



Union and Intersection of Sets

Unit 3 Lesson 8

UNION AND INTERSECTION OF SETS

Students will be able to:

find the intersection and union of sets and
represent them on a Venn diagram.

Key Vocabulary:

- Intersection of Sets
- Union of Sets
- Venn Diagram

UNION AND INTERSECTION OF SETS

UNION OF SETS

The union of two or more sets is the set that contains **ALL** elements of the sets.

Example:

A. The union of the sets $A = \{a, b, c\}$ and $B = \{1, 2, 3\}$ consists of all elements belonging to A **OR** to B .

$$A \cup B = \{a, b, c, 1, 2, 3\}$$

UNION AND INTERSECTION OF SETS

UNION OF SETS

The union of two or more sets is the set that contains **ALL** elements of the sets.

Example:

B. The union of the sets $X = \{1, 2, 3\}$, $Y = \{4, 5, 6, 7\}$ and $Z = \{8, 9, 10\}$ consists of all elements belonging to X **OR** to Y **OR** to Z .

$$X \cup Y \cup Z = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 1: Find each union of the given sets.

A. $A = \{2, 10, 13, 19\}$

$B = \{1, 4, 14, 16\}$

B. $D = \{1, 2, 4, 8, 16\}$

$E = \{2, 3, 5, 7\}$

C. $J = \{7, 13, 15, 17\}$

$K = \{13, 15, 17, 19\}$

D. $X = \{6, 9, 11, 18\}$

$Y = \{5, 11, 18, 20\}$

UNION AND INTERSECTION OF SETS

Sample Problem 1: Find each union of the given sets.

A. $A = \{2, 10, 13, 19\}$ $B = \{1, 4, 14, 16\}$

$$A \cup B = \{1, 2, 4, 10, 13, 14, 16, 19\}$$

B. $D = \{1, 2, 4, 8, 16\}$ $E = \{2, 3, 5, 7\}$

$$D \cup E = \{1, 2, 3, 4, 5, 7, 8, 16\}$$

C. $J = \{7, 13, 15, 17\}$ $K = \{13, 15, 17, 19\}$

$$J \cup K = \{7, 13, 15, 17, 19\}$$

D. $X = \{6, 9, 11, 18\}$ $Y = \{5, 11, 18, 20\}$

$$X \cup Y = \{5, 6, 9, 11, 18, 20\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 2: An urn contains marbles colored in blue, green, yellow, and red. Another urn contains marbles colored in blue, white, and black. If the content of the two urns is mixed, use union of sets to find the set of marbles in the vase.

UNION AND INTERSECTION OF SETS

Sample Problem 2: An urn contains marbles colored in blue, green, yellow, and red. Another urn contains marbles colored in blue, white, and black. If the content of the two urns is mixed, use union of sets to find the set of marbles in the vase.

$$A = \{\textit{blue}, \textit{green}, \textit{yellow}, \textit{red}\}$$

$$B = \{\textit{blue}, \textit{white}, \textit{black}\}$$

$$A \cup B = \{\textit{blue}, \textit{white}, \textit{black}\}$$

UNION AND INTERSECTION OF SETS

INTERSECTION OF SETS

The intersection of sets is the set elements that are **COMMON** to two or more sets.

Example:

A. The intersection of the sets $A = \{10, 12, 14, 16, 18, 20\}$ and $B = \{5, 10, 15, 20, 25\}$ consists of all elements belonging to A **AND** to B .

$$A \cap B = \{10, 20\}$$

UNION AND INTERSECTION OF SETS

INTERSECTION OF SETS

The intersection of sets is the set elements that are **COMMON** to two or more sets.

Example:

B. The intersection of the sets $X = \{1, 2, 3, 4, 5, 6\}$, $Y = \{1, 3, 5, 7, 9, 11\}$ and $Z = \{2, 3, 5, 7, 11\}$ consists of all elements belonging to X **AND** to Y **AND** to Z .

$$X \cap Y \cap Z = \{3, 5, 7\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 3: Find each union of the given sets.

A. $A = \{7, 11, 13, 17\}$ $B = \{x | x \text{ is an odd number less than } 16\}$

B. $D = \{1, 2, 4, 8, 16\}$ $E = \{x | x \text{ is multiple of } 2 \text{ and is less than } 5\}$

C. $J = \{3, 6, 9, 12, 15\}$ $K = \{x | x \text{ is a prime number greater than } 2\}$

D. $X = \{7, 10, 11, 18\}$ $Y = \{x | x \text{ is an even whole number}\}$

UNION AND INTERSECTION OF SETS

Sample Problem 3: Find each union of the given sets.

A. $A = \{7, 11, 13, 17\}$ $B = \{x | x \text{ is an odd number less than } 16\}$

$$A \cap B = \{7, 11, 15, 17\}$$

B. $D = \{1, 2, 4, 8, 16\}$ $E = \{x | x \text{ is multiple of } 2 \text{ and is less than } 5\}$

$$D \cap E = \{2, 4\}$$

C. $J = \{3, 6, 9, 12, 15\}$ $K = \{x | x \text{ is a prime number greater than } 2\}$

$$J \cap K = \{6, 12\}$$

D. $X = \{7, 10, 11, 18\}$ $Y = \{x | x \text{ is an even whole number}\}$

$$X \cap Y = \{10, 18\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

A. $|2x - 4| \leq 10$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

A. $|2x - 4| \leq 10$

$$2x - 4 \leq 10$$

$$2x - 4 \geq -10$$

$$\{x|x \geq -3\} \cap \{x|x \leq 7\} \quad 2x - 4 + 4 \leq 10 + 4 \quad 2x - 4 + 4 \geq -10 + 4$$

$$2x \leq 14$$

$$2x \geq -6$$

$$\frac{2x}{2} \leq \frac{14}{2}$$

$$\frac{2x}{2} \geq \frac{-6}{2}$$

$$x \leq 7$$

$$x \geq -3$$

$$\{x|x \leq 7\}$$

$$\{x|x \geq -3\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

B. $44 > 7x + 9 > 23$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

B. $44 > 7x + 9 > 23$

$$44 > 7x + 9$$

$$7x + 9 > 23$$

$$\{x|x > 2\} \cap \{x|x < 5\}$$

$$44 - 9 > 7x + 9 - 9 \quad 7x + 9 - 9 > 23 - 9$$

$$35 > 7x$$

$$7x > 14$$

$$\frac{35}{7} > \frac{7x}{7}$$

$$\frac{7x}{7} > \frac{14}{7}$$

$$5 > x$$

$$x > 2$$

$$\{x|x < 5\}$$

$$\{x|x > 2\}$$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

C. $-4 < -x + 5 < 13$

UNION AND INTERSECTION OF SETS

Sample Problem 4: Find each union of the given sets.

C. $-4 < -x + 5 < 13$

$$-4 < -x + 5$$

$$-x + 5 < 13$$

$$\{x|x > -8\} \cap \{x|x < 9\} \quad -4 - 5 < -x + 5 - 5 \quad -x + 5 - 5 < 13 - 5$$

$$-9 < -x$$

$$-x < 8$$

$$\frac{-9}{-1} > \frac{-x}{-1}$$

$$\frac{-x}{-1} > \frac{8}{-1}$$

$$9 > x$$

$$x > -8$$

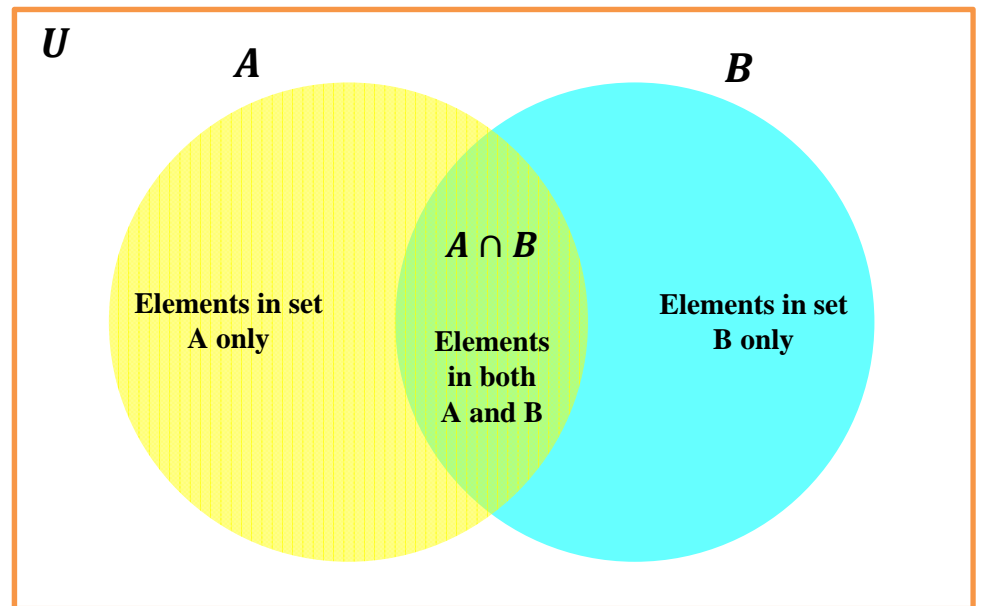
$$\{x|x < 9\}$$

$$\{x|x > -8\}$$

UNION AND INTERSECTION OF SETS

VENN DIAGRAM is used to show the relationships between sets. Sets are represented by circles drawn inside a rectangle (representing the universal set).

- The overlapping region of two circles represents the **intersection** of the two sets.
- The two circles together represent the **union** of two sets.



UNION AND INTERSECTION OF SETS

Sample Problem 5: In a survey, 100 people were asked to choose between cake or ice cream or both cake and ice cream. 52 likes cake and 27 likes cake and ice cream. How many likes cake? Draw a Venn Diagram.

Let A = for those who like cake only

B = for those who likes ice cream only

UNION AND INTERSECTION OF SETS

Sample Problem 5: In a survey, 100 people were asked to choose between cake or ice cream or both cake and ice cream. 52 likes cake and 27 likes cake and ice cream. How many likes cake? Draw a Venn Diagram.

Let A = for those who like cake only and
 B = for those who likes ice cream only

$$A = 52$$

$$A \cup B = 27$$

$$B = 100 - (B - A \cup B) = 100 - (52 - 27) = 100 - (25)$$

$$B = 75$$

UNION AND INTERSECTION OF SETS

Sample Problem 5: In a survey, 100 people were asked to choose between cake or ice cream or both cake and ice cream. 52 likes cake and 27 likes cake and ice cream. How many likes cake? Draw a Venn Diagram.

