1.3 Exercises

Concept Check

Fill-in-the-Blank. Complete each sentence using information found in this section.

1. A/An _____ is a collection of items.
2. To write a set using _____ notation, list each member of the set, separating members by commas, and enclosing them in curly braces.
3. A set with no elements is called the _____ or the null set.
4. If a set is not finite, the set is said to be _____.
5. _____ is a method of writing a set that it uses the features of both the word description method and the roster method.
6. The symbol ____ is read "is an element of."

True/False. Determine whether each statement is true or false. If a statement is false, explain how it can be changed so the statement will be true. (**Note:** There may be more than one acceptable change.)

7. The only ways to write sets are with word descriptions and set-builder notation.
8. Given $A = \{1,2,3,4,5\}$, $5 \in A$.
9. The set $\{x \mid x > 5$ **and** $x < 8\}$ is also known as an intersection.
10. A union of sets uses the word *and*.

Practice

State the property of inequality that is illustrated.

1. If $x < 11$ and $11 < y$, then $x < y$.
2. Either $s = t$, $s > t$, or $s < t$.
3. If $a < -2$ and $-2 < b$, then $a < b$.
4. If $a < b$ and $b < (x - 2)$, then $a < (x - 2)$.
5. Either $a < b$, $a > b$, or $a = b$.
6. Either $n = m$, $n < m$, or $n > m$.

Write a word description of each set. There may be more than one correct answer. See Example 4.

7. $A = \{2,4,6,8,10\}$
8. $B = \{-9,-7,-5,-3,-1\}$
9. $C = \varnothing$
10. $D = \{1\}$
11. $E = \{x \mid x > 2 \text{ and } x \in \mathbb{Z}\}$
12. $F = \{x \mid 3 < x \leq 17 \text{ and } x \in \mathbb{N}\}$

Write each set in roster notation. See Examples 1 and 4.

13. G is the set of even negative integers greater than or equal to negative twelve.
14. H is the set of odd positive integers less than fourteen.

15. I is the set of whole numbers less than twenty that are divisible by three.

16. J is the set of natural numbers divisible by five.

17. $K = \{x \mid 0 < x < 12 \text{ and } x \text{ is odd}\}$

18. $L = \{x \mid -10 \le x < 3 \text{ and } x \text{ is even}\}$

Write each set in set-builder notation. There may be more than one correct answer. See Examples 3 and 4.

19. M is the set of even numbers greater than five and less than nine.

20. N is the set of odd numbers greater than or equal to negative seven and less than zero.

21. O is the set of numbers greater than sixteen.

22. P is the set of integers less than zero.

23. $S = \{0\}$

24. $T = \{-2, -1, 0, 1, 2\}$

Write each set using **a.** a word description, **b.** roster notation, and **c.** set-builder notation. There may be more than one correct answer.

25. Consider the following list of numbers: 3, 4, 5, 6, 7. Write the set U that consists of these numbers.

26. Consider the following list of numbers: –5, –4, –3, –2, –1. Write the set V that consists of these numbers.

27. Consider the following list of numbers: 0, 10, 20, 30. Write the set W that consists of these numbers.

28. Consider the following list of numbers: 2, 4, 6, 8, 10, 12. Write the set X that consists of these numbers.

Fill in the blank with the symbol $\in$ or $\notin$ to make a true statement. See Example 5.
$A = \{1, 3, 5, 7, 9\}$

29. 1 ____ A

30. 4 ____ A

31. –7 ____ A

32. 11 ____ A

Graph each set on a number line. See Examples 6 and 7.

33. $\{x \mid x < 5\}$

34. $\{x \mid x > -7\}$

35. $\{x \mid x \le -2\}$

36. $\{x \mid x \ge 0\}$

37. $\{x \mid x < -2 \textbf{ or } x > 2\}$

38. $\{x \mid x \le 0 \textbf{ or } x > 5\}$

39. $\{x \mid x < 3 \textbf{ or } x \ge 7\}$

40. $\{x \mid x \le -5 \textbf{ or } x \ge -4\}$

41. $\{x \mid x > 2 \textbf{ and } x < 6\}$

42. $\{x \mid x \ge -9 \textbf{ and } x \le 0\}$

43. $\{x \mid -1 < x \le 5\}$

44. $\{x \mid 7 \le x < 11\}$