LessonTitle: Zooming in on Linear Equations — Pre 6.8a

Utah State Core Pre-algebra Content Standard 2 Process Standards 1-5

Summary

In this lesson, students use graphing calculators or computer software. As they program in and then analyze patterns of equations, they develop understanding of the slope intercept form of a linear equation. They apply this understanding to write equations to match various graphs.

Enduring Understanding

The slope intercept form of a linear equation, $y = mx + b$, reveals the rate of change occurring in a mathematical story and an orientation point (the y intercept) on the graph of the story.

Essential Questions

What story does the slope intercept equation form ($y = mx + b$) tell? How do the equation and the graph stories compare?

Skill Focus

- The slope intercept form of a linear equation

Vocabulary Focus

slope, parallel, perpendicular, origin, calculator vocabulary such as max, min, windows, trace

Materials Graphing Calculators or Computers, LCD projector, graph paper.

Launch ideas:

"since we have not used the calculators to graph linear equations, the introduction to using the calculators for graphing will peak the students interest enough for a launce. We will also discuss the essential questions"

Explore ideas:

"Teachers will do a little bit of direct instruction on functions of the calculators then the students will use that knowledge to do the activity in small groups. The students are responsible to learn calculator functions, apple prior knowledge of linear equations, participate and work cooperatively in their small groups."

Summarize ideas:

"Groups will randomly be selected to share answers."

"The worksheet "Reasoning about Linear Equations" (5.2b) is a great summary. Some teachers had the students work in groups and some teachers made transparencies and had the students work in front of the class and explain their answers. This worksheet clearly shows the difficulty most students have in analyzing. There needs to be no-slope equations added on the worksheet and more equations to fill the worksheet."

Application:

"Lesson 5.2b could be done as independent practice, but we are completing it in small groups. Since some of us are using this activity as an introduction to slope-intercept those classes will do a lot of guided practice. The others are doing this lesson as a follow-up to ensure the student have a complete understanding. They will include practice if the students do not understand slope-intercept."

Assess

- Students write a "Show All You Know" assessment about $y = mx + b$ equations. They should be sure to answer all the essential questions and include numeric data, equations, graphs and stories. Evaluate using a teacher/class created rubric.

Information

Activity 1 in the TI Interactive book covers the same concepts. Exploring with Geometer's Sketchpad activities, The Slope of a Line and Equations of Lines could also be used.

Zooming in on a Linear Equation utilizes TI graphing calculators. If you choose to use TI interactive instead, then

- Open a TI Interactive document and record students names. Then open a graph.
- Have students enter in several equations with positive slopes and observe what happens. Label the graph "Steepness of Slopes" and label the x axis "run" and the y axis "rise." Save to document.
- Create a second graph and enter in equations with negative slopes. Label the graph "Negative Slopes." Save to document.
- Create a third graph. Enter in several equations with the same slope and different y intercepts. Label the graph "Parallel Slopes." Save to document.
- Ask students to write a conclusion about what they observed about "y = mx + b." Explain that this is one form of an equation and that the m stands for the slope and the b stands for the y intercept.

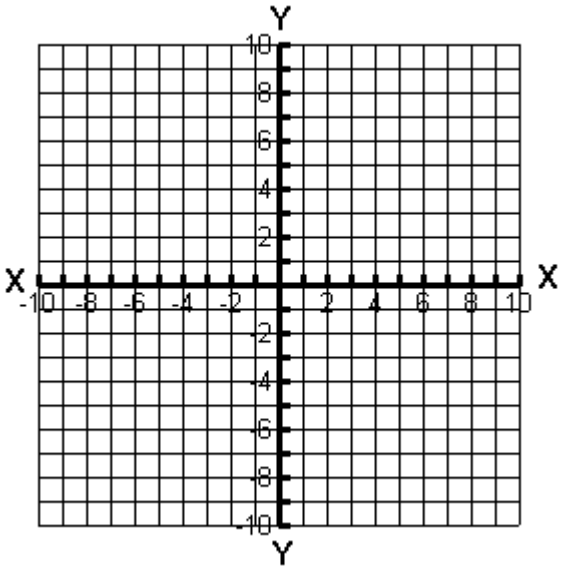
Students will need help making up stories to fit equations. Suggestions: 1) Their story could be one about walking. The slope could be feet per second. The y intercept could be head starts or penalties. 2) They could use rate of pay and use a bonus pay or a parking fee for the positive or negative y intercepts. 3) They could use the mountain hiking idea. Give suggestions and let them try to come up with other creative and fun contexts.

Pre 6.8a1 Zooming in on a Linear Equation (y = mx + b)

Name_____

1. Set TI 73 calculator window: Xmin = - 10, Xmax = 10, Ymin = - 10, Y max = 10

2. Press y = and enter y= 2x +1. Press Graph. Sketch the graph below. (Use the tracer to find the exact y intercept). Label the line with the equation.



3. Enter and graph the following: (you are changing the "m"in the equation y = mx + b.)

   y = 3x + 1 y = 4x + 1 y = 6x + 1

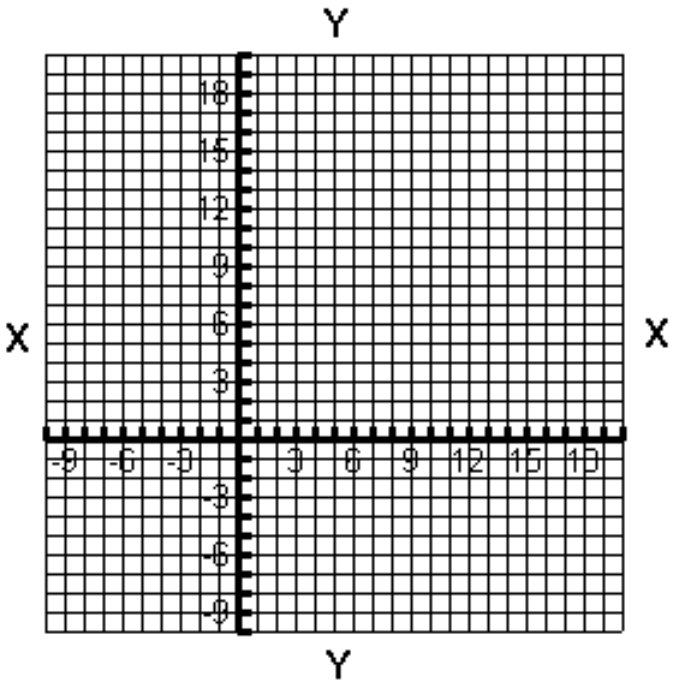
   What happens to the line as "m" (the coefficient of x) increases?

   What do you think would happen if you made "m" negative for these four equations? (for example: y = - 2x + 1)

Try it. Graph and Sketch above. Were you right. If not, then write what happened.

4) Enter and graph: y = 2x + 2, y = 2x + 3, y = 2x + 6, y = 2x –5, y = 2x

What happens to the line when you change the "b" part of y = mx + b?



5) Create some data points for the equation y = 2x. Graph the points and make the graph.line. Label it line G.

x	y
-2	
0	
2	
4	

Make up a story to fit line G.

Move line G up 3. Label the new line H.

Move line G down 2. Label it J.

What is the equation of line H?

y = _____

Make up a story to fit line H

What is the equation of line J?

y = _____

Make up a story to fit line J.

4. Move line H up 2. Label it k.
What is the equation of line k?

y = _____

Make up a story to fit line k

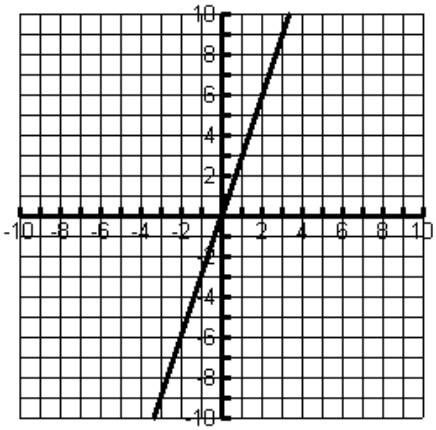
.

5. What is the mathematical term for the relationships of lines G, H, J and K?

6. Explain what we know about equations where the slope is the same and the y intercept is different (m is the same and b is different).

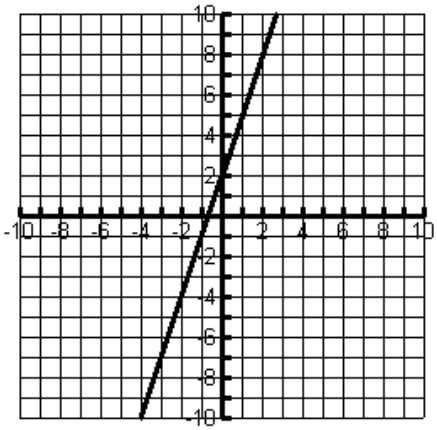
Pre 6.8a2 Revisiting Slope

Write the equation of the line. Then record the points used to find the slope.



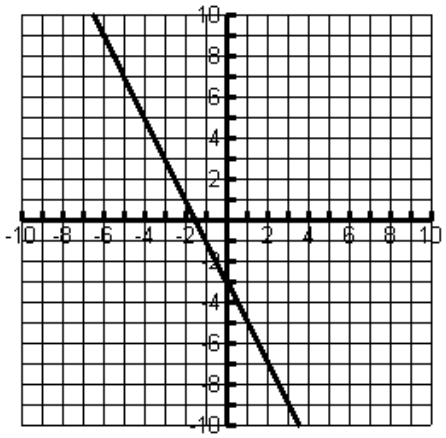
1) Equation: y = _3x_____

Point used for rise/run _(2,6)__ _(0,0)_



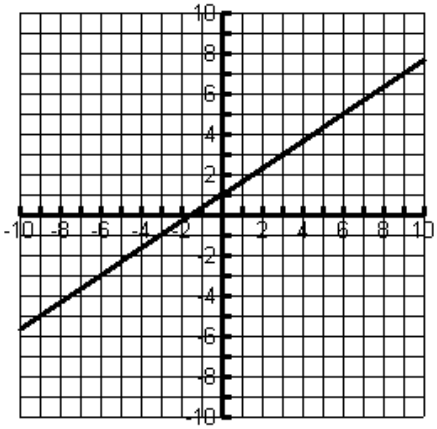
2) Equation: y = _____

Point used for rise/run _____ _____



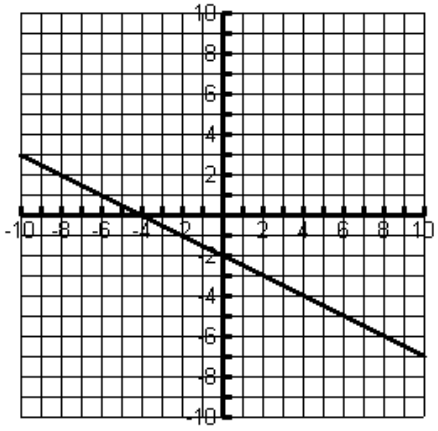
3) Equation: y = _____

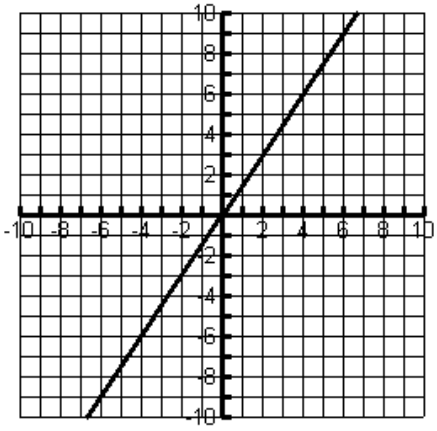
Point used for rise/run _____ _____



4) Equation: y = _____

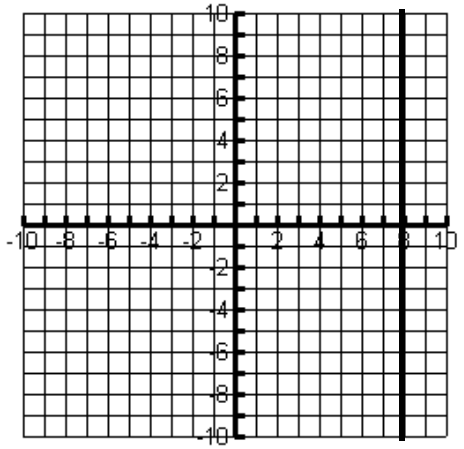
Point used for rise/run _____ _____





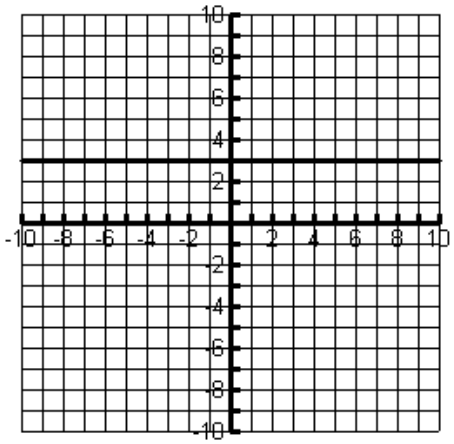
5) Equation: y = _____

Point used for rise/run _____ _____



6) Equation: y = _____

Point used for rise/run _____ _____



7) Equation: y = _____

Point used for rise/run _____ _____

Why is this slope undefined?

8) Equation: y = _____

Point used for rise/run _____ _____

Another way to think about rise/run (slope) is to use this formula:

Change in y/ Change in x or $y_1 - y_2/x_1 - x_2$

Use this formula to redo the slopes from above. Use the rise/run points and show all work.

1.

2.

3.

4.

5.

6.

7.

8.