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Sets

Unit 0 Lesson 1

SETS

Students will be able to:

Understand sets, their notations and the unions and intersections of sets

Key Vocabulary:

- Sets and its notation
- Universal set, Empty Set
- Union, Intersection, Disjoint, Compliment
- Venn Diagram

Definition of Sets

A set is a collection of well-defined objects. For example a set of Natural numbers $\boldsymbol{N = \{1, 2, 3, 4, \ldots\}}$.

Elements of a Set

An object in a set is known as an element. For $\boldsymbol{2}$ is an element in the set $\boldsymbol{N = \{1, 2, 3, 4, \ldots\}}$.

Types of Sets

1. Universal Set

It is a set of all the elements under consideration in a particular context. For example the universal set of digits is $\boldsymbol{D = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}}$.

2. Empty Set

It is a set of with no elements. For example the set of odd numbers divisible by 2 is an empty set. An empty set is denoted by {} or ∅.

Operations on Sets

1. Union of Sets

The union of sets $\boldsymbol{A}$ and $\boldsymbol{B}$ is a new set consisting of all the elements that are either in set $\boldsymbol{A}$ or in $\boldsymbol{B}$.

2. Intersection of Sets

The intersection of sets $\boldsymbol{A}$ and $\boldsymbol{B}$ is a new set consisting of all the common elements in set $\boldsymbol{A}$ or $\boldsymbol{B}$.

Operations on Sets

3. Disjoint Sets

Two sets $\boldsymbol{A}$ and $\boldsymbol{B}$ are said to be disjoint if there is nothing common between the two sets.

4. Compliment of a Set

It is a set consisting of elements in the Universal set $\boldsymbol{U}$ not in the set under discussion.

Problem 1: Given $U = \{1, 2, 3, 4, 5\}$, $A = \{1, 3, 5\}$ and $B = \{2, 4, 6\}$, find:

a) A'

b) $A \cup B$

c) $A \cap B$

SETS

Problem 1: Given $U = \{1, 2, 3, 4, 5\}$, $A = \{1, 3, 5\}$ and $B = \{2, 4, 6\}$, find:

a) A'

$$A' = U - A = \{1, 2, 3, 4, 5\} - \{1, 3, 5\} = \{2, 4\}$$

b) $A \cup B$

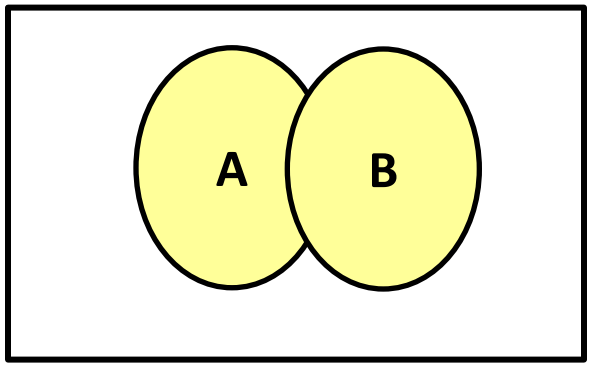
$$A \cup B = \{1, 3, 5\} \cup \{2, 4, 6\} = \{1, 2, 3, 4, 5, 6\}$$

c) $A \cap B$

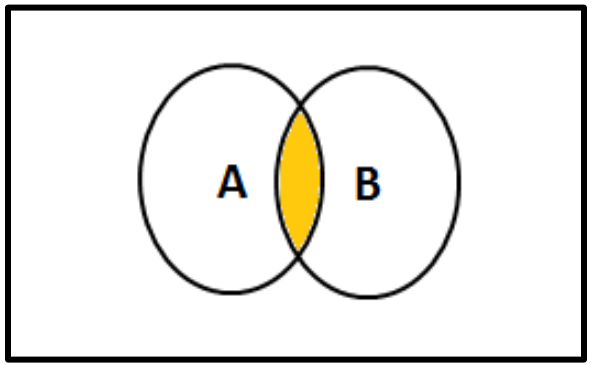
$$A \cap B = \{1, 3, 5\} \cap \{2, 4, 6\} = \{\ \}$$

Venn Diagram

A Venn Diagram represents sets pictorially as circles within an enclosed rectangle. The diagram represents elements as points in the plane and is useful in understanding intersection of sets by overlapped circles.



$A \cup B$



$A \cap B$

Problem 2: Given $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 4, 6\}$, find $A \cup B$ and $A \cap B$ and represent it on the Venn Diagram.

$A \cup B$:

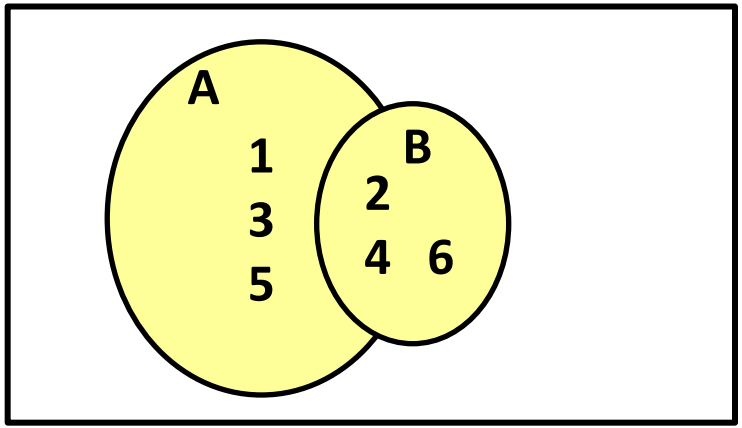
$$A \cup B = \{1, 2, 3, 4, 5\} \cup \{2, 4, 6\} = \{1, 2, 3, 4, 5, 6\}$$

$A \cap B$:

$$A \cap B = \{1, 2, 3, 4, 5\} \cap \{2, 4, 6\} = \{2, 4\}$$

Problem 2: Given $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 4, 6\}$, find $A \cup B$ and $A \cap B$ and represent it on the Venn Diagram.

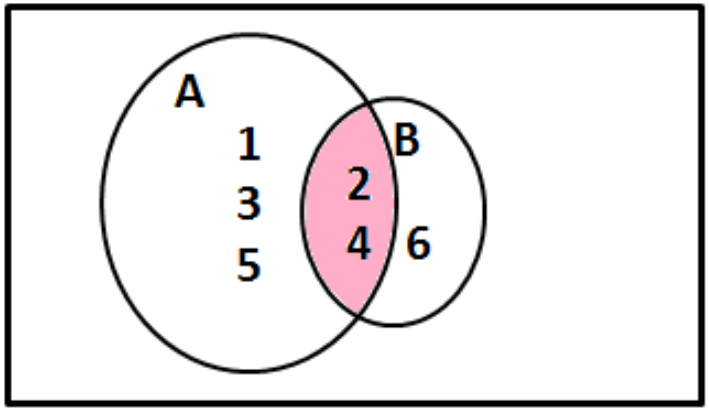
Venn Diagram for $A \cup B = \{1, 2, 3, 4, 5\} \cup \{2, 4, 6\} = \{1, 2, 3, 4, 5, 6\}$



$A \cup B$

Problem 2: Given $A = \{1, 2, 3, 4, 5\}$ and $B = \{2, 4, 6\}$, find $A \cup B$ and $A \cap B$ and represent it on the Venn Diagram.

Venn Diagram for $A \cap B = \{1, 2, 3, 4, 5\} \cap \{2, 4, 6\} = \{2, 4\}$



$A \cap B$