

7.2 Solving Equations Using Addition or Subtraction

ESSENTIAL QUESTION: *How can you use addition or subtraction to solve an equation?*

EXPRESSIONS

$$4 + 8$$

$$x + 8$$

EQUATIONS

$$4 + 8 = 12$$

$$x + 8 = 12$$

EQUATION → a mathematical sentence that uses an equal sign to show that two expressions are equal.

A solution of an equation is a value that makes the equation true.

Value of x	$x + 3 = 7$	Are both sides equal?
3	$3 + 3 \stackrel{?}{=} 7$ $6 \neq 7$ ✗	no
4	$4 + 3 \stackrel{?}{=} 7$ $7 = 7$ ✓	yes
5	$5 + 3 \stackrel{?}{=} 7$ $8 \neq 7$ ✗	no

EXAMPLE 1 → Checking Solutions

Is the value a solution of the equation?

1. $p + 10 = 30$; $p = 10$

$$10 + 10 = 30$$

$$20 = 30$$

not a solution

2. $4y = 56$; $y = 14$

$$4 \cdot 14 = 56$$

$$56 = 56$$

solution

3. $a + 6 = 17$; $a = 9$

$$9 + 6 = 17$$

$$15 = 17$$

not a solution

On Your Own

Is the value a solution of the equation?

1. $9 - g = 5$; $g = 3$

$$9 - 3 = 5$$

$$6 = 5$$

not a solution

2. $35 = 7n$; $n = 5$

$$35 = 7 \cdot 5$$

$$35 = 35$$

solution

3. $\frac{q}{2} = 28$; $q = 14$

$$\frac{14}{2} = 28$$

not a

solution

You can use inverse operations to solve equations.

Inverse operations "undo" each other. Addition and subtraction are inverse operations.

EXAMPLE 2 → Solving Equations Using Addition

Solve the equation.

1. $x - 2 = 6$

$$+2 \quad +2$$

$$x = 8$$

2. $18 = x - 7$

$$+7 \quad +7$$

$$25 = x$$

EXAMPLE 3 -> Solving Equations Using Subtraction

Solve the equation.

1. $x + 2 = 9$

$-2 -2$

$x = 7$

2. $26 = 11 + x$

$-11 -11$

$15 = x$

ON YOUR OWN

Solve the equation.

1. $k - 3 = 1$

$+3 +3$

$k = 4$

2. $n - 10 = 4$

$+10 +10$

$n = 14$

3. $15 = r - 6$

$+6 +6$

$21 = r$

4. $s + 8 = 17$

$-8 -8$

$s = 9$

5. $9 = y + 6$

$-6 -6$

$3 = y$

6. $13 + m = 20$

$-13 -13$

$m = 7$

Solve the equation.

1. $34 + 16 = w - 14$

$50 = w - 14$
 $+14 +14$
 $64 = w$

2. $m + 10 - 3 = 25$

$m + 7 = 25$
 $-7 -7$
 $m = 18$

3. $7 + 84 = 3 + d$

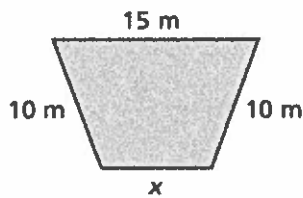
$91 = 3 + d$
 $-3 -3$
 $88 = d$

4. $f - 12 = 24 + 15$

$f - 12 = 39$
 $+12 +12$
 $f = 51$

Write and solve an equation to find x.

1. Perimeter = 43 m

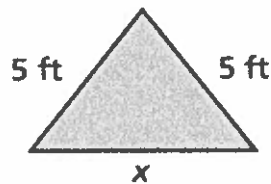


Equation

$10 + 15 + 10 + x = 43$

$35 + x = 43$
 $-35 -35$
 $x = 8$

2. Perimeter = 18 ft



$5 + 5 + x = 18$

$10 + x = 18$
 $-10 -10$

$x = 8$

EXAMPLE 4->Real Life Application

Your parents give you \$20 to help buy the new pair of shoes shown. After you buy the shoes, you have \$5.50 left. Write and solve an equation to find how much money you had before your parents gave you \$20



(s) starting amount + amount parents gave you - cost of shoes = amount left

$$\begin{array}{r}
 S + 20 - 59.95 = 5.50 \\
 + 59.95 \quad + 59.95 \\
 S + 20 = 65.45 \\
 - 20 \quad \quad - 20.00 \\
 \hline
 S = 45.45
 \end{array}$$

You had \$45.45 before your parents gave you money.

You eat 8 blueberries and your friend eats 11 blueberries from a package. There are 23 blueberries left. Write and solve an equation to find the number of blueberries in a full package.

$$\begin{array}{r}
 x - 8 - 11 = 23 \\
 \quad \quad + 11 \quad + 11 \\
 \hline
 x - 8 = 34 \\
 + 8 \quad + 8 \\
 \hline
 x = 42
 \end{array}$$

There are 42 blueberries in a full package.

Solving Equations Using Addition or Subtraction

- Goal is to isolate or get the variable by itself.
- Need to keep the equation balanced.
- What you do to one side of the equation, need to do to the other side.
- To solve an addition equation, you need to do the inverse of addition (subtract on both sides)

$$\begin{array}{r}
 x + 5 = 13 \\
 -5 \quad -5 \\
 \hline
 x = 8
 \end{array}$$

- To solve a subtraction equation, you need to do the inverse of subtraction (add on both sides)

$$\begin{array}{r}
 r - 4 = 19 \\
 + 4 \quad + 4 \\
 \hline
 r = 23
 \end{array}$$