2.3. Solving 1-Step Equations

Solving 1-Step Equations with Adding and Subtracting

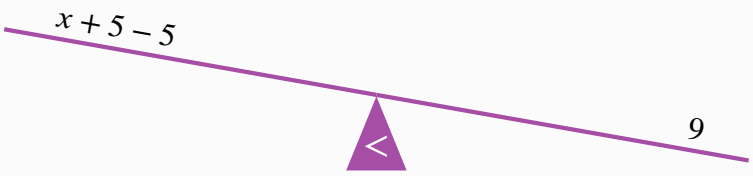
Example 1: Solve $x + 5 = 9$ using the opposite operation.

Solution:

Solve for x

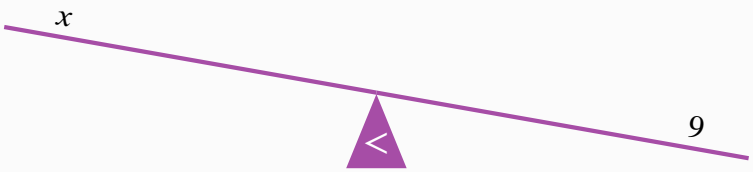
$LS = RS$

Subtract 5 from x



$LS < RS$

Now, the left side is less then the right side:



Subtract 5 from the right side:

$LS = RS$

x = 4

Numerical solution:

$$x + 5 = 9 \quad |\textit{subtract 5 from each side}$$
$$x + 5 - 5 = 9 - 5$$
$$x = 4$$

Check:

$$x + 5 = 9 \quad |\textit{replace the } x \textit{ with } 4$$
$$4 + 5 = 9$$
$$9 = 9$$
$$\textit{Left Side} = \textit{Right Side} \quad \textit{Ok!}$$

Example 2: Solve for x:

$$x + 2 = 5$$

Solution:

$$\begin{aligned} x + 2 &= 5 && \text{|}\textit{subtract 2 from each side} \\ x + 2 - 2 &= 5 - 2 \\ x &= 3 \end{aligned}$$

Check:

$$\begin{aligned} x + 2 &= 5 && \text{|}\textit{substitute the } x \textit{ with 3} \\ (3) + 2 &= 5 \\ \textit{Left Side} &= \textit{Right Side} \end{aligned}$$

Practice 1: Solve the equations. Check your solutions.

a) $x + 8 = 6$

b) $a + 4 = 4$

c) $6 + x = 8$

d) $3 + x = 20$

Example 3: Solve for x:

$$x - 4 = 10$$

Solution:

$$\begin{aligned} x - 4 &= 10 && \text{|add 4 to each side} \\ x - 4 + 4 &= 10 + 4 \\ x &= 14 \end{aligned}$$

Check:

$$\begin{aligned} x - 4 &= 10 && \text{|substitute the } x \text{ with } 14 \\ (14) - 4 &= 10 \\ 10 &= 10 \\ \textit{Left Side} &= \textit{Right Side} \end{aligned}$$

Practice 2: Solve the equations. Check your solutions.

a) $x - 5 = 4$

b) $x - 3 = -10$

c) $-4 + x = -2$

d) $-12 + x = 24$

Solving 1-Step Equations with Multiplying and Dividing

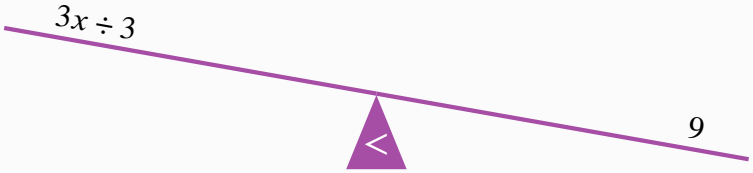
Example 4: Solve $3x = 9$ using the opposite operation. Check to show that the left side (LS) equals the right side (RS).

Solution:

Solve for x

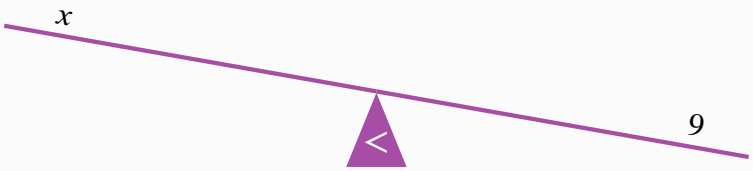
$LS = RS$

Divide $3x$ by 3



$LS < RS$

Now, the left side is less then the right side:



Divide the other side by 3:

$LS = RS$

x = 3

Numerical solution:

$$3x = 9 \quad |\textit{divide each side by 3}$$
$$3x \div 3 = 9 \div 3$$
$$x = 3$$

Check:

$$3x = 3(3) = 9 \quad \textit{Ok!}$$

Example 5: Solve for x:

$$2x = 6$$

Solution:

$$\begin{aligned} 2x &= 6 && \text{|divide each side by 2} \\ \frac{2x}{2} &= \frac{6}{2} \\ x &= 3 \end{aligned}$$

Check:

$$\begin{aligned} 2x &= 6 && \text{|substitute the } x \text{ with 3} \\ 2(3) &= 6 \\ 6 &= 6 \\ \textit{Left Side} &= \textit{Right Side} \end{aligned}$$

Practice 3: Solve the equations. Check solutions.

a) $4x = 12$

b) $-2z = 12$

c) $-3x = -18$

d) $15x = 45$

Example 6: Solve for x: $\frac{x}{2} = 4$

Solution:

$$\frac{x}{2} = 4 \qquad \text{|multiply each side by 2}$$
$$\frac{x}{2} \cdot 2 = 4 \cdot 2$$
$$x = 8$$
$$\textit{Check:} \quad \frac{x}{2} = 4 \qquad \text{|substitute the } x \text{ with 8}$$
$$\frac{(8)}{2} = 4$$
$$4 = 4$$
$$\textit{Left Side} = \textit{Right Side}$$

Practice 4: Solve the equations. Check solutions.

a) $\frac{x}{2} = -5$

b) $\frac{x}{3} = 4$

c) $\frac{a}{5} = -3$

d) $\frac{a}{3} = 9$

Solving 1-Step Equations with Exponents and Roots

Example 7: Solve for x: $x^2 = 4$

Solution:

$$x^2 = 4 \qquad \text{|take the square root of each side}$$
$$\sqrt{x^2} = \sqrt{4}$$

We get 2 solutions:

$$x = 2 \quad \textit{and} \quad x = -2$$

Check:

$x^2 = 4$ *|substitute the x with 2*
$2^2 = 4$
$4 = 4$
Left Side = Right Side

$x^2 = 4$ *|substitute the x with −2*
$(-2)^2 = 4$
$4 = 4$
Left Side = Right Side

Practice 5: Solve the equations. Check solutions.

a) $x^2 = 100$

b) $x^2 = \frac{16}{25}$