Looking Ahead

The vertical bars in the following example represent finding the number of items in a set. Finding the number of items which meet either of two criteria involves adding the number of items which meet one criterion with the number of items which meet the other criterion.

Example Preview

Find the number of playing cards in a standard deck of 52 cards that are either black cards or queens.

Solution

Let set A be the set of all black cards and set B be the set of all queens. Then the number of cards that are either black cards or queens can be written $|A \cup B|$, and we find the solution by applying the inclusion-exclusion principle.

$$|A \cup B| = |A| + |B| - |A \cap B|$$

There are 26 black cards in the deck and there are 4 queens. However, there are 2 queens that are also black cards.

Therefore, $|A \cup B| = 26 + 4 - 2 = 28$. Add and subtract real numbers.

So, there are 28 cards that are either black cards or queens.

2.R.2 Exercises

Concept Check

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.)

1. When adding integers with unlike signs, the answer will be negative.

2. The sum of two positive numbers can equal zero.

3. The additive inverse of negative seven is -7.

4. When a number substituted for a variable makes a statement true, that number is said to be an equation.

Practice

Find the additive inverse (opposite) of each integer.

5. 15

6. –40

Add.

7. $-3+(-5)$

8. $12+14+(-16)$

Add. Be sure to find the absolute value first.

9. $|-7|+(-7)$

Determine whether the given integer is a solution to the equation by substituting for the variable and then adding.

10. $x+5=7; \quad x=-2$

Applications

Solve.

11. A submarine dives to a depth of 250 feet below the surface. It rises 75 feet before diving an additional 100 feet. What is the final depth of the submarine?

12. The temperature at 2 a.m. was −17 °C. By 2 p.m. the temperature increased a total of 15 °C. What was the temperature at 2 p.m.?

Writing & Thinking

Choose the response that correctly completes each statement. In each problem, give two examples that illustrate your reasoning.

13. If x and y are integers, then $x + y$ is (never, sometimes, always) equal to 0.

14. Explain how the sum of the absolute values of two integers might be 0. (Is this possible?)