

## 2-6

**Solving Equations Involving  
the Distributive Property**

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7.EE.3, 7.EE.4.a

**What You'll Learn**

To solve equations of the form  $p(x + q) = r$  using the Distributive Property

**Why Learn This?**

Builders and landscape designers often need to adjust the dimensions of a rectangular area in order to get a specific perimeter.

**KEY CONCEPTS****Distributive Property**

When you multiply a factor by a sum (or difference), the product is the same as multiplying the factor by each term and then adding (or subtracting) the products.

**Arithmetic**

$$4(5 + 9) = 4(5) + 4(9)$$

$$4(14) = 20 + 36$$

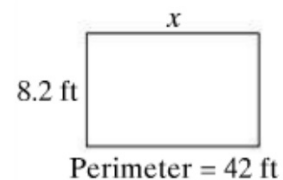
$$56 = 56$$

**Algebra**

$$p(x + q) = px + pq$$

## EXAMPLE Using the Distributive Property

- 1 Suppose you have 42 feet of fencing to enclose your garden. The width of the garden is 8.2 feet. What length must the garden be to use all of the fencing?



Let  $x$  = length of rectangular garden.

$$2(x + 8.2) = 42 \quad \leftarrow \text{Write the equation for perimeter.}$$

$$2x + 2(8.2) = 42 \quad \leftarrow \text{Use the Distributive Property.}$$

$$2x + 16.4 = 42 \quad \leftarrow \text{Simplify.}$$

$$2x = 25.6 \quad \leftarrow \text{Subtract 16.4 from both sides.}$$

$$x = 12.8 \quad \leftarrow \text{Divide both sides by 2.}$$

The length of the garden is 12.8 feet.

## Examples

- ① **Using the Distributive Property** Let  $x$  = the length of a rectangular card. If the width of the card is 3.5 inches, and the perimeter is 17 inches, what is the length of the card?

$$\text{Solve } 2(x + 3.5) = 17.$$

$$2(x + 3.5) = 17 \quad \leftarrow \text{Write the equation for perimeter}$$

$$2x + 2(3.5) = 17 \quad \leftarrow \text{Use the } \boxed{\text{Distributive}} \text{ Property}$$

$$2x + 7 = 17 \quad \leftarrow \text{Simplify}$$

$$2x = 10 \quad \leftarrow \text{Subtract } \boxed{7} \text{ from both sides}$$

$$\boxed{x} = \boxed{5} \quad \leftarrow \text{Divide both sides by 2.}$$

The length of the card is  $\boxed{5 \text{ inches}}$ .

**Test Prep Tip** 

Remember to multiply the number outside the parentheses by both terms inside the parentheses.

**EXAMPLE****Solve Using the Distributive Property**

2 Solve  $10(a - 6) = -25$ .

$$10(a) + 10(-6) = -25$$

$$10a - 60 = -25$$

$$10a = 35$$

$$a = 3.5$$

← Use the Distributive Property.

← Simplify.

← Add 60 to each side.

← Divide each side by 10.

**Check**  $10(3.5) + 10(-6) = 35 + (-60)$

$$10(3.5) + 10(-6) = -25 \text{ The solution checks.}$$

**2 Solve using the Distributive Property** Solve  $4(d - 1.5) = -8$ .

$$4(d - 1.5) = -8$$

$$4 \boxed{x} - 4 \boxed{1.5} = -8$$

← Use the Distributive Property

$$4x - 6 = -8$$

← Simplify each side.

$$4x = \boxed{-2}$$

← Add 6 to both sides

$$\boxed{x} = \boxed{-0.5}$$

← Divide both sides by 2.

**Check**  $4(-0.5) - 4(1.5) = -2 - 6$   
 $= -8$

The solution checks.

## More Than One Way

Each of 4 workers in a gourmet bakery makes  $2\frac{1}{2}$  pounds of cranberry granola every day. The workers also make almond granola. Together, they make 24 pounds of granola every day. How many pounds of almond granola does each worker make daily?

### Kayla's Method

I can use number sense. The amount of cranberry granola made daily is  $4 \times 2\frac{1}{2}$  or 10 pounds. Since  $24 - 10 = 14$  and  $14 \div 4 = 3\frac{1}{2}$ , each worker makes  $3\frac{1}{2}$  pounds of almond granola daily.

### Will's Method

I can write an equation. Let  $b$  represent the pounds of almond granola that each worker makes. Together, the workers make  $4(2\frac{1}{2} + b)$  pounds of granola.

$$4\left(2\frac{1}{2} + b\right) = 24$$

$$10 + 4b = 24 \quad \leftarrow \text{Use the Distributive Property.}$$

$$4b = 14 \quad \leftarrow \text{Subtract 10 from both sides.}$$

$$b = 3\frac{1}{2} \quad \leftarrow \text{Divide both sides by 4.}$$

Each worker makes  $3\frac{1}{2}$  pounds of almond granola daily.



### Quick Check

1. What is the width of a rectangle with a length of 17 centimeters and a perimeter of 58 centimeters?

2. Solve these equations.

a.  $-4.5 = -3(b + 15)$

b.  $8\frac{1}{2}(c - 16) = 340$



 **Check Your Understanding**

**Solve each equation.**

4.  $9\left(\frac{1}{3} + r\right) = 12$   5.  $-2(t - 5) = 32$   6.  $6(n - 1) = 6$

7.  $\frac{1}{2}(b - 8) = 4$   8.  $4(w + 8) = 20$   9.  $3(x - 2) = 33$

You have time to begin working on your assignment, which is a 10 question worksheet, due tomorrow.

## Reteaching 2-6 Solving Equations Involving the Distributive Property

When you multiply a factor by a sum (or difference), the product is the same as multiplying the factor by each term and then adding (or subtracting) the products:

$$p(x + q) = px + pq$$

You can use the Distributive Property to solve equations.

Solve  $4(x - 7) = 12$ .

$$\begin{array}{l} 4(x) + 4(-7) = 12 \quad \leftarrow \text{Use the Distributive Property.} \\ 4x - 28 = 12 \quad \leftarrow \text{Simplify.} \\ 4x = 40 \quad \leftarrow \text{Add 28 to each side.} \\ x = 10 \quad \leftarrow \text{Divide each side by 4.} \end{array}$$

**Check**  $4(10) + 4(-7) = 40 + (-28)$   
 $4(10) + 4(-7) = 12$

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**Solve these equations.**

1.  $-4(3.1 + x) = -38$  \_\_\_\_\_

2.  $6(x - 7) = 30$  \_\_\_\_\_

3.  $\frac{1}{2}(x + 10) = 25$  \_\_\_\_\_

4.  $-\frac{3}{4}(4 - x) = -24$  \_\_\_\_\_

5.  $-9.7(x + (-4)) = 58.2$  \_\_\_\_\_

6.  $3(-6 + x) = 27$  \_\_\_\_\_

7.  $\frac{2}{3}(18 - x) = 8$  \_\_\_\_\_

8.  $8(x + 21) = 56$  \_\_\_\_\_

9.  $4(-7.6 - x) = -59.2$  \_\_\_\_\_

10.  $10(x + 9) = 120$  \_\_\_\_\_