



# Different Options for Solving One Equation

Let's think about which way is better when we solve equations with parentheses.

## 9.1

### Math Talk: Solve Each Equation

Solve each equation mentally.

- $100(x - 3) = 1,000$

- $500(x - 3) = 5,000$

- $0.03(x - 3) = 0.3$

- $0.72(x + 2) = 7.2$



## 9.2

## Analyzing Solution Methods

Three students each attempted to solve the equation  $2(x - 9) = 10$ , but they got different solutions. Here is their work. Do you agree with any of their methods? Explain or show your reasoning.

Noah's method:

$$\begin{array}{ll}
 2(x - 9) = 10 & \\
 2(x - 9) + 9 = 10 + 9 & \text{Add 9 to each side} \\
 2x = 19 & \\
 2x \div 2 = 19 \div 2 & \text{Divide each side by 2} \\
 x = \frac{19}{2} & 
 \end{array}$$

Elena's method:

$$\begin{array}{ll}
 2(x - 9) = 10 & \\
 2x - 18 = 10 & \text{Apply the distributive property} \\
 2x - 18 - 18 = 10 - 18 & \text{Subtract 18 from each side} \\
 2x = -8 & \\
 2x \div 2 = -8 \div 2 & \text{Divide each side by 2} \\
 x = -4 & 
 \end{array}$$

Andre's method:

$$\begin{array}{ll}
 2(x - 9) = 10 & \\
 2x - 18 = 10 & \text{Apply the distributive property} \\
 2x - 18 + 18 = 10 + 18 & \text{Add 18 to each side} \\
 2x = 28 & \\
 2x \div 2 = 28 \div 2 & \text{Divide each side by 2} \\
 x = 14 & 
 \end{array}$$



## 9.3

## Solution Pathways

1. Solve each of these equations twice, one time using each method.

a. applying the distributive property first:

$$2,000(x - 0.03) = 6,000$$

dividing each side first:

$$2,000(x - 0.03) = 6,000$$

b. applying the distributive property first:

$$2(x + 1.25) = 3.5$$

dividing each side first:

$$2(x + 1.25) = 3.5$$



2. Solve each of these equations once. Choose whichever method you think will be easier for that equation.

a.  $\frac{1}{4}(4 + x) = \frac{4}{3}$

b.  $-10(x - 1.7) = -3$

c.  $5.4 = 0.3(x + 8)$



## Lesson 9 Summary

Equations can be solved in many ways. In this lesson, we focused on equations with a specific structure, and two specific ways to solve them.

Suppose we are trying to solve the equation  $\frac{4}{5}(x + 27) = 16$ . Two useful approaches are:

- Divide each side by  $\frac{4}{5}$ .
- Apply the distributive property.

In order to decide which approach is better, we can look at the numbers and think about which would be easier to compute. We notice that  $\frac{4}{5} \cdot 27$  will be hard, because 27 isn't divisible by 5. So, distributing the  $\frac{4}{5}$  is not the best method. But  $16 \div \frac{4}{5}$  gives us  $16 \cdot \frac{5}{4}$ , and 16 is divisible by 4. So, dividing each side by  $\frac{4}{5}$  is a good choice.

$$\begin{aligned}\frac{4}{5}(x + 27) &= 16 \\ \frac{5}{4} \cdot \frac{4}{5}(x + 27) &= 16 \cdot \frac{5}{4} \\ x + 27 &= 20 \\ x &= -7\end{aligned}$$

Sometimes the calculations are simpler if we first use the distributive property. Let's look at the equation  $100(x + 0.06) = 21$ . If we first divide each side by 100, we get  $\frac{21}{100}$  or 0.21 on the right side of the equation. But if we use the distributive property first, we get an equation that only contains whole numbers.

$$\begin{aligned}100(x + 0.06) &= 21 \\ 100x + 6 &= 21 \\ 100x &= 15 \\ x &= \frac{15}{100}\end{aligned}$$