap B) \times (C \cap D) = (A \times C) \cap (B \times D)$
7. Show that- $(P \cap Q) \times (R \cap S) = (P \times R) \cap (Q \times S)$
8. Binary operations
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 $S = \{0,1,2,3,4,5\}$