Intersecting the Solution

TEACHER NOTES

About the Lesson

In this activity, students will learn to solve systems of equations graphically. They will learn the relationship between the algebraic and graphical solutions and create equations that draw upon this connection. As a result, students will:

- Solve systems of equations.
- Use graphs to determine the solution to a system of equations.

Vocabulary

- system of equations

Teacher Preparation and Notes

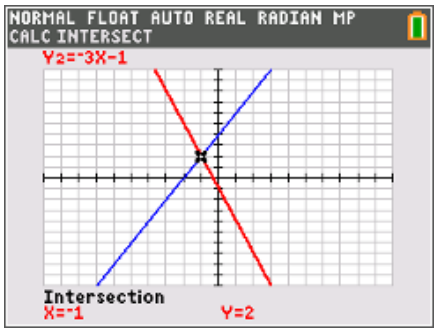
- Problem 2 should be completed in pairs so students can gain additional practice with algebraic techniques.
- Students should know how to solve systems of equations using the substitution method before beginning this activity. Students' knowledge of elimination is helpful, but not necessary.
- The teacher should follow up each part of the activity with the discussion questions in the document for deeper student understanding. However, if the teacher wants the activity to be student centered, add the discussion questions to the student worksheet.

Activity Materials

- Compatible TI Technologies:

  TI-84 Plus*
  TI-84 Plus Silver Edition*
  TI-84 Plus C Silver Edition
  TI-84 Plus CE

***** *with the latest operating system (2.55MP) featuring MathPrint™ functionality.*



Tech Tips:

- This activity includes screen captures taken from the TI-84 Plus CE. It is also appropriate for use with the rest of the TI-84 Plus family. Slight variations to these directions may be required if using other calculator models.
- Watch for additional Tech Tips throughout the activity for the specific technology you are using.
- Access free tutorials at http://education.ti.com/calculators/pd/US/Online-Learning/Tutorials
- Any required calculator files can be distributed to students via handheld-to-handheld transfer.

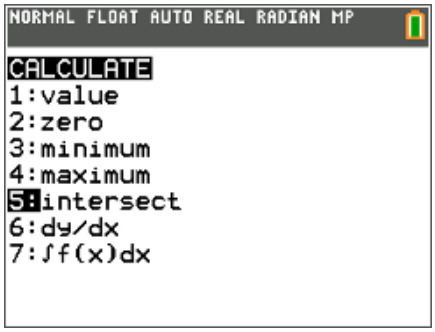
Lesson Files:

- Intersecting_the_Solution_Student.pdf
- Intersecting_the_Solution_Student.doc

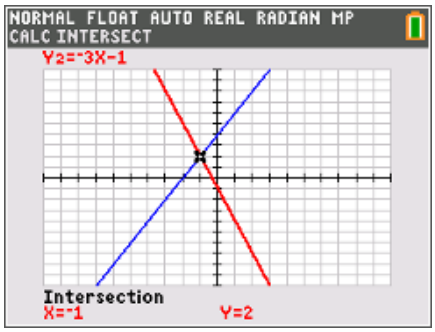
Tech Tip: If your students are using the TI-84 Plus CE have them turn on the GridLine by pressing 2nd zoom to change the [format] settings. If your students are using TI-84 Plus, they could use GridDot.

Problem 1 – Solving Graphically

In this problem, students will solve a system of linear equations algebraically, using substitution, and graphically through use of the calculator. They will see the relationship between the algebraic solution and the graphical solution.



They should discover from solving the system algebraically that the values of x and y are the point of intersection (x, y) when the two lines in the system are graphed.



Teacher Tip: Ask students, *How does the algebraic solution relate to the graph of the two lines?*

1. Solve the following system of equations using an algebraic method, substitution, or elimination.

$y = 2x + 4$

$y = -3x - 1$

Show your work and record your solution below:

Answers:

$2x + 4 = -3x - 1$ $\qquad$ $y = 2x + 4$

$5x = -5$ $\qquad$ $y = 2(-1) + 4$

$x = -1$ $\qquad$ $y = 2$

Solution: $x =$ _____; $y =$ _____

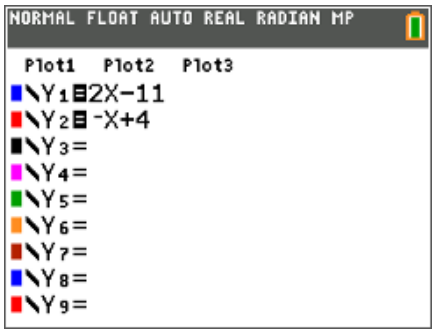
Answers: –1; 2

2. How is the point of intersection related to the algebraic solution of a system of equations?

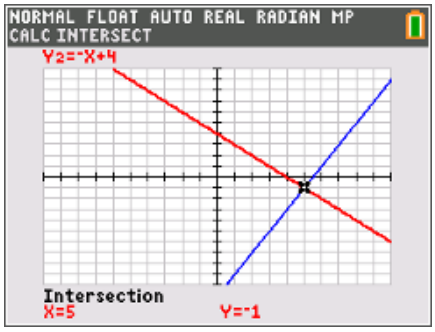
Sample Answer: The point where the lines meet is the same as the algebraic solution.

Problem 2 – Creating a System of Equations

In this problem, students are given two lines and an intersection point. Students will use the sliders to adjust the lines so the solution is the given intersection point. This activity should reinforce the connection of the intersection point as the graphical form of the algebraic solution.



Encourage students to find more than one system of equations that has the solution of (5, –1).



Teacher Tip: Ask students the following questions:

- *Did anyone find two lines with positive slopes? Negative slopes?*
- *Is it possible for a combination of a horizontal and a vertical line to intersect at the solution point?*
- *How many pairs of lines can intersect at the given solution point?*

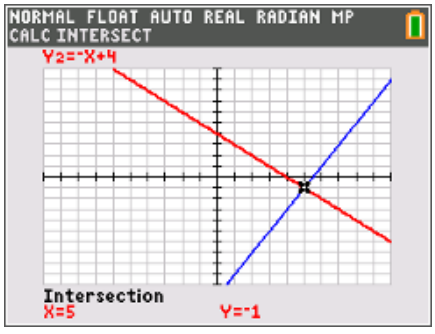
3. Record the equations of the lines:

Sample Answer: $Y_1 = 2x - 11$; $Y_2 = -x + 4$

Problem 3 – Infinite or No Solutions

For an extension, Problem 3 has two lines graphed. Have students change the slope and *y*-intercept of the equations to move the lines to represent **no solutions** or **infinite solutions** for a system of linear equations. Students should share equations that meet these conditions.

A class discussion will need to take place to verify the equations meet the solution criteria. You should have students focus on the slopes of the lines and draw connections between the equations and the graphs.



Teacher Tip: Ask students the following questions:

- *What characteristics of the equations determine if the system has no solutions? Infinite solutions?*
- *What does the graph of a system of linear equations look like when there are no solutions? Infinite solutions?*
- *Is there another way to write the same equation so it is not obvious that the system is the same equation?*

4. Record your equations:

Sample Answer: $y = 2x + 3$ and $y = 2x - 1$

5. What do the equations or lines have to have in common so that they do not have a solution?

Answer: No solution should be parallel lines.

6. Record your equations:

Answer: $y = 2x + 3$ and $y = 2x + 3$

7. What do the equations or lines need to have in common to have infinite solutions?

Answer: Infinite solutions should be same line.