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.

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

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

- $0.03(x - 3) = 0.3$

- $0.72(x + 2) = 7.2$

10.2 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:

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

Elena's method:

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

Andre's method:

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

10.3 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 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.

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

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.

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