Focus Standard: 8.EE.C.7   Solve linear equations in one variable.

        a.   Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ result (where a and b are different numbers).

        b.   Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Student Outcomes

- Students know that a linear equation is a statement of equality between two expressions.
- Students know that a linear equation in x is actually a question: Can you find all numbers x, if they exist, that satisfy a given equation? Students know that those numbers x that satisfy a given equation are called *solutions*.

Exercises

1. Is the equation a true statement when $x = -3$; in other words, is -3 a solution to the equation $6x + 5 = 5x + 8 + 2x$? Explain.

2. Does $x = 12$ satisfy the equation $16 - \frac{1}{2}x = \frac{3}{4}x + 1$? Explain.

3. Chad solved the equation $24x + 4 + 2x = 3(10x - 1)$ and is claiming that $x = 2$ makes the equation true. Is Chad correct? Explain.

4. Lisa solved the equation $x + 6 = 8 + 7x$ and claimed that the solution is $x = -\frac{1}{3}$. Is she correct? Explain.

5. Angel transformed the following equation from $6x + 4 - x = 2(x + 1)$ to $10 = 2(x + 1)$. He then stated that the solution to the equation is $x = 4$. Is he correct? Explain.

6. Claire was able to verify that $x = 3$ was a solution to her teacher's linear equation, but the equation got erased from the board. What might the equation have been? Identify as many equations as you can with a solution of $x = 3$.

7. Does an equation always have a solution? Could you come up with an equation that does not have a solution?

Problem Set

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?