**SUB TOPIC:** SUBSET, SAUPER SET , PROPER SUBSET, UNIVERSAL SET

**SUBJECT : MATHEMATICS**
**CHAPTER NUMBER: 13**
**CHAPTER NAME :SET CONCEPTS**

# LEARNING OUTCOME

Students will be able to

Define and differentiate  subset, superset, proper subset , universal set.

# PREVIOUS CONNECT

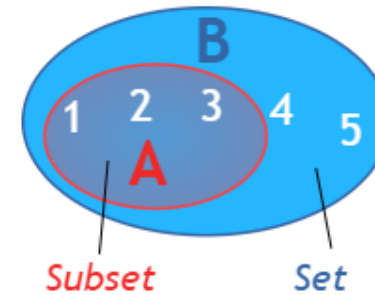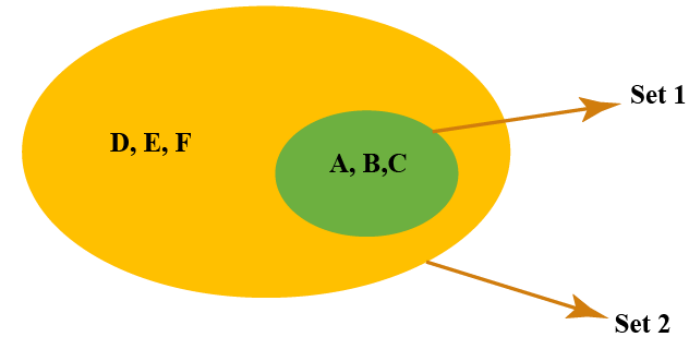- Which of the following represents the null set?
- { 0}, 0 , { }

## SUBSET

Set A is said to be a subset of Set B if all the elements of Set A are also present in Set B.

In other words, set A is contained inside Set B.

Example: If set A has {X, Y} and set B has {X, Y, Z}, then A is the subset of B because elements of A are also present in set B.

Set 1

Set 2

Set 1 is a subset of Set2

## Subset Symbol

In set theory, a subset is denoted by the symbol ⊆ and read as 'is a subset of'.
Using this symbol we can express subsets as follows:

**A ⊆ B; which means Set A is a subset of Set B.**

**Note**: A subset can be equal to the set. That is, a subset can contain all the elements that are present in the set.

## Superset Definition

In set theory, set A is considered as the superset of B, if all the elements of set B are the elements of set A.

For example, if set A = {1, 2, 3, 4} and set B = {1, 3, 4}, we can say that set A is the superset of B. As the elements of B [(i.e.,)1, 3, 4] are in set A.

We can also say that B is not a superset of A.
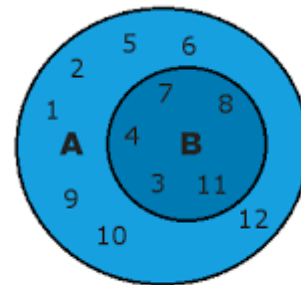


A is SuperSet of B

Superset Symbol

The superset relationship is represented using the symbol "⊃". For instance, the set A is the superset of set B, and it is symbolically represented by A ⊃ B.

Consider another example,
X = {set of polygons}
Y = {set of irregular polygons}

Then X is the superset of Y (X⊃Y). In other words, we can say that Y is a subset of X (Y⊂X).

Proper Subset Symbol

A proper subset is denoted by ⊂ and is read as 'is a proper subset of'. Using this symbol, we can express a proper subset for set A and set B as;

**A ⊂ B**

How many subsets and proper subsets does a set have?

If a set has "n" elements, then the number of subset of the given set is $2^n$ and the number of proper subsets of the given subset is given by $2^n-1$.

Consider an example, If set A has the elements, A = {a, b}, then the proper subset of the given subset are { }, {a}, and {b}.
Here, the number of elements in the set is 2.

We know that the formula to calculate the number of proper subsets is $2^n - 1$.
= $2^2 - 1$
= 4 − 1
= 3
Thus, the number of proper subset for the given set is 3 ({ }, {a}, {b}).

# NUMBER OF SUBSETS AND NUMBER OF PROPER SUBSETS OF A GIVEN SET

If a set has "n" elements, then the number of subset of the given set is $2^n$ and the number of proper subsets of the given subset is given by **$2^n-1$**.

Consider an example, If set A has the elements, A = {a, b}, then the proper subset of the given subset are { }, {a}, and {b}. Here, the number of elements in the set is 2

# UNIVERSAL SET

There happens to be a set 'U' that contains all the elements under consideration. Such a set is called the universal set.

**For example :**

A = {1, 2, 3, 4, 5), B = {4, 5, 6, 7, 8, 9 }. We can say that they are both contained in their universal set, which is a set of natural numbers.

In plane geometry, the set of all points in the plane is the universal set.

# EVALUATION QUESTIONS

Exercise 13C page: 154

**1. Fill in the blanks:**

**(i)   If each element of set P is also an element of set Q, then P is said to be ...... of Q and Q is said to be ....... of P.**

**(ii) Every set is a ..... of itself.**

**(iii) The empty set is a ...... of every set.**

**(iv) If A is proper subset of B, then n (A) .... n (B).**

## Solution:

**Solution:**

(i)  If each element of set P is also an element of set Q, then P is said to be a subset of Q and Q is said to be the superset of P.

(ii) Every set is a subset of itself.

(iii) The empty set is a subset of every set.

(iv) If A is proper subset of B, then n (A) is less than n (B).

**2. If A = {5, 7, 8, 9}; then which of the following are subsets of A?**

(i) B = {5, 8}

(ii) C = {0}

(iii) D = {7, 9, 10}

(iv) E = { }

(v) F = {8, 7, 9, 5}

**Solution:**
(i) B = {5, 8}
Hence, B ⊂ A.

(ii) C = {0} and C ∩ A = Ø
Hence, C ⊄ A.

(iii) D = {7, 9, 10}
Hence, D ⊄ A.

(iv) E = { }
Hence, E ⊂ A as we know that an empty set is a subset of every set.

(v) F = {8, 7, 9, 5}
Hence, F ⊂ A as every set is a subset of itself.
Therefore, (i), (iv) and (v) are subsets of A.

3. If P = {2, 3, 4, 5}; then which of the following are proper subsets of P?

(i) A = {3, 4}

(ii) B = { }

(iii) C = {23, 45}

(iv) D = {6, 5, 4}

(v) E = {0}

Solution:

**Solution:**

It is given that P = {2, 3, 4, 5}

(i)   A = {3, 4}

(ii) B = { }

(iii) C = {23, 45}

(iv) D = {6, 5, 4}

(v) E = {0}

Here only A and B are the proper subsets of P.

**4. If A = {even numbers less than 12},**
**B = {2, 4},**
**C = {1, 2, 3},**
**D = {2, 6} and E = {4}**
**State which of the following statements are true :**
**(i) B⊂A**
**(ii) C⊆A**
**(iii) D⊂C**
**(iv) D ⊄ A**
**(v)E⊇B**
**(vi) A⊇B⊇E**

**Solution:**

A = {even numbers less than 12} = {2, 4, 6, 8, 10}

B = {2, 4}

C = {1, 2, 3}

D = {2, 6} and E = {4}

(i)   B⊂A is true.

(ii) C⊆A is false.

(iii) D⊂C is false.

(iv) D ⊄ A is false.

(v) E⊇B is false

(vi) A⊇B⊇E is true

**5. Given A = {a, c}, B = {p, q, r} and C = Set of digits used to form number 1351.**

**Write all the subsets of sets A, B and C.**

**Solution:**

A = {a, c}

Hence, the subsets are { } or Φ, {a}, {c} and {a, c}.

B = {p, q, r}

Hence, the subsets are { } or Φ, {p}, {q}, {r}, {p, q}, {p, r}, {q, r} and {p, q, r}.

C = Set of digits used to form number 1351

Hence, the subsets are { } or Φ, {1}, {3}, {5}, {1, 3}, {3, 5}, {1, 5} and {1, 3, 5}.

# HOMEWORK

- EX13 C
- Q.NO. 1to 5
- **AHA**
  Given that N= {1,2,3, ..., 100}. Then write

- (i) the subset of N whose elements are even numbers.

- (ii) the subset of N whose element are perfect square numbers.

# THANKING YOU
# ODM EDUCATIONAL GROUP