

6.1 – Slope of a Line

Name: _____

Date: _____

Goal: Determine the slope of a line segment and a line.

Toolkit:

- Rate of change
- Simplifying fractions

Main Ideas:

Definitions

Rise: the vertical distance between two points.

Run: the horizontal distance between two points.

Slope: a measure of how one quantity changes with respect to the other, it can be calculated using:

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in dependent variable}}{\text{change in independent variable}}$$

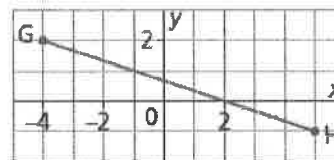
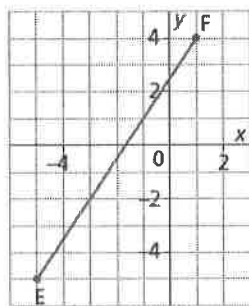
Determining the Slope of a Line Segment

Ex1) Determine the slopes of the following line segments.

Step 1: Choose two points on the line segment.

Step 2: Count the units to determine the *rise* and the *run*.

Step 3: Write the fraction in simplest form.



When a line segment goes up to the _____, both x and y _____. Both the rise and run are _____, so the slope of the line segment is _____.

When a line segment goes down to the _____, y _____ and x _____. The rise is _____ and the run is _____, so the slope of the line segment is _____.

For a horizontal line segment, the change in y is _____. The rise is _____ and the run is positive.

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{0}{\text{run}} = 0$$

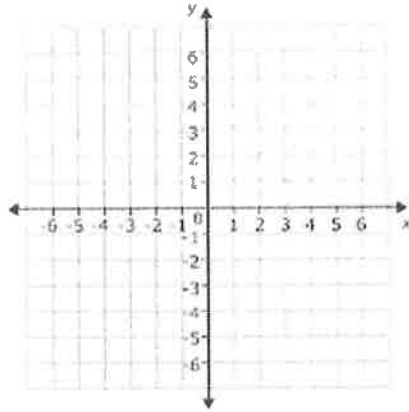
For a vertical line segment, y _____ and the change in x is _____. The rise is positive and the run is _____.

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{rise}}{0} = \text{undefined}$$

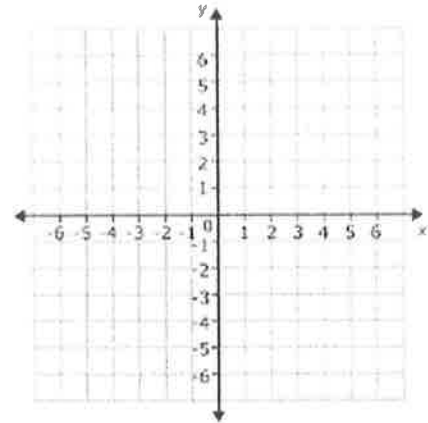
Drawing a line segment with a given slope.

Ex 2) Draw a line segment with the given slope.

a) slope = $\frac{4}{9}$



b) slope = $-\frac{8}{3}$



Finding slope when given two points.

Ex 3) Determine the slope of the line that passes through E(4,-5) and F(8,6).

Slope of a line = $\frac{y_2 - y_1}{x_2 - x_1}$	$A(x_1, y_1) B(x_2, y_2)$
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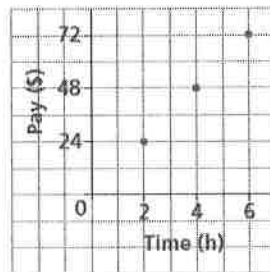
How else could we have found the slope?

Interpreting the slope of a line

Ex 4)

Tom has a part-time job. He recorded the hours he worked and his pay for 3 different days. Tom plotted these data on a grid.

Graph of Tom's Pay



- a) What is the slope of the line through these points?
- b) What does the slope represent?
- c) How can the answer to part b be used to determine:
 - i) how much Tom earned in $3\frac{1}{2}$ hours?
 - ii) the time it took Tom to earn \$30?

Reflection: How is the slope of a line related to rate of change?

6.4 – Slope-Intercept Form of the Equation for a Linear Function

Name: _____

Date: _____

Goal: to relate the graph of a linear function to its equation in slope-intercept form.

Toolkit:

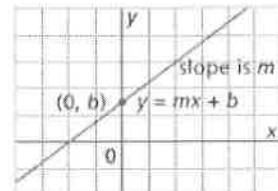
- Slope of a line (m) = $\frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{\text{rise}}{\text{run}}$
- The y-intercept (vertical intercept) of a line is b

Main Ideas:

What is Slope-Intercept Form of the Equation of a Linear Function

The equation of a linear function can be written in the form $y = mx + b$, where m is the slope of the line and b is its y-intercept (with coordinates $(0, b)$).

$$y = mx + b$$



Writing an Equation Given Slope and y-intercept

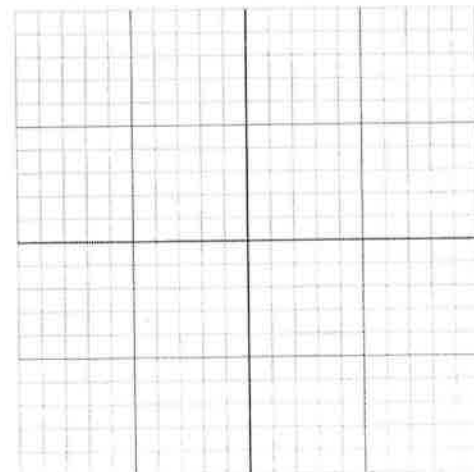
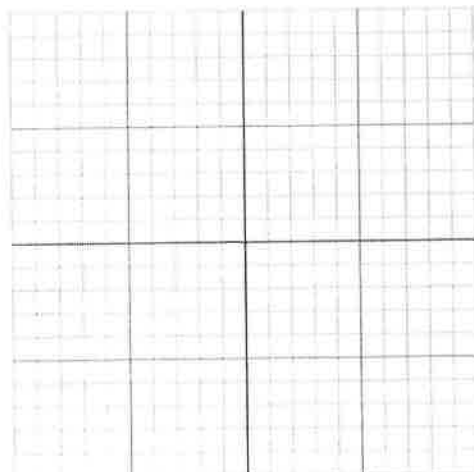
Ex. 1) The graph of a linear function has a slope $\frac{3}{5}$ and y-intercept of -4 . Write an equation for this function.

Graphing a Linear Function Given the Equation in $y = mx + b$

Ex. 2) Graph the linear functions with the following equations:

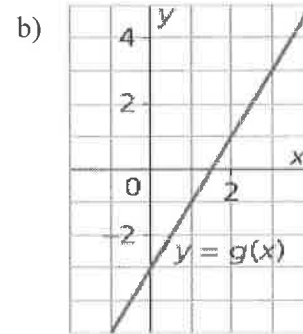
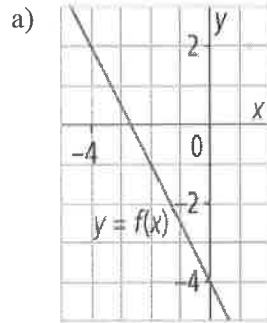
a) $y = \frac{1}{2}x + 3$

b) $y = -\frac{3}{4}x - 1$



Writing the Equation of a Linear Function Given Its Graph

Ex. 3) Write equations to describe the following functions. Verify the equation.



Using an Equation of a Linear Function to Solve a Problem

Ex. 4) The student council sponsored a dance. A ticket cost \$5 and the cost for the DJ was \$300.

- Write an equation for the profit, P , on the sale of t tickets.
- Suppose 123 people bought tickets. Find the profit.
- Suppose the profit was \$350. How many people bought tickets?
- Could the profit be exactly \$146? Justify the answer.

Reflection: How do the values of m and b in the linear equation $y=mx+b$ relate to the graph of the corresponding linear function? Use examples to help.

6.6 – General Form of the Equation for a Linear Relation

Name:

Date:

Goal: to relate the graph of a linear function to its equation in general form.

Toolkit:

- Slope-Intercept form → $y = mx + b$
- Rearranging Equations

Main Ideas:

What is General Form of the Equation of a Linear Relation?

How is Standard Form similar?

Rewriting an Equation in General Form

Graphing a Line in General Form

GENERAL FORM of the Equation of a Linear Relation:

$$Ax + By + C = 0$$

where A is a whole number (not negative!), and B and C are integers.

STANDARD FORM of the Equation of a Linear Relation:

$$Ax + By = C$$

Ex. 1) Write each equation in general form and standard form:

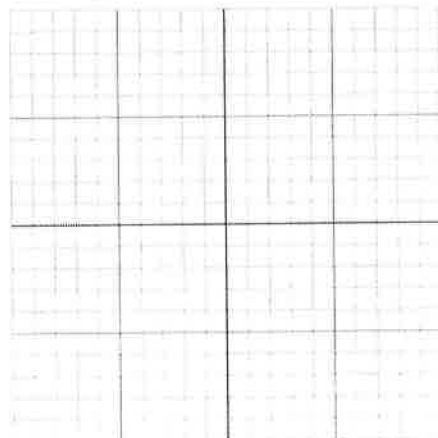
a) $y = -\frac{2}{3}x + 4$

b) $y - 1 = \frac{3}{5}(x + 2)$

Ex. 2) a) Determine the x - and y -intercepts of the line whose equation is $3x + 2y - 18 = 0$

b) Graph the line.

c) Verify that the graph is correct



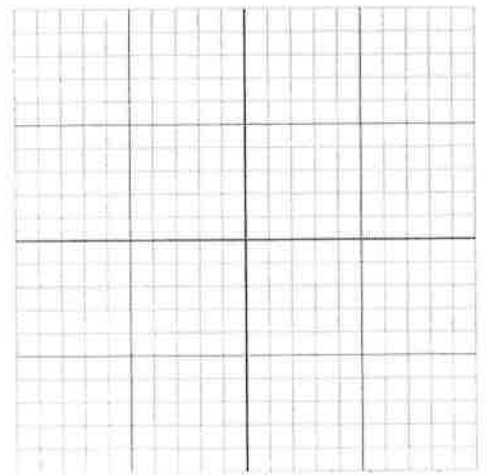
Determining the Slope
of a Line Given Its
Equation in General
Form

(switch to Standard!)

Ex. 3) a) Determine the slope of the line with the equation $3x - 2y - 16 = 0$

b) Determine the slope of the line with the equation $5x - 2y + 12 = 0$

c) Determine the slope AND the y-intercept of the line with the equation $4x - 6y = 0$, then graph the line.



Reflection: Why can't you use intercepts to graph the equation $4x - y = 0$? (where $C = 0$)

What is the best way to graph an equation in

form?

Ex 4) Graph the equation $2x + 3y - 6 = 0 \rightarrow$

Step 1: decide what form it is in:

note: $slope =$

Step 2: for *standard form*, find the intercepts (cover x to get y , cover y to get x)

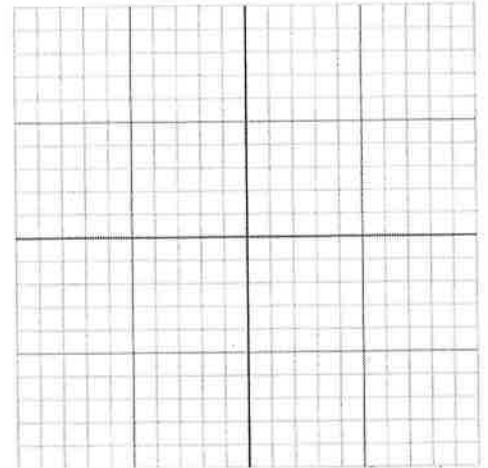
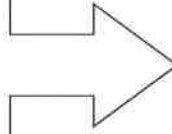
$x\text{-int} =$ $y\text{-int} =$

Step 3: plot x - and y -intercepts

Step 4: connect the dots! (Can check slope)

standard form

- get intercepts
- plot intercepts
- connect the dots!



Reflection: Which form of equation do you prefer to graph?

Would you change every equation to your preferred form, or use the different methods for the different ones? (You may want to try a few in the homework before you answer!)

6.2 – Slopes of Parallel and Perpendicular Lines

Name:

Date:

Goal: to use slope to determine whether two lines are parallel or perpendicular.

Toolkit:

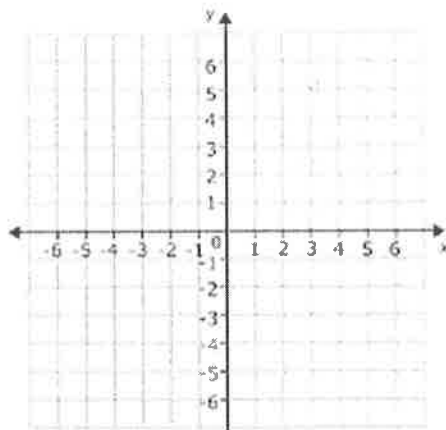
- Slope
- Simplifying fractions
- Reciprocals

Main Ideas:

Identifying Parallel Lines

Lines that have _____ are parallel.

Ex 1) Line EF passes through E(-4,2) and F(2,-1).
 Line CD passes through C(-1,7) and D(7,3).
 Line AB passes through A(-4,5) and B(5,1).
 Sketch the lines. Are they parallel?

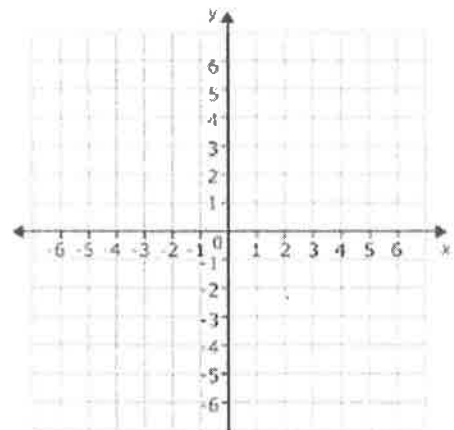


Identifying perpendicular lines

The slopes of two perpendicular lines are _____; that is a line with a slope $a, a \neq 0$, is perpendicular to a line with slope $-\frac{1}{a}$

Ex 2) Line ST passes through S(-2,7) and T(2,-5). Line UV passes through U(-2,3) and V(7,6).

Are these lines parallel, perpendicular or neither? Calculate the slopes, and then sketch the lines to verify your answer.

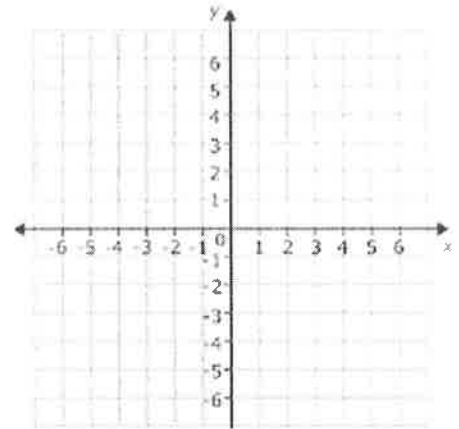


Identifying a line perpendicular to a given line.

Ex 3)

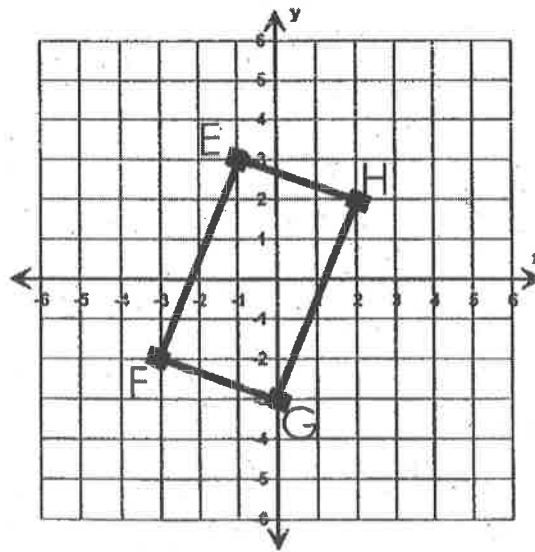
a) Determine the slope of a line that is perpendicular to the line through $G(-2,3)$ and $H(1,-2)$.

b) Determine the coordinates of J so that line GJ is perpendicular to line GH .



Using slope to identify a polygon.

Ex 4) Is EFGH a parallelogram? Is it a rectangle?



Reflection: What have you learned about parallel and perpendicular lines?

6.8 – Equations of Parallel and Perpendicular Lines

Name:

Date:

Goal: to find the equations of lines given information about parallel and perpendicular lines

Toolkit:

- slopes of parallel lines are
- slopes of perpendicular lines are
- to find the equation of a line, you need:
- passing through \rightarrow sub in!

Main Ideas:

Ex 1) For a line with the slope 0.7, what is the **slope** of a line that is

a) Parallel?

b) Perpendicular?

Ex 2) State the **slopes** of lines that are:

a) parallel to the line $3x + 2y - 4 = 0$

b) perpendicular to $y = \frac{1}{2}x - \frac{3}{4}$

Ex 3) For this pair of slopes, what is the value of k if the lines are...

a) Parallel?

$\frac{4}{k}, 2$

b) Perpendicular?

Ex 4) Are the pairs of lines parallel, perpendicular, or neither?

a) $2x + 3y + 9 = 0$, $y = \frac{3}{2}x + 6$ b) $y + 1 = \frac{3}{4}(x + 2)$, $6x - 8y + 3 = 0$

Ex 5) Find the equation of the line (in $y = mx + b$ form) that is parallel to the line $2x + 3y + 9 = 0$ and has the same y -intercept as the line $y = 2x + 4$.

Ex 6) Find the equation of the line (in $Ax + By + C = 0$ form) that is perpendicular to $y = -3x + 4$ and passes through the point $(6, 3)$.

Ex 7) Find the equation of the line that is perpendicular to the x -axis and passes through the point $(4, 3)$

Reflection: What short-cuts have you picked up this unit to make answering the questions faster?