Mathematics Instructional Plan – Algebra I

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.

(http://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 errors.

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

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

<table>
<thead>
<tr>
<th>Screen 1: Interpreting Solutions</th>
</tr>
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<tbody>
<tr>
<td>$3x - 12 = 0$</td>
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<table>
<thead>
<tr>
<th>Screen 4: Try It Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5x + 1 = 3x + 7$</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Screen 5: On Your Own ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.) $-3x - 5 = 2x + 5$</td>
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<tr>
<td>b.)</td>
</tr>
</tbody>
</table>
### Screen 7: Practice

<p>| | |</p>
<table>
<thead>
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</table>
| 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.)   |