

Lesson1: Equations in Two Variables

Solution to a 2 Variable Equation: an ordered pair (x, y); in other words, 2 numbers that make the equation true

Example: $3x + 8y = 38$ Is (2, 4) a solution?
Substitute 2 for x and 4 for y
 $3(2) + 8(4) = 38$
 $6 + 32 = 38$
 $38 = 38$ This is true, so (2,4) is a solution

To Find a Solution to a 2 Variable Equation:

Choose **any value** for x, solve for y

Example: $6x + 3y = 9$

1. Choose x = 2: $6(2) + 3y = 9$ Substitute 2 for x
 $12 + 3y = 9$ Simplify
 $12 - 12 + 3y = 9 - 12$ Subtract 12 from both sides
 $3y = -3$ Divide both sides by 3
 $y = -1$
Solution: (2, -1)

To Solve a 2 Variable Equation for y:

Use transformations to get y by itself (usually on the left side)

Example:

$6x + 2y = -8$
 $6x - 6x + 2y = -8 - 6x$ Subtract 6x from both sides
 $2y = -8 - 6x$
 $\frac{2y}{2} = \frac{-8}{2} - \frac{6x}{2}$ Divide EVERY term by 2
 $y = -4 - 3x$

OFFLINE WORK

- Read pages 83–85.
- Complete Problems 1–15 odd, 27, 29 on pages 86–87.
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*.

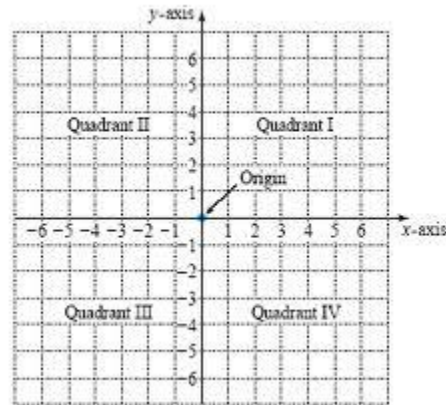
Lesson 2: Graphs

Coordinate Plane

Horizontal line is the **x-axis**; Vertical line is the **y-axis**

The point where the 2 lines meet is the **origin** (0,0)

The axes divide the plane into **4 quadrants**, numbered I, II, III, IV



Ordered Pair

Has the form (x,y) – x and y represent numbers that are called **coordinates**

To locate the ordered pair on the coordinate plane:

Start at the origin (0,0)

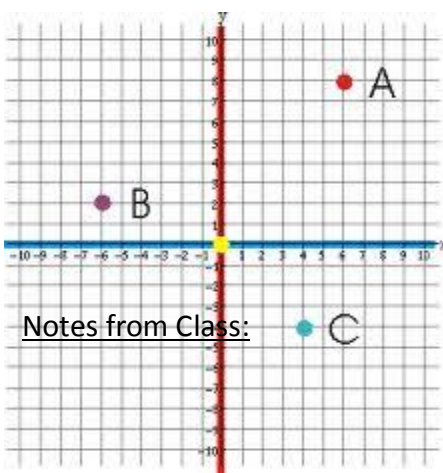
YOU HAVE TO CRAWL BEFORE YOU CAN STAND!!

First, move left or right on the x-axis: **CRAWL FIRST**

Second, move up or down on the y-axis: **STAND SECOND**



Example:



Point A: (6,8) Right 6, Up 8

Point B: (-6,2) Left 6, Up 2

Point C: (4,-4) Right 4, Down 4

Positive x-coordinate – move RIGHT

Negative x-coordinate – move LEFT

Positive y-coordinate – move UP

Negative y-coordinate – move DOWN

Notes from Class:

• C

OFFLINE WORK

- Read pages 88–89 in the reference guide.
- Complete Problems 1–25 and 27–28 on pages 90–92.
- Complete Problems 26, 29, 30 on pages 91–92 for extra practice (optional).
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*.

Lessons 3: Lines and Intercepts

Co-linear: points that, when connected, form a straight line

To determine if points are Co-linear: plot the points
draw a straight line through them

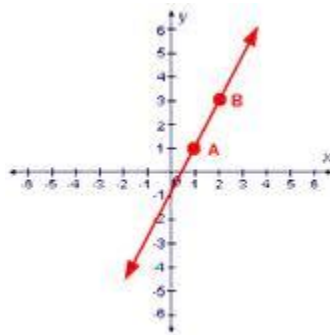
Standard Form of a linear equation: $Ax + By = C$

A, B and C are integers; A and B do not equal 0

Example: $6x + 2y = 16$: $A = 6, B = 2, C = 16$

Graph a Line on a Coordinate Plane

1. Start with 2 ordered pairs: A: (1, 1) B: (2, 3)
2. Plot each point on a coordinate plane
3. Draw a straight line through the points



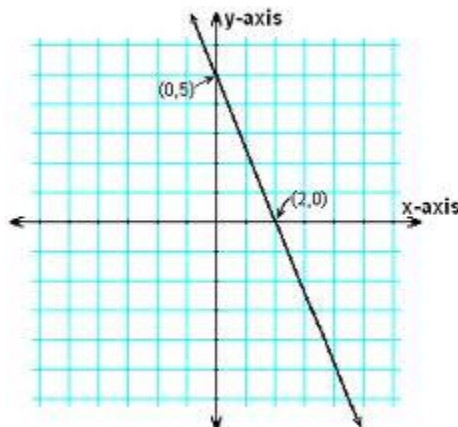
Intercepts of a Line

x-intercept – the x-coordinate of the point where the line crosses (intersects) the x-axis. **Find the x-intercept by substituting 0 for y in the equation**

y-intercept – the y-coordinate of the point where the line crosses (intersects) the y-axis. **Find the y-intercept by substituting 0 for x in the equation**

x-intercept = (2,0)

y-intercept = (0,5)



Graph the equation of a line using Intercepts

Example: $5x - 4y = 20$

$5x - 4(0) = 20$ Find the **x-intercept** by substituting 0 for y

$5x = 20$ Divide both sides by 5

$x = 4$ x-intercept is (4,0)

$5(0) - 4y = 20$ Find the **y-intercept** by substituting 0 for x

$-4y = 20$ Divide both sides by -4

$y = -5$ y-intercept is (0,-5)

Plot (4, 0) and (0,-5) on a coordinate plane and draw a straight line through the points

OFFLINE WORK

- Read pages 93–96 in the reference guide.
- Complete Problems 1–10 and 11–27 odd on pages 96–97.
- Complete Problems 12–24 even on pages 96–97 (optional).
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*

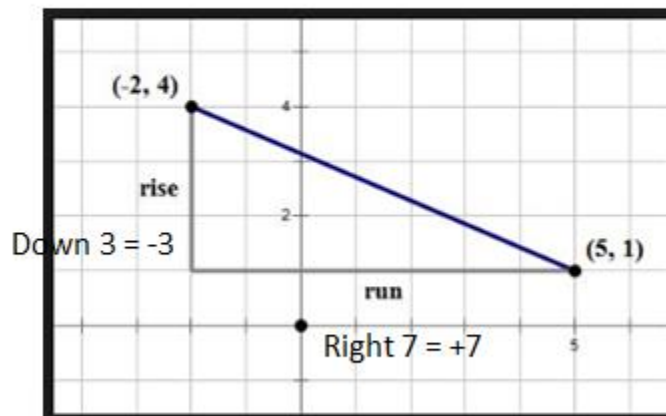
Lesson 4: SKIP (Your Choice)

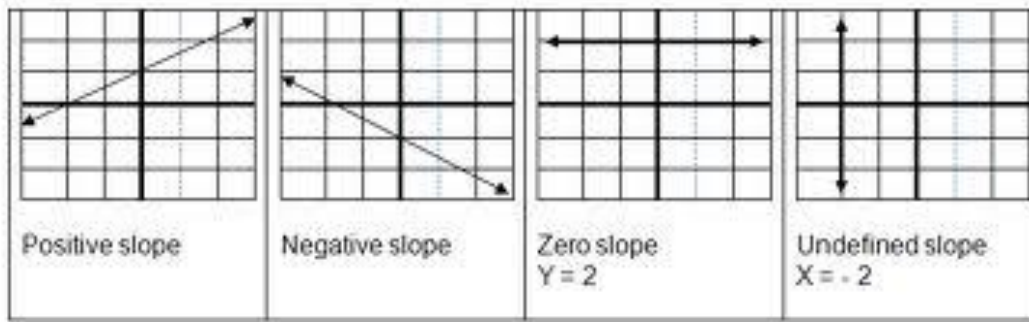
Lesson 5: Slope

Slope: A measurement of the steepness of the line

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{-3}{7}$$





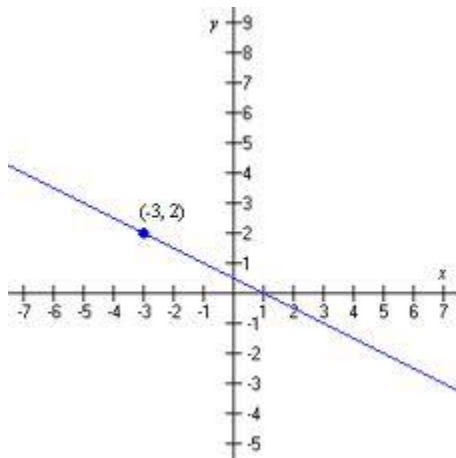
Positive Slope – line goes up from left to right

Negative Slope – line goes down from left to right

Zero Slope – horizontal line

Undefined Slope – vertical line

Example: Find the slope of the line that passes through the points (-3, 2) and (1, 1)

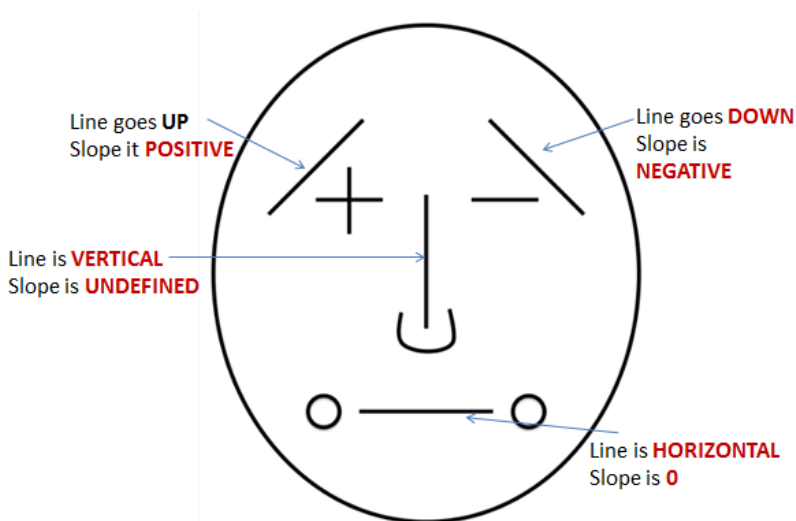


1. Label the points: (-3, 2) and (1, 1)
 (x_1, y_1) (x_2, y_2)

2. Substitute the numbers into the slope formula: $\frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 2}{1 - (-3)} =$

$$\frac{-1}{4}$$

3. This line has a slope of $\frac{-1}{4}$



MR. SLOPE GUY

Lesson 6: Simple Linear Graphs

The origin of the coordinate plane is the point where the x - and y -axes intersect. You use the origin, or point $(0, 0)$, to describe the location of other points on the graph. For instance, the point $(3, -4)$ is 3 units to the right of the origin and 4 units down.

Suppose you drew a line that passes through $(0, 0)$ and $(3, -4)$. That line would pass through the origin. In this lesson, you will learn how to write an equation of a line that passes through the origin.

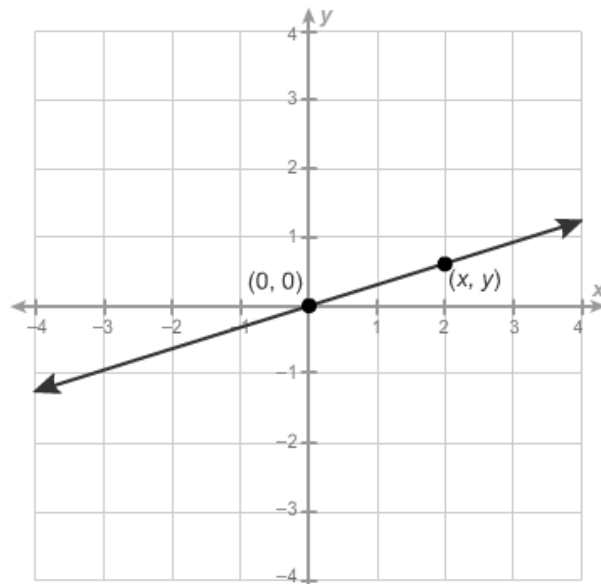
For lines that pass through the origin, both the x -intercept and the y -intercept are zero.

Determining the Equation of a Graphed Line

Identify another point on the line and substitute into the point-slope formula. Then solve for m .

$$m = \frac{y_1 - y_2}{x_1 - x_2} = \frac{y - 0}{x - 0} = \frac{y}{x}$$

$$m = \frac{y}{x}$$



Solve for y .

$$m = \frac{y}{x}$$

$$m \cdot x = \frac{y}{x} \cdot x$$

$$mx = y$$

$$y = mx$$

Equation of Line That Passes Through the Origin
 $y = mx$

m = slope of the line

Find the Slope from an equation in Standard Form: $Ax + By + C$:

Find the x and y intercepts, then use the slope formula to find the slope

Example: $5x - 4y = 20$

$5x - 4(0) = 20$	Find the x-intercept by substituting 0 for y
$5x = 20$	Divide both sides by 5
$x = 4$	x-intercept is (4,0)
$5(0) - 4y = 20$	Find the y-intercept by substituting 0 for x
$-4y = 20$	Divide both sides by -4
$y = -5$	y-intercept is (0,-5)

Find the slope of the line that passes through (4, 0) and (0,-5)

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 0}{0 - 4} = \frac{-5}{-4} = \frac{5}{4}$$

OFFLINE WORK:

- Read pages 104–106.
- Complete Problems 7–9, 13–16, and 23–25 on pages 107–108.
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*.

[LESSON 7: SKIP \(Your Choice\)](#)

Lesson 8: Using Slope as a Rate

Slope can be interpreted as a **rate**: a comparison between 2 units

Examples of Rates: feet climbed per hour
 gallons of gas used per minute

Unit Rate: the second term represents 1 Unit

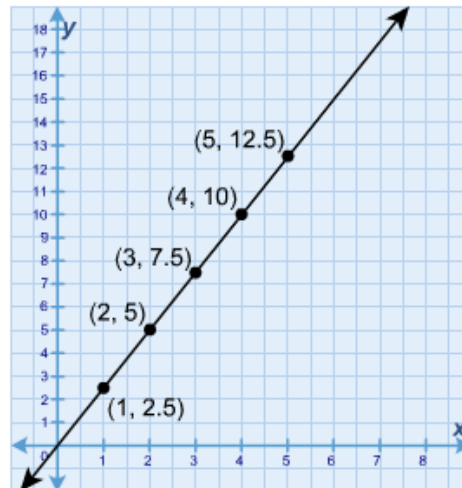
Example: 120 mph = 120 miles in **1 hour** – this is a unit rate

Slope = $\frac{\text{rise}}{\text{run}}$ Rise = units on the y-axis
 Run = units on the x-axis

Example:

Ross is hiking at a steady rate of 2.5 miles per hour. Construct a graph corresponding to this rate.

Hours	Miles
1	2.5
2	5
3	7.5
4	10
5	12.5



Choose any point on the y-axis for the rise and any point on the x-axis for the run

The slope of this line = $\frac{\text{rise}}{\text{run}} = \frac{2.5}{1} = \frac{5}{2} = \frac{12.5}{5} = 2.5$

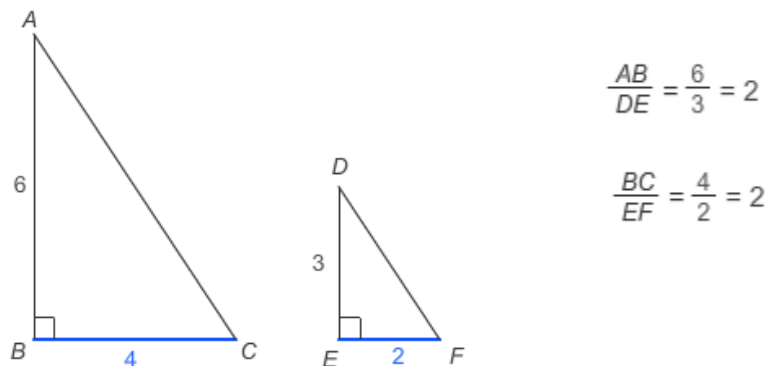
Interpret the slope as a Rate: Ross is hiking at a rate of 2.5 miles per hour

OFFLINE WORK

- Read pages 109–112.
- Complete Problems 1–11 odd, 12–13, and 15–19 odd on pages 113–114.
- Complete Problems 2–10 even 14, and 16–20 even on pages 113–114 for extra practice (optional).
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*

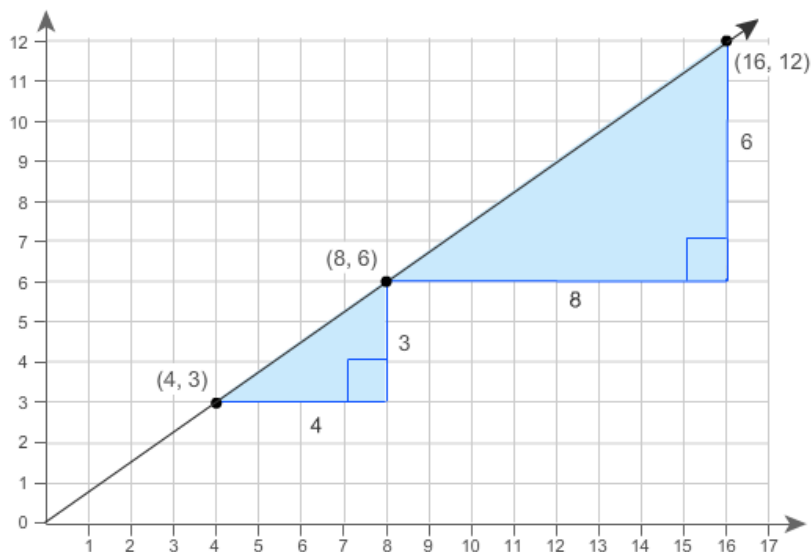
Lesson 9: Slope and Similar Triangles

Similar Triangles: the angles are congruent and the sides are proportional



The angles are congruent and the sides all have the same proportion of 2, therefore, **these are similar triangles and their hypotenuses have the same slope**

Example:



Since the 2 triangles are similar, the slope of the hypotenuse is the same everywhere on the line. **You can choose any 2 points on the line to determine the slope of the line**

OFFLINE WORK

- Read pages 115–116 in the reference guide.
- Complete Problems 1–8 on page 117.
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*.

Lessons 11: Equations from Graphs

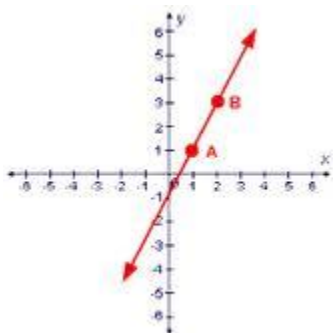
Write the equation of a line from a graph:

1. Identify 2 points on the line

2. Use the slope formula to find the slope: $\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$

3. Write the equation in the requested form

Example:



1. Point A = (1, 1) Point B = (3, 2)

2. Slope = $\frac{2-1}{3-1} = \frac{1}{2}$

3. Point Slope Form:

$$y - 1 = \frac{1}{2}(x - 1)$$

Standard Form:

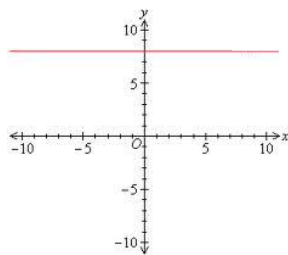
$$-x + 2y = 1$$

Slope-Intercept Form:

$$y = \frac{1}{2}x + \frac{1}{2}$$

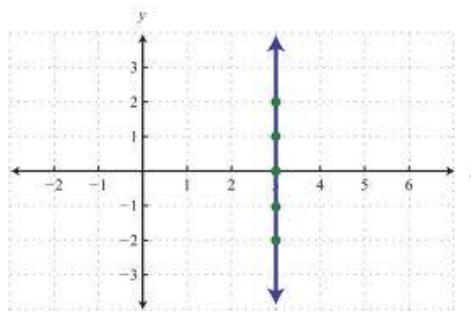
Equation of a Horizontal Line: the y coordinate of every point on a horizontal line is the same. The slope of a horizontal line is 0.

Example: $y = 8$



Equation of Vertical Line: the x coordinate of every point on a vertical line is the same. The slope of a vertical line is undefined.

Example: $x = 3$



OFFLINE WORK

- Read pages 124–125.
- Complete Problems 1–2 on page 125.
- Use the Solution Manual to check your work (optional). The Solution Manual is located in the Resources section in the Online Book Menu of *Intermediate Mathematics C: A Reference Guide and Problem Sets*.

Lesson 12: REVIEW

Lesson 13: OLS Unit Test

Lessons 14: Applications: Linear Models

- Linear Model:**
1. The rate is constant, meaning the slope is the same everywhere on the line
 2. The equation can be written in Slope-Intercept Form
 3. The graph is a straight line

Example: Damian starts with \$100 in his savings account. Every month, he deposits another \$25. Is this a linear model?

The balance in his account is given by the equation:

$$B = 25t + 100 \quad (t = \text{number of months})$$

1. Make a table showing his balance at 1, 4, 9 and 12 months

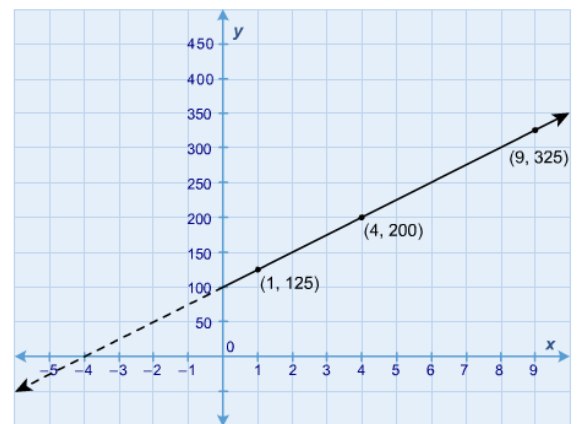
t	1	4	9	12
B	$B = 25t + 100$ $= 25 \cdot 1 + 100$ $= 25 + 100$ $= 125$	$B = 25t + 100$ $= 25 \cdot 4 + 100$ $= 100 + 100$ $= 200$	$B = 25t + 100$ $= 25 \cdot 9 + 100$ $= 225 + 100$ $= 325$	$B = 25t + 100$ $= 25 \cdot 12 + 100$ $= 300 + 100$ $= 400$

2. Plot the ordered pairs:

(1, 125)

(4, 200)

(9, 325)



3. Yes, this is a linear model

The slope is the same everywhere on the line

The graph is a straight line – the rate of change is constant