Solving Linear Equations Using Functions

Strand: Functions

Topic: Solving multistep linear equations by finding the zeros of a related function.

Primary SOL: A.7 The student will investigate and analyze linear and quadratic function families and their characteristics both algebraically and graphically, including
c) zeros;
d) intercepts;

Related SOL: A.4a, A.6c

Materials

- Computers with internet access
- Solving Linear Equations Graphically activity sheet (attached)
- Graphing calculators

Vocabulary

expression, function, intercepts, linear equation, slope, solution, zero

Student/Teacher Actions: What should students be doing? What should teachers be doing?

Note: *Before using this activity, the teacher will need to use the link provided below to visit Desmos, set up an account, familiarize himself/herself with the activity, and create a class code. This class code will allow the teacher to see each student's progress from a desktop computer as they work through the activity.*

(https://teacher.desmos.com/activitybuilder/custom/59d677b6c95c18350b897a0b)

1. Students should each have a computer with internet access on the day this activity is used.
2. Teachers will distribute the Solving Linear Equations Graphically activity sheet and have students visit the website https://student.desmos.com/, where they will enter the class code shared by the teacher.
3. The students will progress through the eight slides provided. *(Note: As a teacher, you can monitor their progress on a desktop, or laptop, computer and see who might need your help.)*
4. Students should be recording all work that is requested on the activity sheet.
5. The final practice problem has no solution, so the students will witness that the related function, a horizontal line, has no x-intercept.

Assessment

- **Questions**
  - Solve $7x + 19 = -2x + 55$ algebraically. Then, solve the equation graphically to check your solution. Were your results the same? Why, or why not?

- Consider the following algebraic solution. Look at the graph of a related function to verify that this solution is incorrect. Find and correct any error.

$$-4(3 - n) = 8(4n - 3)$$
$$-12 - n = 32n - 3$$
$$-9 = 33n$$
$$\frac{-9}{33} = n$$
$$\frac{-3}{11} = n$$

- **Journal/Writing Prompts**
  - Your teacher gave you the equation $3x + 1 = 4x - 3$ and asked you to solve by looking at the graph of a related function. Explain what she means by a "related function" and how that graph can help you solve the given linear equation.
  - In the Desmos activity, we discovered that an equation with no solution has a related function whose graph is a horizontal line that never touches the x-axis. How would the graph of a function related to an equation whose solution set is the set of all real numbers look? Explain your reasoning.
- **Other**
  - Have students work with partners. One student should solve a given equation algebraically while the other solves graphically. Then, compare solutions and change roles.

Extensions and Connections (for all students)

- Follow this activity with instruction aimed at using a graphing calculator to determine the zero of a related function.
- Have students apply a similar strategy to solving quadratic equations graphically.

Strategies for Differentiation

- Project the activity using a demonstration tool (e.g., document camera, digital display) to allow for a more guided learning environment.
- Provide an abbreviated format of the Desmos activity.
- Print the slides of the Desmos activity for students.
- Read questions aloud on each slide.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Solving Linear Equations Graphically

Name _____ **Date** _____

As you work through this activity in Desmos, please show any work requested on this sheet.

Screen 1: Interpreting Solutions
$3x - 12 = 0$
Screen 4: Try It Out
$5x + 1 = 3x + 7$
Screen 5: On Your Own …
a.) $-3x - 5 = 2x + 5$ b.)

Screen 7: Practice	
1. a.) $3x + 7 = -2$	b.)
2. a.) $-x = 4x - 5$	b.)
3. a.) $9x - 1 = 7x + 3$	b.)
4. a.) $5x + 3 = 3(x - 2) + 7$	b.)
5. a.) $2(x + 1) + x = 3x + 4$	b.)