

Solving One-Step Equations

An equation is a number sentence that states that two expressions are equivalent. An equation has an is-equal-to sign ($=$) in it. Among the uses for solving equations are finding the cost of each item in a group, how items are being shared, or how many more one group is than another.

EXAMPLE A

How many circles are equal to a star?

$$\bigcirc \bigcirc \bigcirc + \star = \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$$

Step 1: Write an expression to represent the left side of the equation. Let s represent the number of circles that are equal to a star. $3 + s$

Step 2: Count the number of circles on the right side of the equation. $3 + s = 8$

Step 3: Use a related fact to find how many circles are equal to a star. $8 - 3 = s$

Solution: A star is equal to 5 circles. $8 - 3 = 5$

You can use inverse operations to solve an equation. Inverse operations are operations that “undo” each other. Addition and subtraction are inverse operations. By using inverse operations, you can isolate the variable on one side of the equation.

EXAMPLE B

Find the value of n in the equation $n - 12 = 19$.

Step 1: Undo the subtraction. Add 12 to both sides of the equation.

$$\begin{aligned} n - 12 &= 19 \\ n - 12 + 12 &= 19 + 12 \\ n &= 31 \end{aligned}$$

Solution: The value of n is 31.

You can check if your solution is correct by substituting the solution into the original equation. Since $31 - 12 = 19$, the solution in Example B is correct.

Solving One-Step Equations (continued)

Multiplication and division are inverse operations.

EXAMPLE C

Find the value of p in the equation $p \div 8 = 12$.

Step 1: Undo the division. Multiply each side of the equation by 8.

$$\begin{aligned} p \div 8 &= 12 \\ p \div 8 \times 8 &= 12 \times 8 \\ p &= 96 \end{aligned}$$

Solution: The value of p is 96.

One-step equations may involve negative integers.

EXAMPLE D

What is the value of m in the equation below?

$$4 + m = -6$$

Step 1: Undo the addition. Subtract 4 from both sides of the equation.

$$\begin{aligned} 4 + m &= -6 \\ 4 - 4 + m &= -6 - 4 \\ m &= -10 \end{aligned}$$

Solution: The value of m is -10 .

When multiplying and dividing with integers, remember these rules:

- If the signs are the same, the product or quotient is positive.
- If the signs are different, the product or quotient is negative.

EXAMPLE E

What is the value of q in the equation below?

$$6q = -78$$

Step 1: Undo the multiplication. Divide each side of the equation by 6.

$$\begin{aligned} 6q &= -78 \\ \frac{6q}{6} &= \frac{-78}{6} \\ q &= -13 \end{aligned}$$

Solution: The value of q is -13 .

Solving One-Step Equations (continued)

PRACTICE

Solve each equation.

1. $8 + x = 17$

2. $x - 14 = 13$

3. $5x = 45$

4. $y \div 4 = 11$

5. $16 + y = 45$

6. $\frac{y}{6} = 36$

7. $5 + z = -3$

8. $z - 4 = -2$

9. $3z = -21$

10. Adam has 28 model cars and airplanes. He has 16 model cars. The rest of his models are airplanes. Write and solve an equation to find how many model airplanes Adam has.

11. Melissa baked 4 batches of cookies. She baked the same number of cookies in each batch. She made a total of 96 cookies.

a. Write and solve an equation to find how many cookies were in each batch.

b. Explain how you solved the equation.