

Objective 55-56

Solve multi-step equations with the variable on one side of the equation

Vocab:

Inverse operation: opposite operations that undo each other. For example, addition and subtraction are inverse operations. Multiplication and division are inverse operations.

Example 1: $7x+10=31$

Step 1: Get constants on same side of the equation and the variables on the other.

What you do to one side of the equation, you must do to the other side.

$$\begin{array}{r} 7x + 10 = 31 \\ -10 \quad -10 \quad \text{Subtract 10 from both sides of the equation} \\ \hline 7x = 21 \quad \text{Simplify} \end{array}$$

Step 2: Solve for x by using the inverse operation. Because x is being multiplied by 7, the inverse operation is to divide by 7.

$$\frac{7x}{7} = \frac{21}{7} \quad x=3 \quad \leftarrow \quad \boxed{\text{Answer is 3}}$$

Example 2

PROBLEM

Solve:

$$-10 = \frac{9}{8}x - 7 + \frac{5}{8}x$$

STEP 1

Combine the constants by adding 7 to each side.

$$\begin{array}{l} -10 = \frac{9}{8}x - 7 + \frac{5}{8}x \\ -10 + 7 = \frac{9}{8}x - 7 + 7 + \frac{5}{8}x \\ -3 = \frac{9}{8}x + \frac{5}{8}x \end{array}$$

STEP 2

Combine like terms.

$$\begin{array}{l} -3 = \frac{9}{8}x + \frac{5}{8}x \\ -3 = \frac{14}{8}x \end{array}$$

STEP 3

Simplify the fraction.

$$\begin{array}{l} -3 = \frac{14}{8}x \\ -3 = \frac{14^7}{8_4}x \\ -3 = \frac{7}{4}x \end{array}$$

STEP 4

Multiply both sides of the equation by $\frac{4}{7}$, the reciprocal of $\frac{7}{4}$.

$$\begin{array}{l} -3 = \frac{7}{4}x \\ \left(\frac{4}{7}\right)(-3) = \left(\frac{7}{4}x\right)\left(\frac{4}{7}\right) \\ -\frac{12}{7} = x \end{array}$$

ANSWER

$$x = -\frac{12}{7}$$

Guided Practice: solve and express your answer in scientific notation.

$$7x + 2 = 16$$

$$\frac{3}{4}x + 3 = 15$$

$$17x - 12 = 22$$

Practice: Solve the following equations. *Show your work.*

1) $-220 = -20n$

2) $-23 - n = -52$

3) $42 = 18 - b$

4) $-9 = -8 + \frac{x}{20}$

5) $\frac{k+7}{26} = 1$

6) $4 = \frac{a+9}{2}$

7) $-2 = \frac{-9+r}{13}$

8) $-7 + \frac{v}{2} = -13$

9) $2 = -2(4 - 5v)$

10) $-6x + 3(6x - 1) = -3$

11) $-46 = 6k + 8(3k - 2)$

12) $-6(v - 4) = 6$

Additional Help:

<https://www.youtube.com/watch?v=QQoPAU5L52s>

<https://www.youtube.com/watch?v=wVWQWEta1rE>