

Whenever you find the root of an equation, you are solving the equation. Some equations can be solved mentally. For example, to solve $n - 1 = 4$, think “If you subtract 1 from a number, you get 4. What is the number?” Since $5 - 1 = 4$, $n = 5$.

When equations cannot be solved mentally, you can add equal amounts to both sides of an equation to find the root, or value, of the variable:

EXAMPLE 1 Solve $n - 17 = 81$ for n .

Step 1 Write the equation.

$$n - 17 = 81$$

Step 2 Add 17 to both sides of the equation.

$$\begin{array}{rcl} n - 17 & = & 81 \\ + 17 & = & + 17 \end{array}$$

Step 3 Simplify.

$$\begin{array}{rcl} n - 17 & = & 81 \\ + 17 & = & + 17 \\ n & = & 98 \end{array}$$

Step 4 Check.

$$98 - 17 = 81$$

EXAMPLE 2 Solve $x - 29 = 43$ for x .

Step 1 Write the equation.

$$x - 29 = 43$$

Step 2 Add 29 to both sides of the equation.

$$\begin{array}{rcl} x - 29 & = & 43 \\ + 29 & = & + 29 \end{array}$$

Step 3 Simplify.

$$\begin{array}{rcl} x - 29 & = & 43 \\ + 29 & = & + 29 \\ x & = & 72 \end{array}$$

Step 4 Check.

$$72 - 29 = 43$$

EXAMPLE 3 Solve $g - (-2) = 7$ for x .

Step 1 Rewrite the equation.

$$g + 2 = 7$$

Step 2 Add (-2) to both sides of the equation.

$$\begin{array}{rcl} g + 2 & = & 7 \\ + (-2) & = & + (-2) \end{array}$$

Step 3 Simplify.

$$\begin{array}{rcl} g + 2 & = & 7 \\ + (-2) & = & + (-2) \\ g & = & 5 \end{array}$$

Step 4 Check.

$$5 - (-2) = 7$$

Subtracting a negative is the same as adding the opposite.

Recall that you used the idea of opposites to solve equations of the form $x - b = c$. The same idea of opposites can be used to solve equations of the form $x + b = c$.

EXAMPLE 1Solve $a + 24 = 51$ for a .

Step 1 Write the equation. $a + 24 = 51$

Step 2 Subtract 24 from both sides of the equation. $a + 24 = 51$
This is the same as adding $-24 = -24$ to both sides.

Step 3 Simplify. $a + 24 = 51$
 $-24 = -24$
 $a = 27$

Step 4 Check. $27 + 24 = 51$

EXAMPLE 2Solve $r + 1.4 = 3.7$ for r .

Step 1 Write the equation. $r + 1.4 = 3.7$

Step 2 Subtract 1.4 from both sides of the equation. $r + 1.4 = 3.7$
 $-1.4 = -1.4$

Step 3 Simplify. $r + 1.4 = 3.7$
 $-1.4 = -1.4$
 $r = 2.3$

Step 4 Check. $2.3 + 1.4 = 3.7$

EXAMPLE 3Solve $k + (-2) = 7$ for k .

Step 1 Rewrite the equation. $k - 2 = 7$

Step 2 Add 2 to both sides of the equation. $k - 2 = 7$
 $+2 = +2$

Step 3 Simplify. $k - 2 = 7$
 $+2 = +2$
 $k = 9$

Step 4 Check. $9 + (-2) = 7$

Remember that subtraction is the same as adding the opposite.

Again, each equation was solved by adding the opposite. Whenever you add an opposite, remember to add the opposite to both sides of the equation.