

Looking Ahead

When finding the number of elements in a set, you want to make sure not to double count any elements. To ensure this, when finding the number of items that meet at least one of two criteria, you will subtract the number of items which meet both criteria.

Example Preview

A survey of 400 students yielded the following information: 252 were seniors, 215 were commuters, and 145 of the seniors were commuters. How many of the 400 surveyed students were seniors or were commuters?

Solution

To determine how many students were seniors or were commuters, we need to find the union of the two sets. Note that the students that were seniors and were also commuters were counted in both categories. Since some students are included in both sets, we need to use the inclusion-exclusion principle.

If we let set A consist of the set of all seniors and set B consist of the set of all commuters, then $|A| = 252$, $|B| = 215$, and we are looking for $|A \cup B|$. We were told that 145 of the seniors were commuters, which means that $|A \cap B| = 145$. Substituting these values into the formula for the inclusion-exclusion principle gives the following.

$$\begin{aligned} |A \cup B| &= |A| + |B| - |A \cap B| \\ &= 252 + 215 - 145 \quad \text{Add and subtract real numbers.} \\ &= 322 \end{aligned}$$

So, there are a total of 322 students who were seniors or were commuters.

2.R.3 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. Moving to the right on the number line is equivalent to moving in a positive direction.
2. Like addition, subtraction is both commutative and associative.
3. The expression “ $15 - 7$ ” can be thought of as “fifteen plus negative seven.”

Practice

Perform the indicated operations.

4. $17 - 22$

5. $-17 - 30$

6. $-3 - (-3) + (-2)$

Applications

Solve.

7. Beginning with a temperature of 8° above zero, the temperature was measured hourly for 4 hours. It rose 3° , dropped 7° , and rose 1° . What was the final temperature recorded?
8. In a 5-day week, the NASDAQ stock market posted a gain of 145 points, a loss of 100 points, a loss of 82 points, a gain of 50 points, and a gain of 25 points. If the NASDAQ started the week at 6300 points, what was the value of the market at the end of the week?

Writing & Thinking

9. Under what conditions can the difference between two negative numbers be a positive number?
10. Give two examples to illustrate why subtraction is not commutative.