

6. Solve the linear equation $\frac{x+x+2}{4} = 189.5$. State the property that justifies your first step and why you chose it.

I chose to use the multiplication property of equality to get all terms with an x on one side of the equal sign.

$$\begin{aligned}\frac{x+x+2}{4} &= 189.5 \\ x+x+2 &= 4(189.5) \\ 2x+2 &= 758 \\ 2x+2-2 &= 758-2 \\ 2x &= 756 \\ \frac{2}{2}x &= \frac{756}{2} \\ x &= 378\end{aligned}$$

The left side of the equation is $\frac{378+378+2}{4} = \frac{758}{4} = 189.5$, which is equal to the right side of the equation.

Therefore, $x = 378$ is a solution to $\frac{x+x+2}{4} = 189.5$.

7. Alysha solved the linear equation $2x - 3 - 9x = 14 + x - 1$. Her work is shown below. When she checked her answer, the left side of the equation did not equal the right side. Find and explain Alysha's error, and then solve the equation correctly.

$$\begin{aligned}2x - 3 - 9x &= 14 + x - 1 \\ -6x - 3 &= 13 + 2x \\ -6x - 3 + 3 &= 13 + 3 + 2x \\ -6x &= 16 + 2x \\ -6x + 2x &= 16 \\ -4x &= 16 \\ \frac{-4}{-4}x &= \frac{16}{-4} \\ x &= -4\end{aligned}$$

Alysha made a mistake on the fifth line. She added $2x$ to the left side of the equal sign and subtracted $2x$ on the right side of the equal sign. To use the property correctly, she should have subtracted $2x$ on both sides of the equal sign, making the equation at that point.

$$\begin{aligned}-6x - 2x &= 16 + 2x - 2x \\ -8x &= 16 \\ \frac{-8}{-8}x &= \frac{16}{-8} \\ x &= -2\end{aligned}$$

For each problem, show your work and check that your solution is correct.

1. Solve the linear equation $x + 4 + 3x = 72$. State the property that justifies your first step and why you chose it.
2. Solve the linear equation $x + 3 + x - 8 + x = 55$. State the property that justifies your first step and why you chose it.
3. Solve the linear equation $\frac{1}{2}x + 10 = \frac{1}{4}x + 54$. State the property that justifies your first step and why you chose it.
4. Solve the linear equation $\frac{1}{4}x + 18 = x$. State the property that justifies your first step and why you chose it.
5. Solve the linear equation $17 - x = \frac{1}{3} \cdot 15 + 6$. State the property that justifies your first step and why you chose it.
6. Solve the linear equation $\frac{x+x+2}{4} = 189.5$. State the property that justifies your first step and why you chose it.

7. Alysha solved the linear equation $2x - 3 - 9x = 14 + x - 1$. Her work is shown below. When she checked her answer, the left side of the equation did not equal the right side. Find and explain Alysha's error, and then solve the equation correctly.

$$2x - 3 - 9x = 14 + x - 1$$

$$-6x - 3 = 13 + 2x$$

$$-6x - 3 + 3 = 13 + 3 + 2x$$

$$-6x = 16 + 2x$$

$$-6x + 2x = 16$$

$$-4x = 16$$

$$\frac{-4}{-4}x = \frac{16}{-4}$$

$$x = -4$$

Name _____

Date _____

Solving a Linear Equation

1. Guess a number for x that would make the equation true. Check your solution.

$$5x - 2 = 8$$

2. Use the properties of equality to solve the equation $7x - 4 + x = 12$. State which property justifies your first step and why you chose it. Check your solution.

3. Use the properties of equality to solve the equation $3x + 2 - x = 11x + 9$. State which property justifies your first step and why you chose it. Check your solution.

1. Guess a number for x that would make the equation true. Check your solution.

$$5x - 2 = 8$$

When $x = 2$, the left side of the equation is 8, which is the same as the right side. Therefore, $x = 2$ is the solution to the equation.

2. Use the properties of equality to solve the equation $7x - 4 + x = 12$. State which property justifies your first step and why you chose it. Check your solution.

I used the commutative and distributive properties on the left side of the equal sign to simplify the expression to fewer terms.

$$7x - 4 + x = 12$$

$$8x - 4 = 12$$

$$8x - 4 + 4 = 12 + 4$$

$$8x = 16$$

$$\frac{8}{8}x = \frac{16}{8}$$

$$x = 2$$

The left side of the equation is $7(2) - 4 + 2 = 14 - 4 + 2 = 12$. The right side is also 12. Since the left side equals the right side, $x = 2$ is the solution to the equation.

3. Use the properties of equality to solve the equation $3x + 2 - x = 11x + 9$. State which property justifies your first step and why you chose it. Check your solution.

I used the commutative and distributive properties on the left side of the equal sign to simplify the expression to fewer terms.

$$3x + 2 - x = 11x + 9$$

$$2x + 2 = 11x + 9$$

$$2x - 2x + 2 = 11x - 2x + 9$$

$$(2 - 2)x + 2 = (11 - 2)x + 9$$

$$2 = 9x + 9$$

$$2 - 9 = 9x + 9 - 9$$

$$-7 = 9x$$

$$\frac{-7}{9} = \frac{9}{9}x$$

$$-\frac{7}{9} = x$$

The left side of the equation is $3\left(-\frac{7}{9}\right) + 2 - \frac{-7}{9} = -\frac{21}{9} + \frac{18}{9} + \frac{7}{9} = \frac{4}{9}$. The right side is $11\left(-\frac{7}{9}\right) + 9 = \frac{-77}{9} + \frac{81}{9} = \frac{4}{9}$. Since the left side equals the right side, $x = -\frac{7}{9}$ is the solution to the equation.

Students solve equations using properties of equality.

For each problem, show your work and check that your solution is correct.

1. Solve the linear equation $x + 4 + 3x = 72$. State the property that justifies your first step and why you chose it.

I used the commutative and distributive properties on the left side of the equal sign to simplify the expression to fewer terms.

$$\begin{aligned}x + 4 + 3x &= 72 \\4x + 4 &= 72 \\4x + 4 - 4 &= 72 - 4 \\4x &= 68 \\\frac{4}{4}x &= \frac{68}{4} \\x &= 17\end{aligned}$$

The left side is equal to $17 + 4 + 3(17) = 21 + 51 = 72$, which is equal to the right side. Therefore, $x = 17$ is a solution to the equation $x + 4 + 3x = 72$.

2. Solve the linear equation $x + 3 + x - 8 + x = 55$. State the property that justifies your first step and why you chose it.

I used the commutative and distributive properties on the left side of the equal sign to simplify the expression to fewer terms.

$$\begin{aligned}x + 3 + x - 8 + x &= 55 \\3x - 5 &= 55 \\3x - 5 + 5 &= 55 + 5 \\3x &= 60 \\\frac{3}{3}x &= \frac{60}{3} \\x &= 20\end{aligned}$$

The left side is equal to $20 + 3 + 20 - 8 + 20 = 43 - 8 + 20 = 35 + 20 = 55$, which is equal to the right side. Therefore, $x = 20$ is a solution to $x + 3 + x - 8 + x = 55$.

3. Solve the linear equation $\frac{1}{2}x + 10 = \frac{1}{4}x + 54$. State the property that justifies your first step and why you chose it.

I chose to use the subtraction property of equality to get all of the constants on one side of the equal sign.

$$\begin{aligned}\frac{1}{2}x + 10 &= \frac{1}{4}x + 54 \\ \frac{1}{2}x + 10 - 10 &= \frac{1}{4}x + 54 - 10 \\ \frac{1}{2}x &= \frac{1}{4}x + 44 \\ \frac{1}{2}x - \frac{1}{4}x &= \frac{1}{4}x - \frac{1}{4}x + 44 \\ \frac{1}{4}x &= 44 \\ 4 \cdot \frac{1}{4}x &= 4 \cdot 44 \\ x &= 176\end{aligned}$$

The left side of the equation is $\frac{1}{2}(176) + 10 = 88 + 10 = 98$. The right side of the equation is $\frac{1}{4}(176) + 54 = 44 + 54 = 98$. Since both sides equal 98, $x = 176$ is a solution to the equation $\frac{1}{2}x + 10 = \frac{1}{4}x + 54$.

4. Solve the linear equation $\frac{1}{4}x + 18 = x$. State the property that justifies your first step and why you chose it.

I chose to use the subtraction property of equality to get all terms with an x on one side of the equal sign.

$$\begin{aligned}\frac{1}{4}x + 18 &= x \\ \frac{1}{4}x - \frac{1}{4}x + 18 &= x - \frac{1}{4}x \\ 18 &= \frac{3}{4}x \\ \frac{4}{3} \cdot 18 &= \frac{4}{3} \cdot \frac{3}{4}x \\ 24 &= x\end{aligned}$$

The left side of the equation is $\frac{1}{4}(24) + 18 = 6 + 18 = 24$, which is what the right side is equal to. Therefore, $x = 24$ is a solution to $\frac{1}{4}x + 18 = x$.

5. Solve the linear equation $17 - x = \frac{1}{3} \cdot 15 + 6$. State the property that justifies your first step and why you chose it.

The right side of the equation can be simplified to 11. Then the equation is

$$17 - x = 11,$$

and $x = 6$. Both sides of the equation equal 11; therefore, $x = 6$ is a solution to the equation $17 - x = \frac{1}{3} \cdot 15 + 6$. I was able to solve the equation mentally without using the properties of equality.