

Name _____

Date _____

Linear Equations in x

1. Is 8 a solution to $\frac{1}{2}x + 9 = 13$? Explain.
2. Write three different equations that have $x = 5$ as a solution.
3. Is -3 a solution to the equation $3x - 5 = 4 + 2x$? Explain.

1. Given that $2x + 7 = 27$ and $3x + 1 = 28$, does $2x + 7 = 3x + 1$? Explain.
2. Is -5 a solution to the equation $6x + 5 = 5x + 8 + 2x$? Explain.
3. Does $x = 1.6$ satisfy the equation $6 - 4x = -\frac{x}{4}$? Explain.
4. Use the linear equation $3(x + 1) = 3x + 3$ to answer parts (a)–(d).
 - a. Does $x = 5$ satisfy the equation above? Explain.
 - b. Is $x = -8$ a solution of the equation above? Explain.
 - c. Is $x = \frac{1}{2}$ a solution of the equation above? Explain.
 - d. What interesting fact about the equation $3(x + 1) = 3x + 3$ is illuminated by the answers to parts (a), (b), and (c)? Why do you think this is true?

1. Is 8 a solution to $\frac{1}{2}x + 9 = 13$? Explain.

If we replace x with the number 8, then the left side is $\frac{1}{2}(8) + 9 = 4 + 9 = 13$, and the right side is 13. Since $13 = 13$, then $x = 8$ is a solution.

2. Write three different equations that have $x = 5$ as a solution.

Answers will vary. Accept equations where $x = 5$ makes a true number sentence.

3. Is -3 a solution to the equation $3x - 5 = 4 + 2x$? Explain.

If we replace x with the number -3 , then the left side is $3(-3) - 5 = -9 - 5 = -14$. The right side is $4 + 2(-3) = 4 - 6 = -2$. Since $-14 \neq -2$, then -3 is not a solution of the equation.

Students practice determining whether or not a given number is a solution to the linear equation.

1. Given that $2x + 7 = 27$ and $3x + 1 = 28$, does $2x + 7 = 3x + 1$? Explain.

No, because a linear equation is a statement about equality. We are given that $2x + 7 = 27$, but $3x + 1 = 28$. Since each linear expression is equal to a different number, $2x + 7 \neq 3x + 1$.

2. Is -5 a solution to the equation $6x + 5 = 5x + 8 + 2x$? Explain.

If we replace x with the number -5 , then the left side of the equation is

$$\begin{aligned} 6 \cdot (-5) + 5 &= -30 + 5 \\ &= -25, \end{aligned}$$

and the right side of the equation is

$$\begin{aligned} 5 \cdot (-5) + 8 + 2 \cdot (-5) &= -25 + 8 - 10 \\ &= -17 - 10 \\ &= -27. \end{aligned}$$

Since $-25 \neq -27$, then -5 is not a solution of the equation $6x + 5 = 5x + 8 + 2x$.

Note: Some students may have transformed the equation.

3. Does $x = 1.6$ satisfy the equation $6 - 4x = -\frac{x}{4}$? Explain.

If we replace x with the number 1.6, then the left side of the equation is

$$\begin{aligned} 6 - 4 \cdot 1.6 &= 6 - 6.4 \\ &= -0.4, \end{aligned}$$

and the right side of the equation is

$$-\frac{1.6}{4} = -0.4.$$

Since $-0.4 = -0.4$, then $x = 1.6$ is a solution of the equation $6 - 4x = -\frac{x}{4}$.

4. Use the linear equation $3(x + 1) = 3x + 3$ to answer parts (a)–(d).

a. Does $x = 5$ satisfy the equation above? Explain.

If we replace x with the number 5, then the left side of the equation is

$$\begin{aligned} 3(5 + 1) &= 3(6) \\ &= 18, \end{aligned}$$

and the right side of the equation is

$$\begin{aligned} 3x + 3 &= 3 \cdot 5 + 3 \\ &= 15 + 3 \\ &= 18. \end{aligned}$$

Since $18 = 18$, then $x = 5$ is a solution of the equation $3(x + 1) = 3x + 3$.

b. Is $x = -8$ a solution of the equation above? Explain.

If we replace x with the number -8 , then the left side of the equation is

$$\begin{aligned} 3(-8 + 1) &= 3(-7) \\ &= -21, \end{aligned}$$

and the right side of the equation is

$$\begin{aligned} 3x + 3 &= 3 \cdot (-8) + 3 \\ &= -24 + 3 \\ &= -21. \end{aligned}$$

Since $-21 = -21$, then $x = -8$ is a solution of the equation $3(x + 1) = 3x + 3$.

c. Is $x = \frac{1}{2}$ a solution of the equation above? Explain.

If we replace x with the number $\frac{1}{2}$, then the left side of the equation is

$$\begin{aligned} 3\left(\frac{1}{2} + 1\right) &= 3\left(\frac{1}{2} + \frac{2}{2}\right) \\ &= 3\left(\frac{3}{2}\right) \\ &= \frac{9}{2}, \end{aligned}$$

and the right side of the equation is

$$\begin{aligned} 3x + 3 &= 3 \cdot \left(\frac{1}{2}\right) + 3 \\ &= \frac{3}{2} + 3 \\ &= \frac{3}{2} + \frac{6}{2} \\ &= \frac{9}{2}. \end{aligned}$$

Since $\frac{9}{2} = \frac{9}{2}$, then $x = \frac{1}{2}$ is a solution of the equation $3(x + 1) = 3x + 3$.

d. What interesting fact about the equation $3(x + 1) = 3x + 3$ is illuminated by the answers to parts (a), (b), and (c)? Why do you think this is true?

Note to teacher: Ideally, students will notice that the equation $3(x + 1) = 3x + 3$ is an identity under the distributive law. The purpose of this problem is to prepare students for the idea that linear equations can have more than one solution, which is a topic of Lesson 7.