Math Objectives

- Students will recognize what it means for an ordered pair to be a solution to a linear equation in two variables.
- Students will use appropriate tools strategically (CCSS Mathematical Practices).
- Students will look for and express regularity in repeated reasoning (CCSS Mathematical Practices).

Vocabulary

- linear equation
- solution
- solve
- variable

About the Lesson

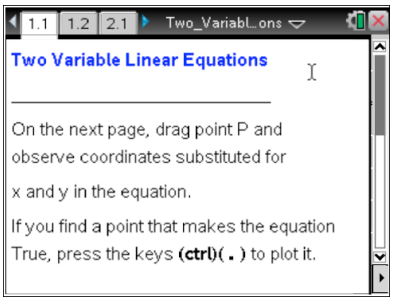
- This lesson involves finding the solution set for a linear equation in two variables written in the form $y = mx + b$.
- As a result, students will:
  - Plot points that make a linear equation in the form $y = mx + b$ true.
  - Examine the relationship among those points.

Related Lessons

- After this lesson: Slope as a Unit Rate

TI-Nspire™ Navigator™ System

- Use Quick Polls to check student understanding.
- Use Screen Capture to examine patterns that emerge.
- Use Teacher Edition computer software to review student documents.



TI-Nspire™ Technology Skills:

- Download a TI-Nspire document
- Open a document
- Move between pages
- Grab and drag a point

Tech Tips:

- Make sure the font size on your TI-Nspire handheld is set to Medium.
- You can hide the function entry line by pressing ctrl G.

Lesson Materials:

Student Activity

- Two_Variable_Linear_Equations_Student.pdf
- Two_Variable_Linear_Equations_Student.doc

TI-Nspire document

- Two_Variable_Linear_Equations.tns

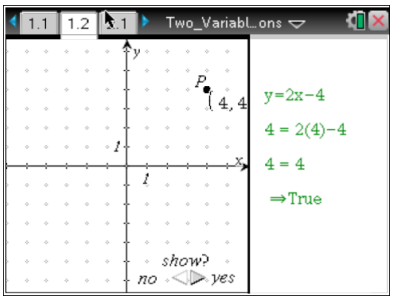
Visit www.mathnspired.com for lesson updates and tech tip videos.

Discussion Points and Possible Answers

Tech Tip: If students experience difficulty moving a point, move the cursor to hover over the point until a pair of horizontal and vertical arrows appears. The right, left, up and down directional arrows on the touch pad will move the point on grid points. Students might also drag the point. Check to make sure they have moved the cursor (arrow) until it becomes a hand (☜) getting ready to grab the point. Then press ctrl ☜ to grab the point and close the hand (☜). When finished moving the point, press esc to release the point.

Move to page 1.2.

1. a. Move point *P* and describe how the coordinates relate to the equation shown in the screen.



Answer: The coordinates of point *P* are changing and are substituted into the equation. When the coordinates do not make the equation true, the word false shows up on the screen. When they make the equation true, the word true shows up on the screen.

Teacher Tip: Be sure to emphasize the mathematical relationship between the coordinates of point *P* and the equation. Students should recognize that the true or false statement comes from the calculations when the coordinates of point P are substituted into the equation.

2. a. If $x = 0$, what value of y is needed to make the equation true?

Answer: $y = -4$

Move point *P* so that the first coordinate is 0, and the equation is true. Press ctrl . to mark this point.

Answer: The point (0,-4) should be plotted on the graph.

b. If $y = 0$, what value of x is needed to make the equation true?

Answer: $x = 2$

Move point *P* so that the second coordinate is 0, and the equation is true. Press ctrl . to mark this point.

TI-Nspire Navigator Opportunity: *Live Presenter*
See Note 1 at the end of this lesson.

3. Move point *P* to a new location where the equation is true. Press ctrl . to mark this point. Mark at least one more point that makes the equation true.

a. How are the points you marked related to each other?

Answer: The points form a linear pattern rising from left to right.

Teacher Tip: Students can use different approaches in marking points. Some of them might look for ordered pairs they know satisfy the equation; others might notice a pattern using the slope. For example, from one marked point, a slope of 2, moving up two, right one or moving down two, left one will generate additional points that are solutions.

b. Make a guess about what will happen if you draw a graph of the equation.

Sample answer: The graph should be a straight line through the points.

c. Press "show? yes" arrow at the bottom of the screen to see the graph of the equation? Does the graph support your guess? Why or why not?
Sample answer: Yes the graph supports my guess as it goes right through all of the points I plotted.

TI-Nspire Navigator Opportunity: *Screen Capture* and *Quick Poll*
See Note 2 at the end of this lesson.

A solution to an equation in two variables is an ordered pair (*x, y*) that makes the statement true. Each point you have marked is one solution to the equation.

4. a. How many solutions does this equation have? How do you know?

Answer: This equation has infinitely many solutions. You can choose any value for *x* and find a corresponding value for *y*, so there are an infinite number of ordered pairs that will make the equation true.

Teacher Tip: Students can only describe integer solutions as point *P* moves from grid point to grid point due to the design of this file. It is important to make sure students understand that this equation would have non-integer solutions as well. Ask students whether it is possible to have solutions that are non-integers.

b. Suppose the coordinates of two different points both make the equation $y = -5x+3$ true. Can the coordinates of those same two points make a different equation of the form $y = mx+b$ true? Why or why not?

Answer: The coordinates cannot make two different equations of the form $y = mx+b$ true. Two points determine a line and that line has a unique equation when written in the form $y = mx+b$. Every point on that line makes the equation true and every point that makes that equation true lies on that line.

Teacher Tip: You can extend this activity by asking students to make connections to the slope of the line. The activity can also be extended by choosing a different equation to investigate. Close the tns file without saving. Reopen the file and press ctrl G to obtain the function entry line; change the function in the entry line; press ctrl G to hide the entry line. Have students repeat the process and questions in the activity for their new equation.

Page 2.2 also offers a sequence of several linear equations. This could be used along with graph paper for a student to self-assess their understanding.

Wrap Up

Upon completion of the discussion, the teacher should ensure that students understand:

- A solution to an equation in two variables is an ordered pair that makes the statement true.
- A linear equation in two variables has an infinite number of integer and non-integer solutions whose points follow a linear path.

TI-Nspire Navigator

Note 1

Question 2, *Live Presenter*: Select a student to illustrate his/her answer to Question 2 using *Live Presenter*.

Note 2

Question 3, *Screen Capture* and *Quick Poll*: As students are answering Questions 3 and 4, take screen captures to monitor their progress. Take a quick poll with an oral prompt and use the Open Response feature, “how are the points you plotted related?” Then look at the responses with the class and discuss what is correct and what is not and why.

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