

USING BASIC OPERATIONS ON SETS

Model Problem:

It is necessary to know the symbols for union and intersection and the definitions of each.

Set intersection ($A \cap B$) is the set of elements that each of the sets defined have in common.

Set union ($A \cup B$) is the set of elements that are contained in one or both of the sets.

Set complement (\bar{A}) or (A') is the set of elements that are in a universal set (U) but not in the specific set.

Given $U = \{\text{whole numbers} < 10\}$ $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$:

$A \cup B = \{1, 2, 3, 4, 5\}$, $A \cap B = \{3\}$; $A' = \{0, 4, 5, 6, 7, 8, 9\}$

Practice Exercises:

- Given $U = \{\text{natural numbers}\}$, $A = \{1, 3, 5, 7\}$ $B = \{2, 3, 4, 5\}$ $C = \{1, 4, 5\}$:
find: a) $A \cup B$ b) $(A \cup B) \cup C$
- Given $U = \{x | x \text{ is a whole number} < 10\}$, $A = \{1, 2, 3, 4, 5\}$ $B = \{1, 3, 5\}$
find: a) A' b) B' c) $(A \cap B)'$
- Given $U = \{x | x \text{ is a whole number}\}$, $A = \{x | x \text{ is a natural number and } x > 5\}$, $B = \{x | x \text{ is a whole number} < 15\}$ and $C = \{0, 2, 4, 6, 8, \dots\}$, find:
a) $A \cup B$ b) $A \cup C$ c) $A \cap C$ d) $A \cap B$ e) $(A \cup B)'$ f) $(A \cap C)'$
- Given $U = \{\text{letters in the English alphabet}\}$, $A = \{a, e, i, o, u\}$ and $B = \{x | x \text{ is a consonant in the English alphabet}\}$, find
a) $A \cup B$ b) $A \cap B$ c) $(A \cup B)'$ d) $(A \cap B)'$

Answers:

- a) $\{1, 2, 3, 4, 5, 7\}$ b) $\{1, 2, 3, 4, 5, 7\}$
- a) $\{0, 6, 7, 8, 9\}$ b) $\{0, 2, 4, 6, 7, 8, 9\}$ c) $\{0, 2, 4, 6, 7, 8, 9\}$
- a) $\{0, 1, 2, 3, \dots\}$ b) $\{0, 2, 4, 6, 7, 8, \dots\}$ c) $\{6, 8, 10, \dots\}$
d) $\{6, 7, 8, 9, 10, \dots, 14\}$ e) $\{ \}$ f) $\{0, 1, 2, 3, 4, 5, 7, 9, 11, 13, \dots\}$
- a) $\{a, b, c, \dots, x, y, z\}$ b) $\{ \}$ c) $\{ \}$
d) $\{a, b, c, \dots, x, y, z\}$