Big Ideas Math: Blue

Parent Newsletter

BIG IDEAS LEARNING.

Chapter 4: Graphing and Writing Linear Equations

Standards

Common Core:

8.EE.5: Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6: Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

8.F.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

Students will...

Understand that lines represent solutions of linear equations.

Graph linear equations.

Find slopes of lines by using two points.

Find slopes of lines from tables.

Identify parallel and perpendicular lines.

Write and graph proportional relationships.

Find slopes and y-intercepts of graphs of linear equations.

Graph linear equations written in slope-intercept form.

Graph linear equations written in standard form.

Write equations of lines in slope-intercept form.

Write equations of lines using a slope and a point.
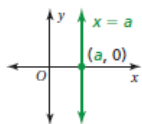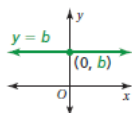
Write equations of lines using two points.

Key Ideas

Linear Equation
You can use a graph to show the solutions of a linear equation.

Graphing Horizontal and Vertical Lines

The graph of $y = b$ is a horizontal line passing through $(0, b)$.

The graph of $x = a$ is a vertical line passing through $(a, 0)$.

Forms of Linear Equations

- A linear equation written in the form $y = mx + b$ is in **slope-intercept form**. The slope of the line is m, and the y-intercept of the line is b.

- The **standard form** of a linear equation is $ax + by = c$ where a and b are not both zero.

- A linear equation written in the form $y - y_1 = m(x - x_1)$ is in **point-slope form**. The line passes through the point (x_1, y_1), and the slope of the line is m.

Parallel and Perpendicular Lines and Slope
- Lines in the same plane that do not intersect are parallel lines.
- Nonvertical parallel lines have the same slope.
- All vertical lines are parallel.
- Lines in the same plane that intersect at right angles are perpendicular lines.
- Two nonvertical lines are perpendicular when the product of their slopes is -1.
- Vertical lines are perpendicular to horizontal lines.

Direct Variation
- When two quantities x and y are proportional, the relationship can be represented by the direct variation equation $y = mx$, where m is the constant of proportionality.
- The graph of $y = mx$ is a line with a slope of m that passes through the origin.
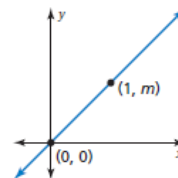
Slope
The slope m of a line is a ratio of the change in y to the change in x between any two points, (x_1, y_1) and (x_2, y_2), on the line.

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{y_2 - y_1}{x_2 - x_1}$$
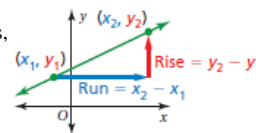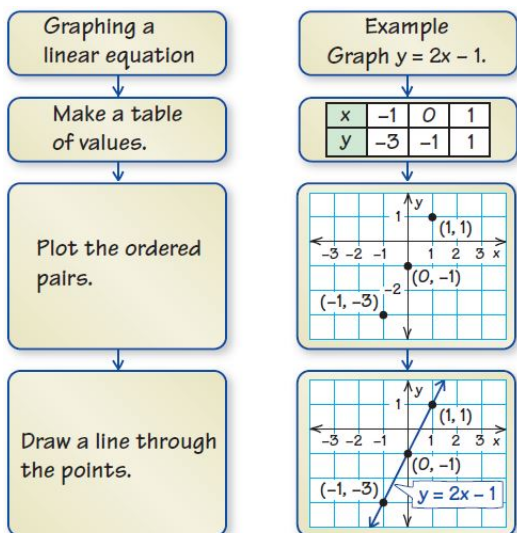
- Lines with a positive slope rise from left to right.
- Lines with a negative slope fall from left to right.
- Lines with a slope of 0 are horizontal.
- Lines with an undefined slope are vertical.

Good to know.

Game
- Six in a Row

This is available online in the *Game Closet* at www.bigideasmath.com.

Reference Tools

A **Process Diagram** can be used to show the steps involved in a procedure. Process diagrams are particularly useful for illustrating procedures with two or more steps, and they can have one or more branches. As shown, process diagrams can have two parallel parts, in which the procedure is stepped out in one part and an example illustrating each step is shown in the other part. Or, the diagram can be made up of just one part, with example(s) included in the last "bubble" to illustrate the steps that precede it.

Graphing a linear equation

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Make a table of values.

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Plot the ordered pairs.

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Draw a line through the points.

Example
Graph $y = 2x - 1$.

x	-1	0	1
y	-3	-1	1

(1, 1)
(0, −1)
(−1, −3)

(1, 1)
(0, −1)
(−1, −3) $y = 2x - 1$

Key Terms

A *linear equation* is an equation whose graph is a line.

The points on the line are *solutions* of the equation.

Slope is the rate of change between any two points on a line.

The *x-intercept* of a line is the x-coordinate of the point where the line crosses the x-axis.

The *y-intercept* of a line is the y-coordinate of the point where the line crosses the y-axis.

The *rise* is the change in y between any two points on a line.

The *run* is the change in x between any two points on a line.

Essential Questions

How can you recognize a linear equation? How can you draw its graph?

How can you use the slope of a line to describe the line?

How can you describe the graph of the equation $y = mx$?

How can you describe the graph of the equation $y = mx + b$?

How can you describe the graph of the equation $ax + by = c$?

How can you write an equation of a line when you are given the slope and the y-intercept of the line?

How can you write an equation of a line when you are given the slope and a point on the line?

Quick Review

- Another way to discuss the equation $y = b$ is to say that "y always equals a certain number, while x can equal anything." For example, if $y = -4$, the table of values may look like this:

x	-1	0	1	2
y	-4	-4	-4	-4

- Another way to discuss the equation $x = a$ is to say that "x always equals a certain number, while y can equal anything." For example, if $x = -2$, the table of values may look like this:

x	-2	-2	-2	-2
y	-1	0	1	2

- A *direct variation* equation is a special kind of linear equation, one whose graph passes through the origin.

- The *point-slope form* of the equation of a line is equivalent to the *slope-intercept form* and is the equation of a unique line.

What's the Point?

The ability to write and graph linear equations is very useful in real life for events like predicting arrival times. Have your student calculate what time they will arrive at school given the distance and the average speed of the car. What point on the coordinate plane does their answer represent?

Hmmm.

The STEM Videos available online show ways to use mathematics in real-life situations. The Chapter 4: Hurricanes! STEM Video is available online at www.bigideasmath.com.