Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Solving Linear Equations**

**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* results (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.

**A. Solving Equations:**

1. An equation states two \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are equal.

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are operations that undo each other.

3. Examples:

|  |
| --- |
| **One-step equations** – use inverse operations to isolate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. x = a |
| a. x + 14 = 9 solution is: x = \_\_\_\_\_ | b. -5x = 45 solution is: x = \_\_\_\_\_ |
| c. $\frac{x}{4}$ = -3 solution is: x = \_\_\_\_\_ | d. x – 8 = - 19 solution is: x = \_\_\_\_\_ |
| **Fractions** – to get rid of a fraction multiply by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ x = a |
| e. $\frac{1}{4}y$ = 12 solution is: x = \_\_\_\_\_  | f. -$\frac{3}{4}y$ = -8 solution is: x = \_\_\_\_\_  |
| g. $ -\frac{1}{3}k$ = 9 solution is: x = \_\_\_\_\_ | h. $-\frac{2}{3}p$ = -12 solution is: x = \_\_\_\_\_1. |
| **Two-step equations** – 1st undo the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_x = a 2nd undo the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| i. 3x + 10 = 25 solution is: x = \_\_\_\_\_ | j. 4x + 8 = -28 solution is: x = \_\_\_\_\_ |
| k. 6x – 12 = 36 solution is: x = \_\_\_\_\_ | l. -90 = 5m + 15 solution is: x = \_\_\_\_\_ |
| **Multi-step** **Equations**– 1st \_\_\_\_\_\_\_\_\_\_\_\_\_each expression (each side of the equal sign) if necessary by using the distributive property2nd Isolate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to one side of the equation3rd Isolate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to the other side of the equation 4th \_\_\_\_\_\_\_\_\_\_\_\_ for the variable |
| m. 4x + 7 = -3x + 14 x = \_\_\_\_\_\_ | n. 3y + 4 + 2y = 10 – 4y + 12 y = \_\_\_\_\_\_ |
| o. 4p + 6 + 3yp = 15 – 5p + 3 p = \_\_\_\_\_\_ | p. -5(3k – 2) = -3k + 4 k = \_\_\_\_\_\_ |
| q. -2(4x – 3) = -3(x + 3) – 2x x = \_\_\_\_\_ | r. $\frac{1}{2}$(2n – 12) = 4n x = \_\_\_\_\_\_2. |
| **Equations with infinite solutions:** a = a |
| s. 7x – 3 = -3 + 7x | t. 11x – 2x + 15 = 8 + 9x + 7 |
| u. 3(6c + 8) = 24 + 18c | v. $\frac{1}{2}$(8x + 26) = 13 + 4x  |
| **What do you notice about linear equations with infinite solutions?** |
| **Equations with no solution:** a = b |
| w. 7x – 3 = 7x + 5 | x. -3g + 32 – 7g = -2(5g + 10) |
| y. 5(3x + 4) – 2x = 7x – 3(-2x + 11) | z. 18x + $\frac{1}{2}$ = 6(3x + 25) |
| **What do you notice about linear equations with no solution?**3. |

**4. Error Analysis – Solving Equations**

Caden solved the following equations but was having some trouble. In each of the following problems, Caden made a mistake. See if you can help Caden fix his mistakes. Examine the problem. When you find the mistake, circle it. Then, in the space provided, explain why it is a mistake, and solve the equation correctly.

|  |  |  |
| --- | --- | --- |
| Caden’s Work | Explain: What mistake did he make? | Corrected Solution |
| a. 3x + 2x – 6 = 24 -2x -2x x – 6 = 24 + 6 + 6 x = 30 |  | 3x + 2x – 6 = 24 |
| b. -2x + 4 = 12 -4 -4 -2x 8  2 2 x = 4 |  | -2x + 4 = 12 |
| c. 4x – 3 = 17 +3 +3 4x = 20 -4 -4 x = 16 |  | 4x – 3 = 17 |
| d. 3(2x – 4) = 8 6x – 1 = 8 +1 +1 6x = 9  6 6 x = 3/2 |  | 3(2x – 4) = 8 |

4.

**Equation Application:**

a. The sum of three consecutive integers is 1, 623. Write and solve an equation to find the value of x. Then determine the three numbers.

b. Ethan bought two books. One book costs $4.00 more than three times the other. Together, the two books cost him $72. Write and solve an equation to find the value of x. Then find the cost of the books.

c. The two rectangles shown below have the same perimeter. Write and solve an equation to find the value of x. Then find the measures of the length and width of Rectangle B. All measurements are in inches.

Rectangle A Rectangle B

4x - 3

5

x

7

d. Emma is three years older than her sister Madison. Emma’s brother is eight years younger than their sister Madison. The sum of their ages is 55 years. Write and solve an equation to find the value of x. Then determine how old each sibling is.

s. 6p = 0.6(5p + 15) x = \_\_\_\_\_\_

t. 3x – 5 = $\frac{1}{2}$x + 2x x = \_\_\_\_\_\_

c. One fifth of a number plus three times the number is equal to twice the number plus 42. What is the number?

c. The square and the equilateral triangle shown have the same perimeter. Write and solve an equation to solve for x. What is the value of x?

 equation:

3x - 1

x + 3