

Algebra I
Section 3.5 Notes
Working with Sets

Name: Key

Key Definitions:

1. Roster form is a way to write sets in which you list the elements of the set within braces.

Ex. $\{0,1,2,3,4,5\}$

2. Set-builder notation is a way to write sets in which you describe the characteristics an element must have in order to be in the set.

Ex. $\{x \mid x \text{ is a positive, even number}\}$

3. The empty set is the set that contains no elements or solutions.

Ex. $\{\emptyset\}$

**The empty set is a subset of every set.

4. The universal set is the largest set within a group of sets.

5. The complement of a set, A' , is the set of all elements in the universal set that are NOT in the set A .

Ex. Universal = $\{1,2,3,4,5,6\}$, Set $A = \{2,5,6\}$, Set $A' = \{1,3,4\}$

Practice Problems

Write each set in roster form and in set-builder notation.

1. M is the set of integers that are greater than -5 .

$-4, -3, -2, -1, \dots$

$M = \{-4, -3, -2, -1, \dots\} \{m \mid m \text{ is integers greater } -5\}$

2. N is the set of natural, even numbers that are less than 8.

$6, 4, 2$

$N = \{6, 4, 2\} \{N \mid N \text{ even numbers less than } 8\}$

3. P is the set of numbers that are factors of 25.

$1, 5, 25$

$P = \{1, 5, 25\} \{P \mid P \text{ numbers factors of } 25\}$

4. R is the set of odd, whole numbers that are less than 12.

$11, 9, 7, 5, 3, 1$

$R = \{11, 9, 7, 5, 3, 1\} \{R \mid R \text{ odd whole numbers less than } 12\}$

Write each set in set-builder notation.

5. $B = \{-3, -2, -1, 0, 1, \dots\}$

$\{B \mid B \text{ integers greater than } -3\}$

6. $M = \{2, 4, 6, 8, 10\}$

$\{m \mid m \text{ even numbers between } 2 \text{ and } 10\}$

7. $S = \{1, 3, 5, 7, 9, 11\}$

$\{s \mid s \text{ odd numbers between } 1 \text{ and } 11\}$

8. $G = \{\dots, -5, -3, -1, 1, 3, 5, \dots\}$

$\{G \mid G \text{ odd integers}\}$

Write the solutions of each inequality in set-builder notation.

1. $2y + 5 < 21$
 $\quad \quad \quad -5 \quad -5$

$\frac{2y}{2} < \frac{16}{2}$

$y < 8$ {y | y less than 8}

2. $3r + 3 > 63$
 $\quad \quad \quad -3 \quad -3$

$\frac{3r}{3} > \frac{60}{3}$

$r > 20$ {r | r greater than 20}

3. $12 - 8m \geq 60$
 $\quad \quad \quad -12 \quad -12$

$\frac{-8m}{-8} \geq \frac{48}{-8}$

$m \leq -6$ {m | m less than or equal to -6}

4. $-(3x + 5) \leq -13$

$-3x - 5 \leq -13$
 $\quad \quad \quad +5 \quad +5$

$\frac{-3x}{-3} \leq \frac{-8}{-3}$

$x \geq \frac{8}{3}$ {x | x greater than or equal to $\frac{8}{3}$ }

List all the subsets of each set.

1. {a, b, c}

{a}, {b}, {c}, {a,b}, {a,c}, {b,c}, {a,b,c}, {∅}

4. {-5, 5}

{-5}, {5}, {∅}, {-5, 5}

5. $-2(x - 7) > -10 - 6x$

$-2x + 14 > -10 - 6x$
 $\quad \quad \quad +6x \quad \quad \quad +6x$

$4x + 14 > -10$
 $\quad \quad \quad -14 \quad -14$

$\frac{4x}{4} > \frac{-24}{4}$ {x | x greater than -6}

X. {0, 3, 6, 9}

6. $-3(2x + 4) + 1 > -13$

$-6x - 12 + 1 > -13$

$-6x - 11 > -13$
 $\quad \quad \quad +11 \quad +11$

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

$x < \frac{1}{3}$ {x | x less than $\frac{1}{3}$ }

3. {car, bus, truck}

{car}, {bus}, {truck}, {∅}, {C,B}, {C,T}, {BT}, {C,B,T}

6. {dog}

{dog}, {∅}

Answer the following questions.

1. Suppose $U = \{0, 2, 4, 6, 8, 10\}$ is the universal set and $A = \{2, 4, 6\}$. What is A' ?

$A' = \{0, 8, 10\}$

2. Suppose $U = \{x \mid x \text{ is an even number}\}$ is the universal set and $C = \{2, 5, 6, 9, 10\}$. What is C' ?

$C' = \{4, 8, 12, 14, \dots\}$

3. Suppose $U = \{-5, -3, -1, 3, 5\}$ is the universal set and $R = \{1, 3, 5\}$. What is R' ?

$R' = \{-5, -3, -1\}$

4. Suppose $U = \{x \mid x \text{ is a multiple of 3, } x \geq 18\}$ is the universal set and $C = \{21, 24, 27, 30\}$. What is C' ?

$C' = \{33, 36, 39, \dots\}$

Suppose $U = \{1, 2, 4, 7, 11, 15\}$, $A = \{2, 4, 7\}$, and $B = \{1, 2, 4\}$. Tell whether each statement is true or false. Explain your reasoning.

1. $A \subseteq U$

True

2. $U \subseteq B$

False

3. $B \subseteq A$

False

4. $\emptyset \subseteq B$

True

$U = \{1, 2, 4, 7, 11, 15\}$ $A = \{2, 4, 7\}$

\emptyset is always a subset.