Applet Overviews: Are They Linear? (1-4)

Applet Overview: Are They Linear? (1)

Essential Math Concept

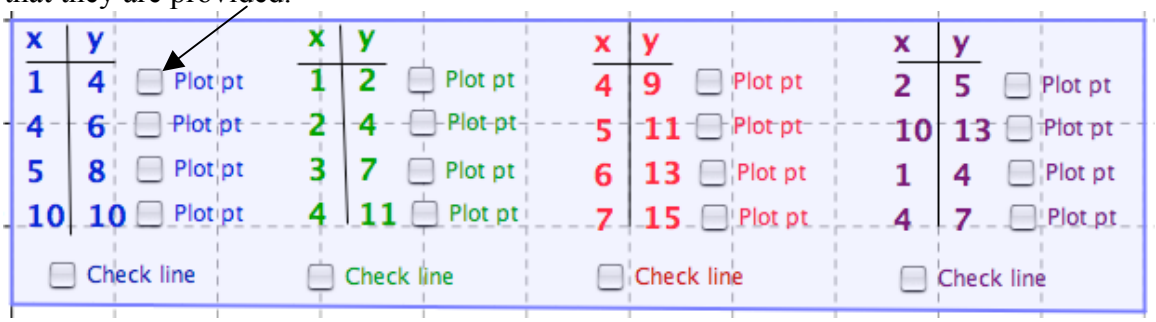
Analyze a table of ordered pairs to determine whether it represents a linear function.

Essential Questions To Consider

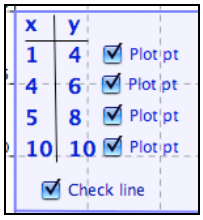
Do students understand how to recognize a set of ordered pairs as linear or non-linear?
Do students know how to determine if the rate of change is consistent or changing?
Do students apply an algorithm/process on just one aspect of the table (x values or y values) and don't look at the ratio using both the change in x and the change in y?
Do students recognize when the ordered pairs are not in sequential order (by x values)?

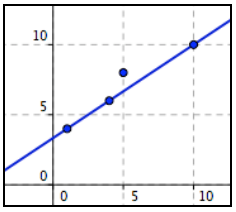
Student Engagement

Step 1: Students use the check boxes beside the coordinates to plot the points in the order that they are provided.



Step 2: Students use the checkbox labeled "check line" to determine if the points form a straight line.





Notes:

- The blue table has y values that increase consistently by 2s but the x values do not increase in a consistent pattern.
- The green table has x values that increase by a consistent amount but the y values change at an increasing rate.
- The red table is linear.
- The purple table represents a linear relationship but the points are not in ascending or descending order so the common strategy of subtracting two consecutive y values may not yield accurate results unless students look at the ratio of y to x when comparing.

Applet Overview: Are They Linear? (2)

Essential Math Concept

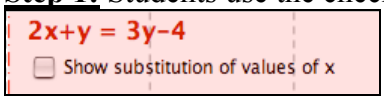
Analyze an equation to determine whether it represents a linear function.

Essential Questions To Consider

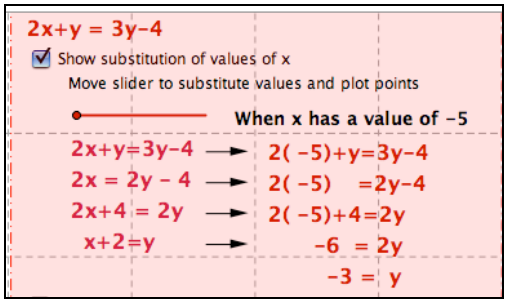
Do students understand how to determine if an equation is linear or non-linear?
Do students recognize equations that are not written in standard or slope-intercept form as linear?
Can students change equations written in forms other than standard or slope-intercept form into a form they can recognize?

Student Engagement

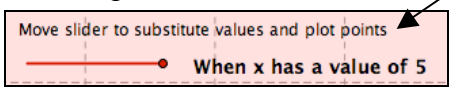
Step 1: Students use the check boxes under the equation to substitute values of x.

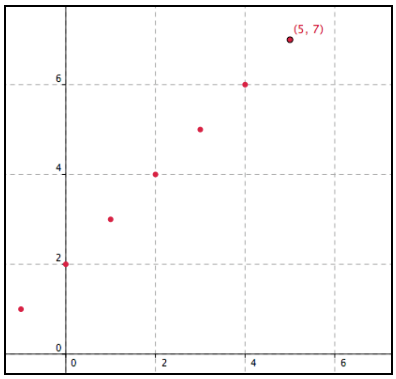


Checked:

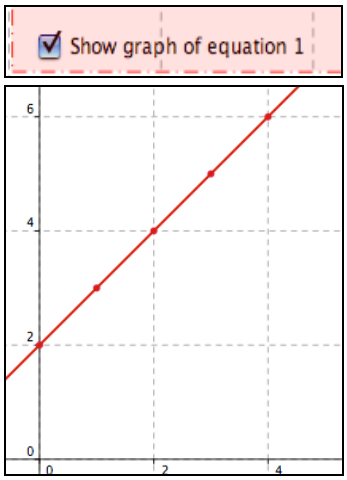


Step 2: Students use the slider to plot points as they substitute values into the equation provided.





Step 3: Click on the show graph check box to draw the graph of the expression provided.



Notes:

- The steps on the left show the equation being simplified. The steps on the right include interactive text that allows the student to substitute the values from the slider.
- Move the slider to see the values being substituted in the expression.
- Points are plotted at the same time that the vales are substituted.
- Click the check box to show the graph of the equation.
  - Even when the show graph and substitute values check boxes are unchecked the points remain until you refresh the applet. (Refresh at the top of the browser or Command-F while in GeoGebra.)

Applet Overview: Are They Linear? (3)

Essential Math Concept

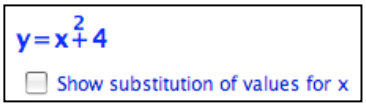
Analyze an equation to determine whether it represents a linear function.

Essential Questions To Consider

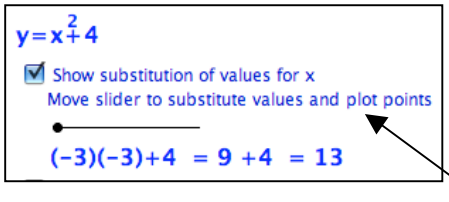
Do students understand how to determine if an equation is linear or non-linear?
Do students recognize equations that have squares in them as possibly being linear?
Can students simplify equations into a form they can recognize as linear?

Student Engagement

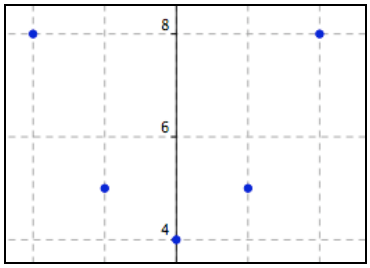
Step 1: Students use the check boxes below the equation to show the equations with values substituted for x. They can use the slider to modify the values.



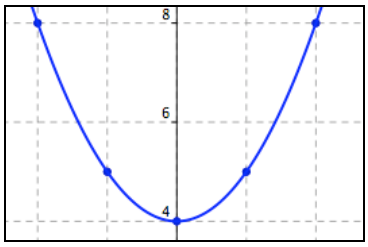
Checked:



Step 2: Students use the slider to plot points as they substitute values into the equation provided.



Step 3: Click on the show graph check box to draw the graph of the expression provided.



Notes:

- Move the slider to see the values being substituted in the expression.
- Points are plotted at the same time that the vales are substituted.
- Even when the show graph and substitute values check boxes are unchecked the points remain until you refresh the applet. (Refresh at the top of the browser or Command-F while in GeoGebra.)

Applet Overview: Are They Linear? (4)

Essential Math Concept

Analyze a table of ordered pairs to determine whether it represents a linear function.

Essential Questions To Consider

Do students understand how to recognize a set of ordered pairs as linear or non-linear?

Do students know how to determine if the rate of change is consistent or changing?

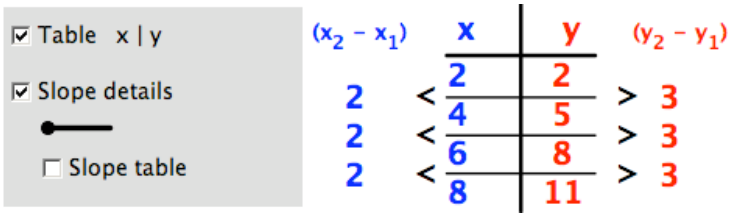
Do students apply an algorithm/process on just one aspect of the table (x values or y values) and don't look at the ratio using both the change in x values and the change in y values?

Do students recognize when the ordered pairs are not in sequential order (by x values)?

Student Engagement

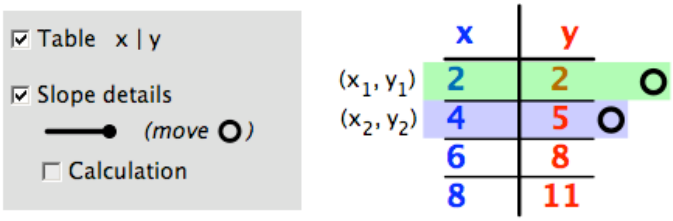
Step 1: Students use the "Example" to choose among pre-set tables of values provided. Only some examples are linear. Example 10 allows students to move points on the graph to create new a custom table.

Step 2: Students use the checkbox labeled "Slope details" to show the change in x values ($x_2 - x_1$) and the change in y values ($y_2 - y_1$). The slider under the "Slope details" checkbox toggles back and forth between two options: the changes in values for each "step" down the table or the change in values for two selected ordered pairs.



Option 1: *Changes in values "stepping down the table:"*

Option 2: *Choose the ordered pairs by dragging the circles up and down*



Step 3: Students can click on the "Slope table" (for Option 1, above) or "Calculation" (for Option 2) checkboxes to see additional details about the slopes between the ordered pairs in the table:

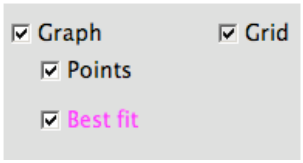
Slope table:

(x_2-x_1)	(y_2-y_1)	slope (frac.)	slope (dec.)
2	3	$\frac{3}{2}$	1.5
2	3	$\frac{3}{2}$	1.5
2	3	$\frac{3}{2}$	1.5

Calculation (when selecting two pairs):

$$\frac{y_2-y_1}{x_2-x_1}=\frac{5-2}{4-2}=\frac{3}{2}=1.5$$

Step 4: Students can click on the "Graph" checkbox to see options for graphing the examples, including the points, the grid, and the line or curve of best fit. If the best fit is not a line, an option for showing the best fit line will appear. For example 10, the "Graph" checkbox allows students to see and move four points to create a custom table.



Notes:

- The examples that are LINEAR are numbers 1, 4, 7, and 9.
- The examples that are NOT LINEAR are numbers 2, 3, 5, 6, and 8.
- Example 10 can show linear or non-linear examples, depending on where the points are positioned.
- To see more of the graphs that extend to quadrants II and III, uncheck the "Table" and "Slope details" checkboxes