Unions and Intersections of Sets

Vocabulary

Review

Write the elements of each set.

1. whole numbers less than 4
   \{0, 1, 2, 3\}

2. even numbers between 1 and 9
   \{2, 4, 6, 8\}

3. Two sets are disjoint when they have no elements in common.

Are the sets in Exercises 1 and 2 disjoint? Yes / No

Vocabulary Builder

union (noun) ˈyoon yuhn

Related Word: intersection (noun), Venn diagram (noun)

Definition: The union of two or more sets is the set that contains all the elements of the sets. The intersection of two or more sets is the set of elements that are in all of the sets.

Example: Set \( A = \{\text{penny, nickel, dime}\} \) and set \( B = \{\text{nickel, dime, quarter}\} \).

\( A \cup B = \{\text{penny, nickel, dime, quarter}\} \) and \( A \cap B = \{\text{nickel, dime}\} \)

Use Your Vocabulary

Write union or intersection to describe each set.

4. \( D = \{\text{cheese, milk, yogurt}\} \) and \( F = \{\text{apple, banana, pear}\} \)
   the set \{apple, banana, cheese, milk, pear, yogurt\}

5. \( D = \{\text{cheese, milk, yogurt}\} \) and \( M = \{\text{bread, cheese, egg}\} \)
   the set \{cheese\}

6. \( F = \{\text{apple, banana, pear}\} \) and \( M = \{\text{bread, cheese, egg}\} \)
   the empty set

union

intersection

intersection
Problem 1 Union of Sets

Got It? Write sets $P$ and $Q$ below in roster form. What is $P \cup Q$?

$P = \{ x \mid x \text{ is a whole number less than } 5 \}$
$Q = \{ y \mid y \text{ is an even natural number less than } 5 \}$

7. The symbol $\cup$ means the union/intersection of the sets.

8. Circle the numbers in set $P$.

0 1 2 3 4 5

9. Write set $P$ in roster form.

$P = \{ 0, 1, 2, 3, 4 \}$

10. Circle the numbers in set $Q$.

0 1 2 3 4 5

11. Write set $Q$ in roster form.

$Q = \{ 2, 4 \}$

12. Write $P \cup Q$.

$P \cup Q = \{ 0, 1, 2, 3, 4 \}$

13. Reasoning What is true about the union of two distinct sets if one set is a subset of the other? (Assume that the subset is not the original set.)

Answers may vary. Sample: Their union is the larger set.

Problem 2 Intersection of Sets

Got It? Let $A = \{ 2, 4, 6, 8 \}$, $B = \{ 0, 2, 5, 7, 8 \}$, and $C = \{ n \mid n \text{ is an odd whole number} \}$. What is $A \cap B$?

14. The symbol $\cap$ means the union/intersection of the sets.

15. The numbers 2 and 8 are in both set $A$ and set $B$.

16. Write $A \cap B$.

$A \cap B = \{ 2, 8 \}$

17. Write $A \cap C$, and write $C \cap B$.

$A \cap C = \{ \}$

$C \cap B = \{ 5, 7 \}$

18. Reasoning What is true about the intersection of two distinct sets if one set is a subset of the other? (Assume that the subset is not the original set.)

Answers may vary. Sample: Their intersection is the smaller set.
Problem 5 Writing Solutions of an Inequality

Got It? Solve the inequality $8 \leq x + 5 < 11$. Write the solutions as either the union or the intersection of two sets.

24. Multiple Choice What is the first step in solving the inequality?
   - A. Add 5 to each expression.
   - B. Subtract 5 from each expression.
   - C. Add 8 to each expression.
   - D. Subtract 8 from each expression.

25. When you isolate the variable, the inequality becomes $3 \leq x < 6$.

26. Write two inequalities.
   $$3 \leq x \quad \text{and} \quad x < 6$$

27. Now write the solutions of the inequality as the union or the intersection of two sets.
   $$\{x \mid 3 \leq x\} \cap \{x \mid x < 6\}$$

Lesson Check • Do you UNDERSTAND?

Compare and Contrast How are unions and intersections of sets different?

28. Write U if the statement describes a union. Write I if the statement describes an intersection.
   - U It contains the elements that belong to either set or both sets.
   - I In a Venn diagram, it is the part of the circles that overlap.

29. Use your answers to Exercise 28 to explain how unions and intersections are similar and how they are different.

Answers may vary. Sample: Unions of sets include all elements in both sets. Intersections of sets include only the elements that the sets share.

Math Success

Check off the vocabulary words that you understand.

☐ union ☐ intersection ☐ disjoint sets ☐ subsets

Rate how well you can find unions and intersections of sets.

Need to review 0 2 4 6 8 10 Now I get it!