Different Options for Solving One Equation

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

10.1   Math Talk: Solve Each Equation

Solve each equation mentally.

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

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

- $0.03(x - 3) = 0.3$

- $0.72(x + 2) = 7.2$

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:

$$2(x - 9) = 10$$
$$2(x - 9) + 9 = 10 + 9 \qquad \text{Add 9 to each side}$$
$$2x = 19$$
$$2x \div 2 = 19 \div 2 \qquad \text{Divide each side by 2}$$
$$x = \frac{19}{2}$$

Elena's method:

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

Andre's method:

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

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

    a.   applying the distributive property first: dividing each side first:

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

    b.   applying the distributive property first: dividing each side first:

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

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 10 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.

$$\frac{4}{5}(x + 27) = 16$$
$$\frac{5}{4} \cdot \frac{4}{5}(x + 27) = 16 \cdot \frac{5}{4}$$
$$x + 27 = 20$$
$$x = \text{-}7$$

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.

$$100(x + 0.06) = 21$$
$$100x + 6 = 21$$
$$100x = 15$$
$$x = \frac{15}{100}$$