

Ways to Express and Build Sets

Set Description : THE SET OF POSITIVE INTEGERS GREATER THAN 10.

Roster Notation : $T = \{ 11, 12, 13, 14, \dots \}$

Set Builder : $T = \{ x \in \mathbb{Z}^+ : x > 10 \}$
↑ SUCH THAT

✓ Set Description : THE SET OF NATURAL NUMBERS THAT ARE MULTIPLES OF 3.

✓ Roster Notation $M = \{ 3, 6, 9, 12, 15, \dots \}$

Set Builder : $M = \{ x \in \mathbb{N} : 3x \}$

✓ Set Description SET A IS THE SET OF ODD NUMBERS.

✓ Roster Notation $A = \{ 1, 3, 5, 7, 9, \dots \}$

Set Builder : $A = \{ x \in \mathbb{Z}^+ : 2x - 1 \}$

The Concept of Set Intersection, Set Union, Set Subtraction, and Compliments of Sets

Set Intersection : THE INTERSECTION OF SET A AND SET B ARE THE ELEMENTS IN BOTH SET A AND SET B.

NOTATION: \cap

$$A \cap B = \{x \in U : x \in A \wedge x \in B\}$$

Set Union : THE UNION OF SET A AND SET B ARE THE ELEMENTS THAT ARE IN SET A OR SET B. (MARRIAGE).

NOTATION: \cup

$$A \cup B = \{x \in U : x \in A \vee x \in B\}$$

Set Subtraction : THE SUBTRACTION OF SET B FROM SET A ARE THE ELEMENTS IN SET A THAT ARE REMOVED FROM SET A BY SET B.

NOTATION: $A - B$

Compliment of a Set : GIVEN SET A WITH ELEMENTS IN A UNIVERSAL SET. THE COMPLIMENT OF SET A IS THE SET OF ELEMENTS IN THE UNIVERSAL SET BUT NOT IN SET A (LEFTOVERS).

NOTATION: A'

CARDINALITY OF A SET : THE CARDINALITY OF SET A IS THE NUMBER OF ELEMENTS IN SET A.

NOTATION: $n(A)$

Examples of Set Intersections, Unions, Subtraction, and Compliments

① $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{2, 4, 6, 8\}$ $B = \{8, 9, 10\}$ $C = \{0, 1, 2, 3\}$ $D = \{4, 5, 6\}$

FIND: $A \cap B = \{8\}$ $C \cup B = \{0, 1, 2, 3, 8, 9, 10\}$ $C \cap D = \{ \}$

$A \cap D = \{4, 6\}$ $\underline{D} - A = \{5\}$ $\underline{B} - C = \{8, 9, 10\}$

$\underline{A} - C = \{4, 6, 8\}$ $n(B) = 3$ $n(C) = 4$

②

$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$

$A = \{2, 4, 6\}$ $B = \{0, 1, 2, 3, 4\}$ $C = \{1, 3, 5, 7\}$ $D = \{7, 8\}$

FIND: $B' = \{5, 6, 7, 8\}$

$D' = \{0, 1, 2, 3, 4, 5, 6\}$

$A \cap B = \{2, 4\}$

$D \cup A = \{2, 4, 6, 7, 8\}$

$\underline{A} - B = \{6\}$

$(A \cup B)' = \{0, 1, 2, 3, 4, 6\}' = \{5, 7, 8\}$

$(B' \cap A') = \{5, 6, 7, 8\} \cap \{0, 1, 3, 5, 7, 8\} = \{5, 7, 8\}$

$(A \cap C \cap \overset{D}{\emptyset}) = \{ \}$

$(C \cap D) \cap (A \cup B) = \{ \}$

$\{7\} \cap \{0, 1, 2, 3, 4, 6\}$

$n(A \cup C)' = 2$

$\{1, 2, 3, 4, 5, 6, 7\}' = \{0, 8\}$

$(A \cup B')' = A' \cap B = \{0, 1, 3, 5, 7, 8\} \cap \{0, 1, 2, 3, 4\}$
 $= \{0, 1, 3\}$