Brockton High School
Content: Math I
Week of: May 25 to May 29, 2020

Greetings Math I Students! We hope you are safe and well with your families! This assignment is for this week, use your time wisely. You do not have to complete this in one sitting. Here is the lesson plan for this week:

Goals for This Week
Learning Objectives: Students will be able to: 1. Write equivalent equations using Properties of Equality. 2. Use Properties of Equality to solve linear equations and justify a solution method. 3. Determine whether an equation has one solution, no solution, or infinite solutions. 4. Solve linear equations with variables on both sides. *(Standards A-CED.1, A-REI.1, A-REI.3)*
Literacy Objectives: Students will be able to: 1. Explain the logic of an argument or solution. 2. Read, break down, and solve a word problem. 3. To detect the fallacy in an argument or proof. 4. Create, interpret and explain a table, chart or graph. *(https://www.bpsma.org/schools/brockton-high-school/about-us/mission-literacy-charts)*
Standards for Mathematical Practice: Students should always look to develop the following habits of mind when working on mathematics: • Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics. • Use appropriate tools strategically. • Attend to precision. • Look for and make use of structure. • Look for and express regularity in repeated reasoning.

Carnegie Learning (use with Carnegie Resources provided below)
(Log-in through Clever – see below)

Instructional Video Links: Please watch the video below to help guide you.

- Solving Linear Equations 1
- Solving Linear Equations 2
- Solving Linear Equations 3

Printable Resources:
Please see the attached lesson document "Strike a Balance – Solving Linear Equations"
(starting on page M2-97)

Practice Activities:
On-Line:
All students now have access to an on-line learning program called Carnegie Learning/Mathia!

- If you are new to Mathia: Please see the log-in information below
- If you can get online, please complete the lessons below from IM 1 Module 3: Exploring Linear Functions:
    5. Linear Inequalities,
    6. Systems of Linear Equations,
    7. Linear Inequalities in Two Variables,
    8. Distances in the Coordinate Plane

No Internet Access:
Please see information on printable resources.

Key Terms:

- **solution** – it is the value of the variable that makes the equation a true statement
- **no solution** – when there is no value for a variable that makes the equation a true statement
- **infinite solutions** – when any value of a variable makes the equation a true statement.

Extension Activities:
See *Stretch* on page 13 of the document (M2-107).
Consider the equation $2x - 5(x - 1) = 50$.

a. Solve the equation for x.
b. Chen was asked to solve the inequality: $2x - 5(x - 1) < 50$. She gave an answer of $x < -15$. Substitute in any value for x less than –15 to determine if Chen is correct. If not, determine the correct solution.

Log-in Information

1. Log-in to Clever
2. Click on the Carnegie Learning logo

Additional Support

Email:
Please email your math teacher with specific questions.

Office Hours:
For a list of office hours for all BHS Math teachers, please click here. Your teacher is available to help you during their scheduled office hours.

1

Strike a Balance

Solving Linear Equations

Warm Up

Solve each equation for x.

1. $\frac{1}{3}x = 8$

2. $5 + x = 12.7$

3. $2x - 9 = 6$

4. $12 + 2x = 3x - 1$

Learning Goals

- Write equivalent equations using Properties of Equality.
- Use Properties of Equality to solve linear equations and justify a solution method.
- Determine whether an equation has one solution, no solution, or infinite solutions.
- Solve linear equations with variables on both sides.

Key Terms

- solution
- no solution
- infinite solutions

You know that equations are one way to represent a linear function, and you have used equations to evaluate linear functions for a given input value. How can you use equations to solve for unknown input values of a function?

Equation Creation

An equation is a mathematical sentence that uses an equals sign to show that two expressions are equivalent. When one of those expressions contains a variable, you can solve the equation.

A **solution** to an equation is a value for the variable that makes the equation a true statement.

Consider the equation $x = 2$. You can substitute the value 2 for x to create the true statement $2 = 2$. Because this is the only value that makes the statement true, 2 is the only solution to the equation $x = 2$.

By performing the same operation on each side of an equation, you can create more complex equations that have the same solution.

1. Consider the equation $x = 2$.

a. Choose any constant. Add that constant to each side of the equation and simplify.

b. Choose any constant other than 0. Multiply each side of the equation you created in part (a) by that constant and simplify.

c. Choose any number other than 0 to represent a in the expression ax. Subtract the term ax from each side of the equation you created in part (b) and simplify.

d. Choose any constant other than 0. Divide each side of the equation you created in part (c) by that constant and simplify.

2. Have a partner solve the equation you created in Question 1 to verify that $x = 2$ is the solution.

What strategies can you use to verify a solution?

ACTIVITY
1.1 Using Properties to Justify Solutions

Recall that the Properties of Equality are rules that allow you to maintain balance and rewrite equations to isolate the variable.

Properties of Equality	For all numbers ***a***, ***b***, and ***c***
Addition Property of Equality	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	If $a = b$, then $ac = bc$.
Division Property of Equality	If $a = b$ and $c \neq 0$, then $\frac{a}{c} = \frac{b}{c}$.

Sara and Ethan both created new equations starting from the solution statement $x = 2$.

Sara

$-3x + 14 = 18 - 5x$

Ethan

$2x = 5 - \frac{1}{2}x$

1. Verify that both equations are equivalent to $x = 2$ using the given strategy.

a. substitution

b. Properties of Equality

There are also basic number properties that you are already familiar with that can be used to justify your steps when solving equations.

Number Properties	For all numbers a, b, and c
Commutative Property	$a + b = b + a$ $ab = ba$
Associative Property	$a + (b + c) = (a + b) + c$ $a(bc) = (ab)c$
Distributive Property	$a(b + c) = ab + ac$

2. Solve each equation and check your solution. Write the properties that justify each step of your solving strategy.

a. $24x + 7 = -4x$

b. $3(2x + 1) = 4x + 6$

c. $\frac{1}{2}x - 6 = 2 + (2x + 1)$

3. Compare the solution strategies used by Kaleigh and Destiny. What do you notice about the properties each student used?

Kaleigh

$$4(3x + 2) = 8x + 4$$
$$12x + 8 = 8x + 4$$
$$4x = -4$$
$$x = -1$$

Destiny

$$4(3x + 2) = 8x + 4$$
$$\frac{4(3x + 2)}{4} = \frac{8x + 4}{4}$$
$$3x + 2 = 2x + 1$$
$$x = -1$$

ACTIVITY
1.2

Solutions to Linear Equations

In the Getting Started, you built equations from $x = 2$. In this activity, you will build equations from two mathematical sentences and compare your results.

1. **Consider the mathematical sentence 2 = 2.**
   Is there any variable or constant that you could add, subtract, multiply, or divide to both sides using the Properties of Equality to make this true sentence false? Choose variables and constants to create new mathematical sentences to justify your conclusion.

2. **Consider the mathematical sentence 2 = 3.**
   Is there any variable or constant that you could add, subtract, multiply, or divide to both sides using the Properties of Equality to make this false sentence true? Choose variables and constants to create new mathematical sentences to justify your conclusion.

A linear equation can have *one solution*, *no solution*, or *infinite solutions*. The equations you solved in the previous activity are examples of linear equations with one solution. A linear equation with **no solution** means that there is no value for the variable that makes the equation true. A linear equation with **infinite solutions** means that any value for the variable makes the equation true.

3. Consider the equations you created in this activity.

a. Explain whether the equation(s) you created in Question 1 have one solution, no solution, or infinite solutions.

b. Explain whether the equation(s) you created in Question 2 have one solution, no solution, or infinite solutions.

4. Consider the equation $2x = 3x$. Does this equation have one solution, no solution, or infinite solutions? Explain your reasoning.

ACTIVITY
1.3 Tic-Tac-Bingo

In this activity, you are going to play a game called Tic-Tac-Bingo. The object of the game is to match two expressions to create an equation with specific solution types. Use the Tic-Tac-Bingo sheet located at the end of the lesson.

Prepare the board.

The board has 9 spaces. Three spaces are already designated. Fill each remaining space with one of the solution types listed. Each option must be used at least once.

Solution Types
- positive rational solution
- negative rational solution
- non-zero integer solution

Play the game.

Your teacher will assign you an expression. When you and a classmate have created an equation with one of the solution types, write your equation in the corresponding box.

Try to be the first person to fill three spaces in a row. Then, try to be the first person to completely fill your board with equations.

1. Reflect on the equations you created.

a. How can you look at an equation and determine that it has no solution?

b. How can you look at an equation and determine that it has infinite solutions?

NOTES

TALK the TALK

One Step at a Time

1. Write the property that justifies each step to solve the given equation.

$-\frac{1}{3}(6x - 21) = -5(x + 1)$

$-2x + 7 = -5x - 5$ _____

$-2x + 5x + 7 = -5x + 5x - 5$ _____

$3x + 7 - 7 = -5 - 7$ _____

$\frac{3x}{3} = \frac{-12}{3}$ _____

$x = -4$

2. Solve the equation using the justification given for each step.

$5x + 7 = \frac{(-15x - 1)}{3} + \frac{4}{3}$

_____ Multiplication Property of Equality

_____ Distributive Property

_____ Associative Property

_____ Subtraction Property of Equality

_____ Addition Property of Equality

_____ Division Property of Equality

$x = -\frac{3}{5}$

Tic-Tac-Bingo Board

Equation: Solution:	**Solution is neither positive or negative** Equation: Solution:	Equation: Solution:
No solution Equation: Solution:	**FREE SPACE**	Equation: Solution:
Equation: Solution:	Equation: Solution:	**Infinite solutions** Equation: Solution:

Assignment

Write

Explain how you know when an equation has no solution and when it has infinite solutions.

Remember

To solve an equation, use the Properties of Equality to isolate the variable. A linear equation can have one solution, no solution, or infinite solutions.

Practice

1. Solve each equation. Write the properties that justify each step in the solution method.
   a. $3x - 8 = -7x + 18$
   b. $-2(4 - x) = 12x - 3$
   c. $\frac{1}{2}(-10x + 4) = -4(-3 + 2x) + 8$
   d. $\frac{(-2x - 4)}{5} + \frac{8}{5} = 3(x - 1)$
   e. $\frac{4}{3}x - 2\left(9 - \frac{1}{3}x\right) = -\frac{7}{3}x + 9$
2. Determine whether each equation has one solution, no solution, or infinite solutions. Explain your reasoning.
   a. $-2(x + 5) = -6x + 4(x - 2)$
   b. $4(0.2x - 1.2) = -0.5x + 3.4$
   c. $\frac{\left(\frac{1}{2}x - 7\right)}{2} = -3x + 4$
   d. $2(x - 4) + x = 3(x - 2) - 2$
   e. $3 - \frac{2}{5}x - \frac{12}{5} = \frac{10 - 2x}{5}$
   f. $6(x - 1) + 21 = 6x + 15$

Stretch

Consider the equation $2x - 5(x - 1) = 50$.

a. Solve the equation for x.
b. Chen was asked to solve the inequality: $2x - 5(x - 1) < 50$. She gave an answer of $x < -15$. Substitute in any value for x less than -15 to determine if Chen is correct. If not, determine the correct solution.

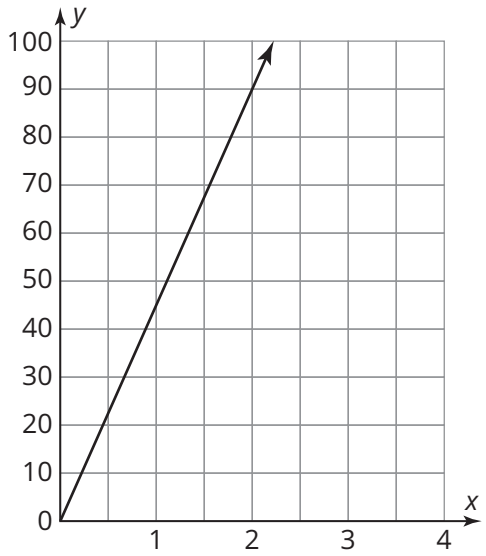
Review

1. Determine whether the table of values represents a linear function. If it does represent a linear function, write the function. If it does not represent a linear function, explain why.

x	$f(x)$
−2	4
−1	1
0	0
1	1

2. Nelson grows tomatoes and sells them at a nearby farmer's roadside stand. He sells them for $2.50 each. The farmer charges him $15 a day to use the stand. Write a linear function in factored form and general form that represents the amount of money, M, Nelson will make from selling x tomatoes.
3. Clean Green Landscapers uses a graph to show what they charge, and Sunshine Landscaper lists what they charge in a table.

Clean Green Landscapers



Sunshine Landscaper

0.5	$25
1	$50
1.5	$75
2	$100
2.5	$125

   a. Each representation shows a functional relationship between quantities. Label the quantities and their units in the table and on the graph.
   b. Let $C(x)$ represent the function for Clean Green Landscapers, and let $S(x)$ represent the function for Sunshine Landscapers. Which function has a steeper slope? Explain how you know.

4. Evaluate the function $f(x) = 0.4x^2 - 3x - 8$ for the value $x = -2$.
5. The cost to install x number of central air conditioning units for a company is given by the function $C(x) = \frac{4000x + 1300}{3}$. Use the function to determine the cost to install 45 air conditioners.