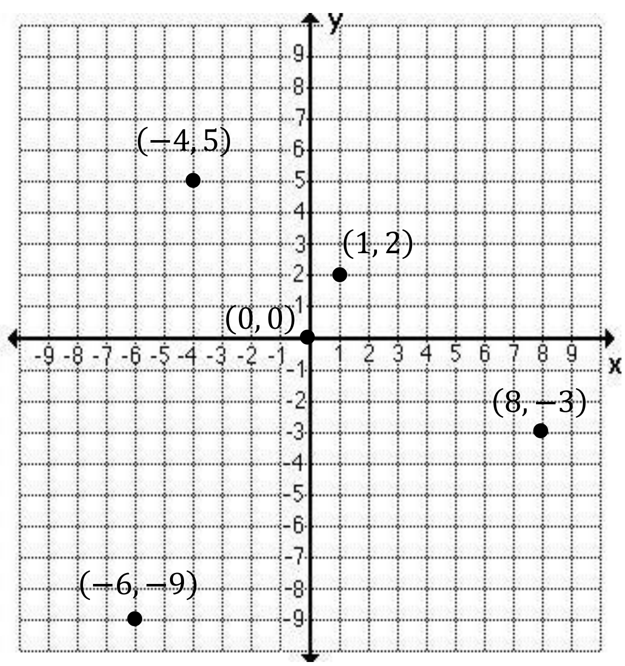
Section 7.1a – Slope Intercept Form – Part 1

This booklet belongs to:______________________Block:_____

Mapping Points on a 2-D Grid

- Every equation of a straight-line (except 2 special ones) has **specific criteria**.
- They **have 2 variables** (unknowns), generally **denoted** $\boldsymbol{x}, \boldsymbol{y}$ and they have **an** $=$ **sign**.
- All lines can be **mapped on a 2-D grid,** called it a Cartesian plane.



- The Grid is made up of **2 axes**
- An $\boldsymbol{x-axis}$ and a $\boldsymbol{y-axis}$
- The axes are both **number lines**
- The $x-axis$ move **left and right**
- The $y-axis$ move **up and down**

- In order to be **a point** found on the grid you need both an $\boldsymbol{x-value\ and\ y-value}$ denoted $(\boldsymbol{x}, \boldsymbol{y})$
- Together they give the **2-D coordinates** of points on the grid

Example: See above grid for placement

$(0,0)$ Known and the ORIGIN

$(1,2)$

$(-4,5)$

$(8,-3)$

$(-6,-9)$

✓ Without 2 values, an $\boldsymbol{x}$ **and** $\boldsymbol{y}$, it is not possible to be a point on the grid.
✓ Each value represents 1 dimension, and we have a 2-dimensional grid

So now we know how to map out points!

Mapping the Slope

Now when we consider the rise and the run on a grid, we need to consider both the $x - axis$ and the $y - axis$ as number lines.

The $x - axis$

- When **we move right** on the $x - axis$, we are moving in a **positive direction**
- When **we move left** on the $x - axis$, we are moving in **a negative direction**

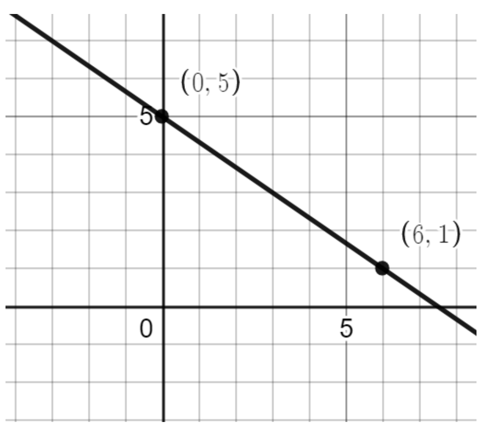
The $y - axis$

- When **we move up** on the $y - axis$, we are moving in **a positive direction**
- When **we move down** on the $y - axis$, we are moving **in a negative direction**

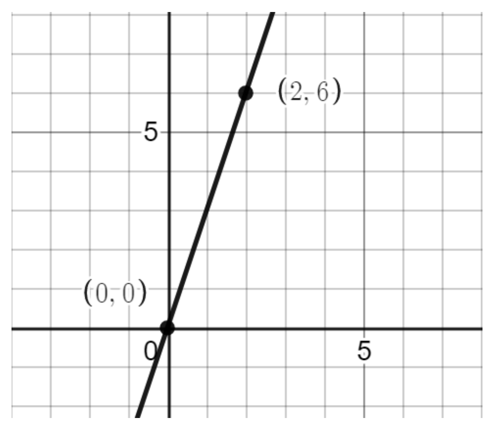
With this information, we can simply count the slope of a graph on a grid, by counting horizontally for our run, and vertically for our rise. Just be sure to consider if you are counting left/right and up/down and what that means for the sign of the given metric

Example 2: What is the slope of the following lines. Trace your movement horizontally and vertically. Try counting from left to right and from right to left and see what happens with the slope you come up with.

a)



b)

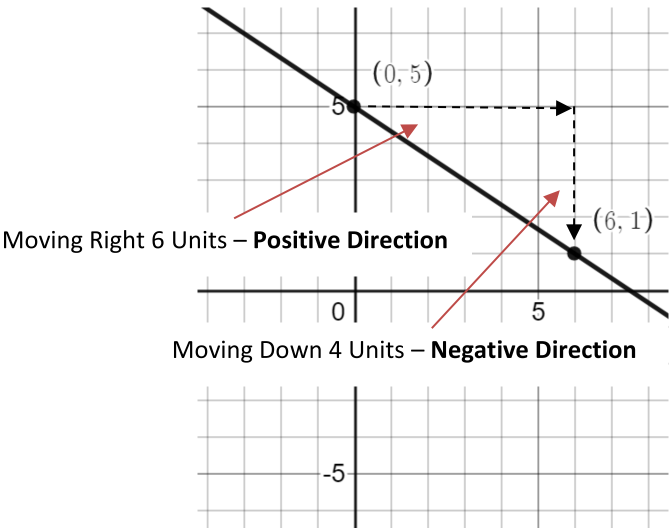


<u>Solution 2:</u>

First let's count from Left to Right

- Start at a left most point and count horizontally until you are in line with the next point
- Then count up or down to meet the line

a)

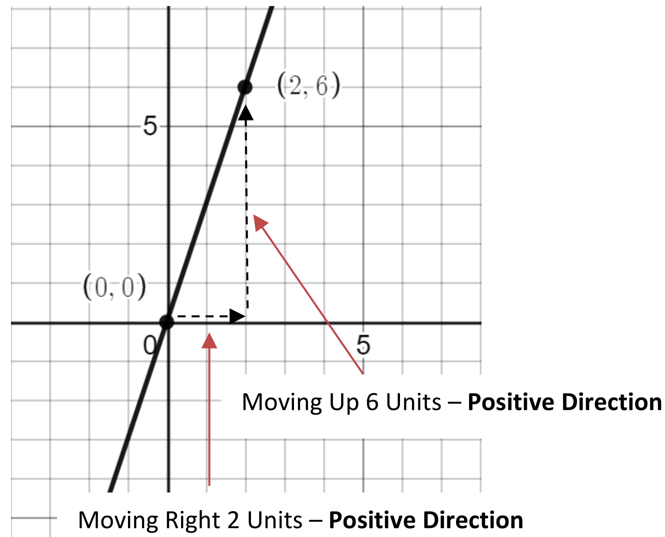


$$Slope = \frac{Rise}{Run}$$

$$Slope = \frac{-4}{6}$$

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

b)



$$Slope = \frac{Rise}{Run}$$

$$Slope = \frac{6}{2}$$

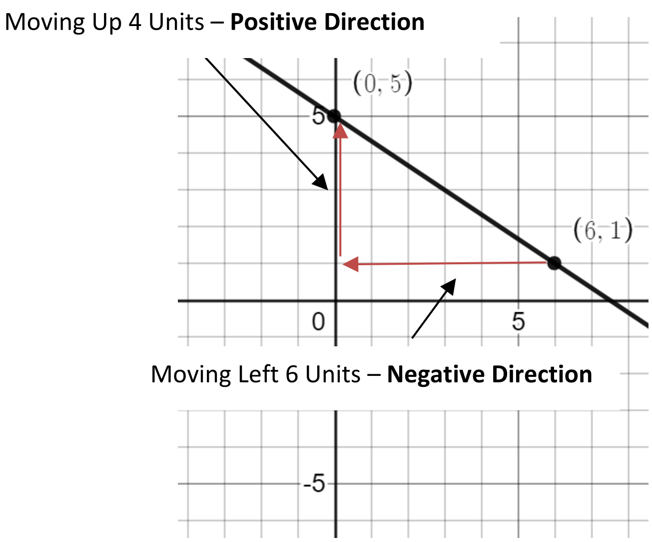
$$Slope = 3$$

- So, pick a point you can see on the graph.
- Count horizontally until you are in-line with another point either above or below your progress
- Then count up or down to get back to the line.

Now let's count from Right to Left

- Start at the right most point and count horizontally until you are in line with the next point
- Then count up or down to meet the line

a)

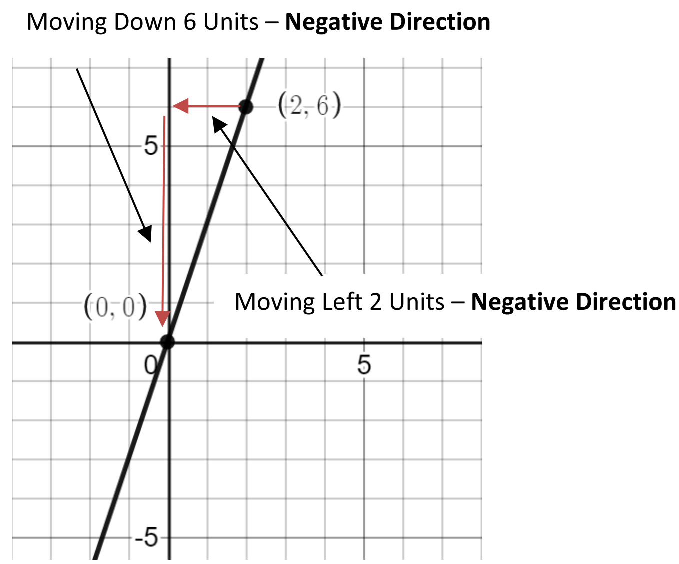


$$Slope = \frac{Rise}{Run}$$

$$Slope = \frac{4}{-6}$$

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

b)



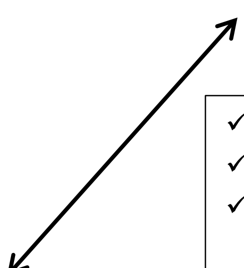
$$Slope = \frac{Rise}{Run}$$

$$Slope = \frac{-6}{-2}$$

$$Slope = 3$$

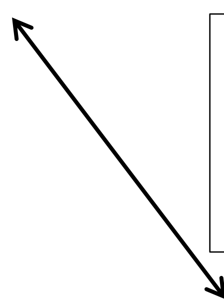
- As you can see, there is no difference in the Final Slope ratio if you count left to right or right to left
- Just stay consistent!

We will come across **4 different types of lines**. Their characteristics will result in **4 types of Slope**. We will look at the first 2 here and the next 2 in the next section. Look at them from **Left to Right**.



- ✓ The Rise is Positive
- ✓ The Run is Positive
- ✓ So that means the Slope will be:

$$\frac{Positive}{Positive} = Positive$$



- ✓ The Rise is Negative
- ✓ The Run is Positive
- ✓ So that means the Slope will be:

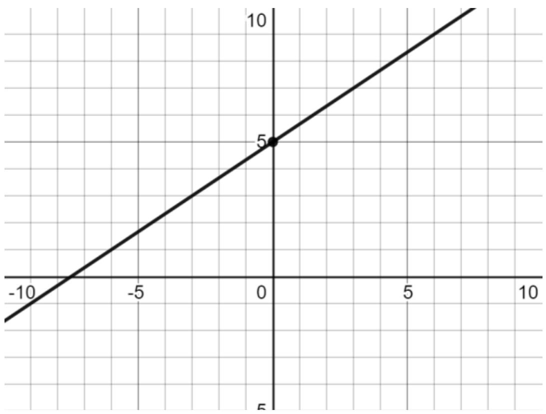
$$\frac{Negative}{Positive} = Negative$$

<u>The $y - intercept\ (0, b)$</u>

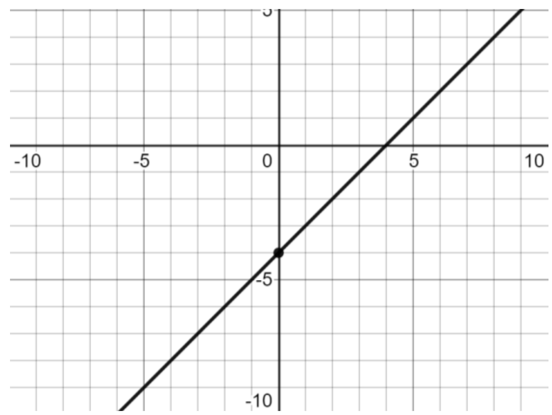
- The $y - intercept$ is the coordinate point where the **line crosses the $y - axis$** (the vertical axis)
- Since we have **not moved left or right along the $x - axis$**, we always, always, always have an **$x - coordinate$ of 0**.
- So, no matter what the $y - value$ of the $y - intercept$ is, the $x - value$ is always 0.

<u>Example 3:</u> What is the $y - intercept$ of the following graphs?

a)

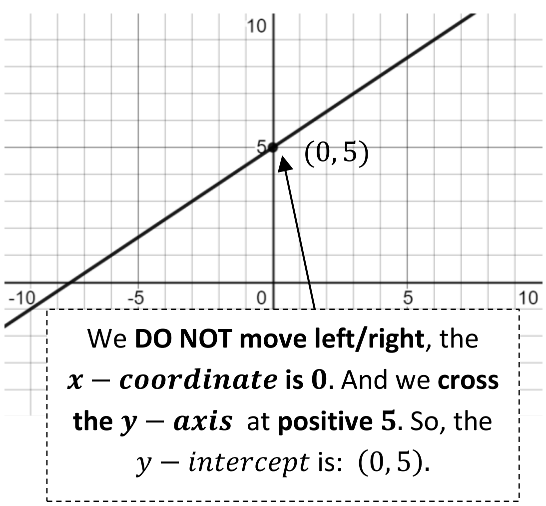


b)

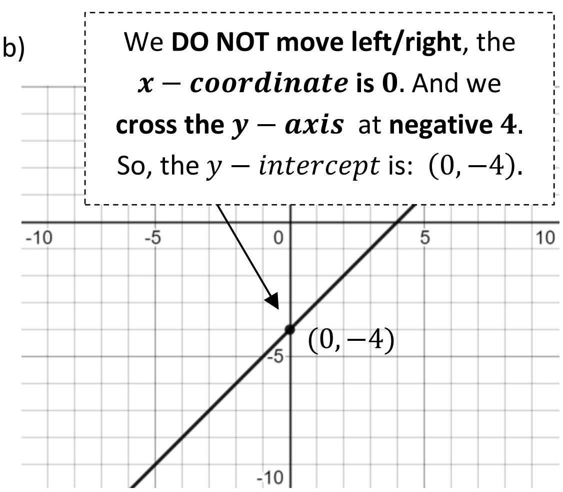


<u>Solution 3:</u> We are looking for the point where the line crosses the $y - axis$

a)



b)



Determining the Slope from Two Given Points

Any two points can be connected by a straight line. This line has a slope and it is defined by:

- Slope $= \frac{Change\ in\ height\ (y-values)}{Change\ in\ length\ (x-vlaues)} = \frac{RISE}{RUN} = \frac{y_2-y_1}{x_2-x_1}$

- Given any two points we can use the equation above solve for the slope.
- The little 1 and 2 just mean **Point 1 and Point 2**
- It does not matter which is which, but stay consistent.

Example: What is the slope of a line passing through:

$$\mathbf{(3,5)\ and\ (-4,8)}$$

Let's say: Point 1 and Point 2

Solution:

$$Slope = \frac{y_2 - y_1}{x_2 - x_1}$$

$$Slope = \frac{8-5}{-4-3} = \frac{3}{-7} = -\frac{\mathbf{3}}{\mathbf{7}}$$

Example 1: What is the slope of the line that connects the following points?

a) $(3,4)$ and $(-1,7)$ b) $(8,1)$ and $(1,-6)$ c) $(-2,0)$ and $(5,8)$

Solution 1: Remember, you can select any point as point 1, but for consistency just go with what point comes first

a) Slope $= \frac{y_2-y_1}{x_2-x_1}$

$$Slope = \frac{7-4}{-1-3} = \frac{3}{-4} = -\frac{\mathbf{3}}{\mathbf{4}}$$

b) Slope $= \frac{y_2-y_1}{x_2-x_1}$

$$Slope = \frac{-6-1}{1-8} = \frac{-7}{-7} = \mathbf{1}$$

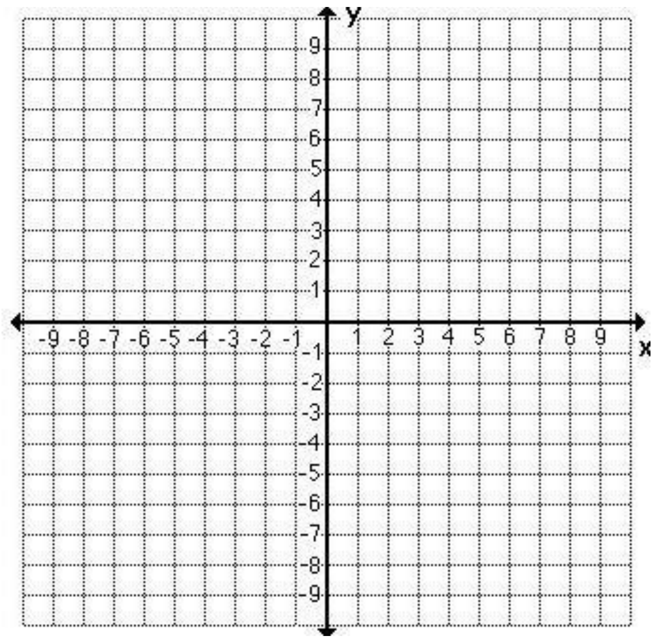
c) Slope $= \frac{y_2-y_1}{x_2-x_1}$

$$Slope = \frac{8-0}{5-(-2)} = \frac{8}{7} = \frac{\mathbf{8}}{\mathbf{7}}$$

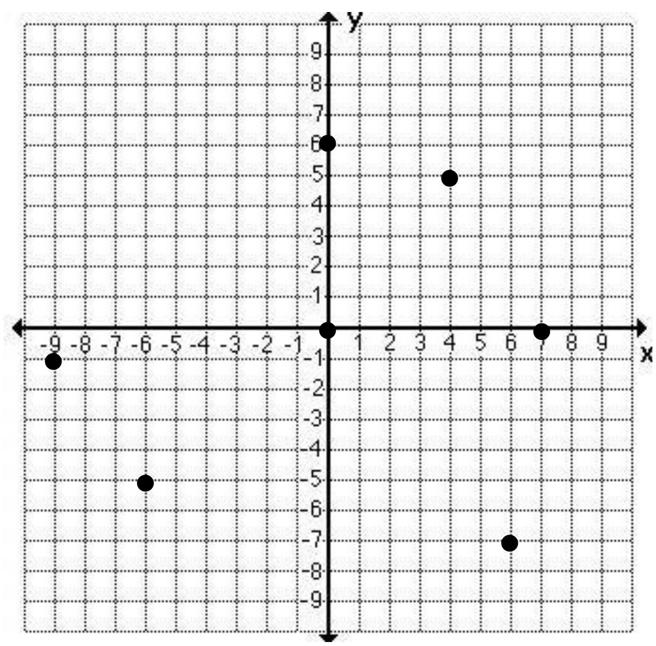
Section 7.1a – Practice Questions

1. Map the following Coordinate (x, y) on the 2-D plane (GRID)

$A\ (1, 3)$ $B\ (9, -1)$
$C\ (-4, 4)$ $D\ (-7, -7)$
$E\ (-5, -3)$ $F(1,8)$
$G\ (8, -2)$ $H(-5, 2)$



2. Identify the Coordinates of the given points



3. What does it mean to be a solution to an equation with respect to coordinates (x, y) of a point?

4. What is the $y - intercept$? What is the $\boldsymbol{x - coordinate}$ of every $y - intercept\ point$? Example?

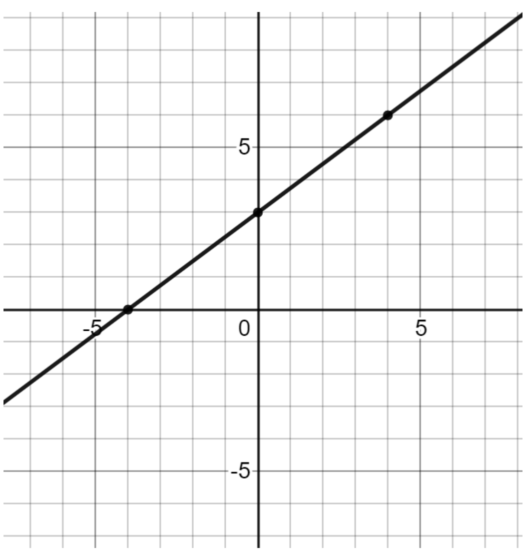
5. What is the $x - intercept$? What is the $\boldsymbol{y - coordinate}$ of every $x - intercept\ point$? Example?

6. For the sake of our Math Vocabulary then:

SLOPE $=$

7. What is the **SLOPE** and **Y-INTERCEPT** of the following lines?

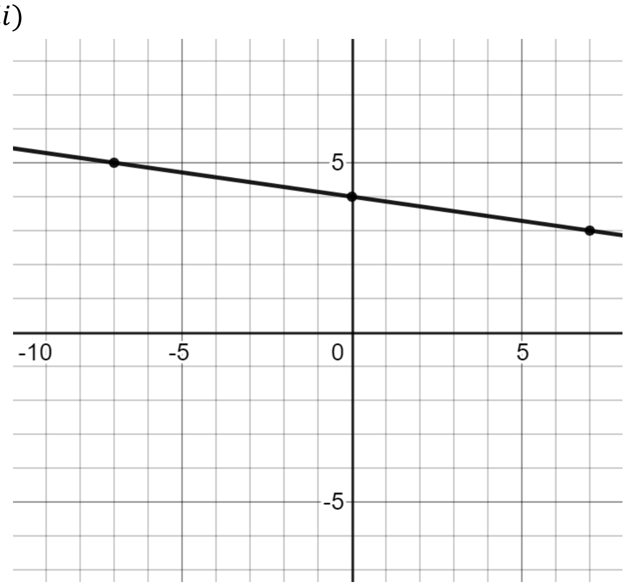
$i)$



$Slope \quad =$

$y - int\ (as\ ordered\ pairs) =$

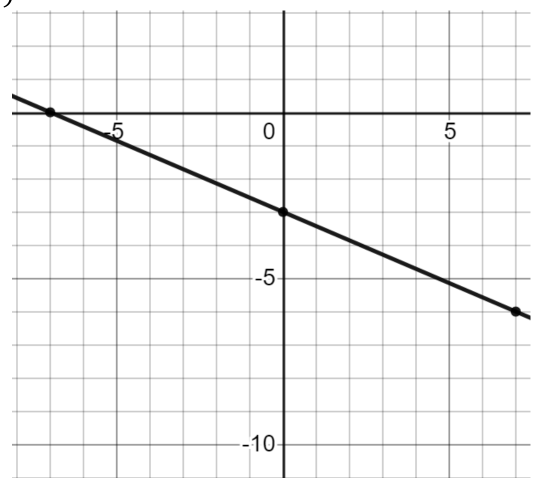
$ii)$



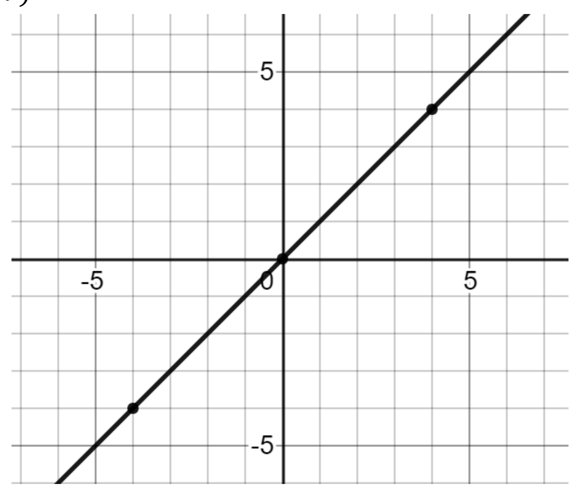
$Slope \quad =$

$y - int\ (as\ ordered\ pairs) =$

$iii)$



$iv)$



$Slope \quad =$

$y - int\ (as\ ordered\ pairs) =$

$Slope \quad =$

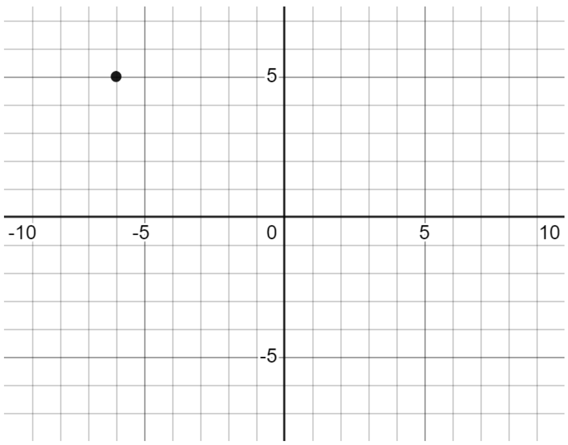
$y - int\ (as\ ordered\ pairs) =$

8. Using the slope formula, what is the Slope of the line that connects the following points on a given line?

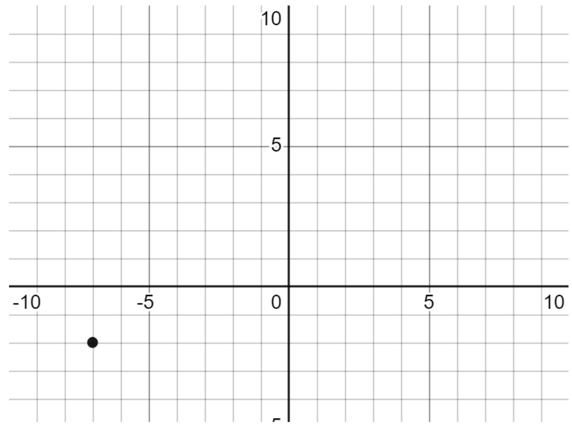
a) $(3, 4)\ and\ (-1, 7)$	b) $(4, 0)\ and\ (5, 6)$
c) $(-7, 5)\ and\ (-7, 8)$	d) $(1, 6)\ and\ (-3, -5)$
e) $(3, 6)\ and\ (-7, 6)$	f) $(-2, 7)\ and\ (10, 5)$

Map the line starting at the provided point and using the given slope

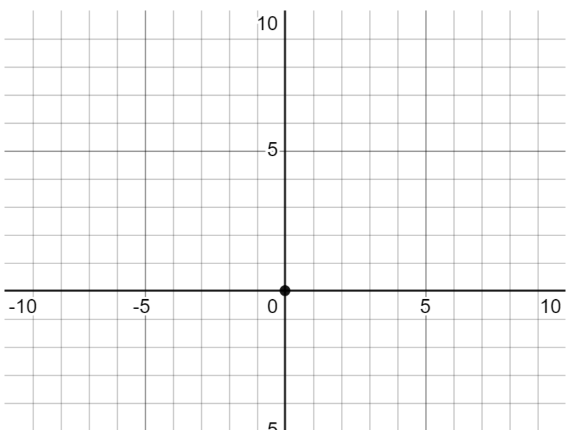
9. Slope: -3



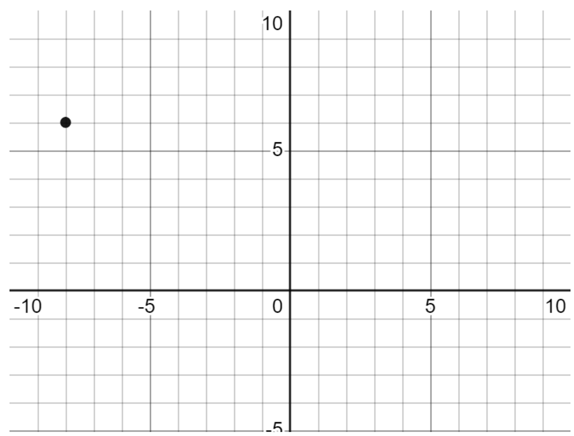
10. Slope: $\frac{1}{5}$



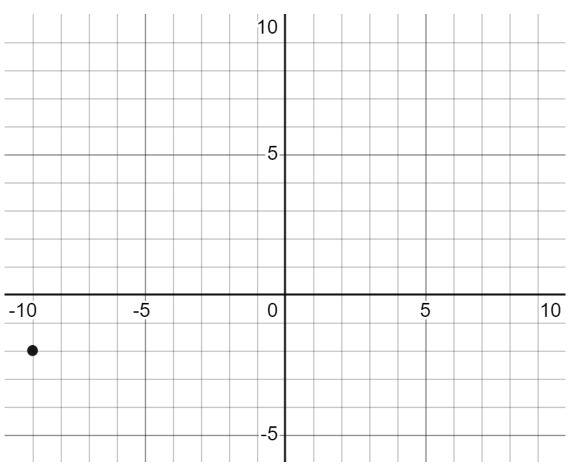
11. Slope: $\frac{5}{2}$



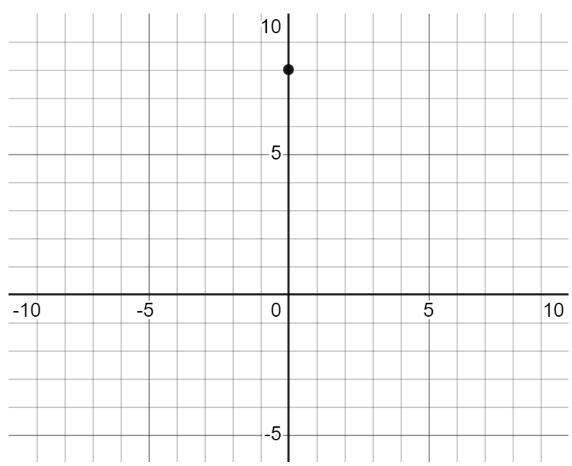
12. Slope: $-\frac{3}{4}$



13. Slope: $\frac{3}{8}$

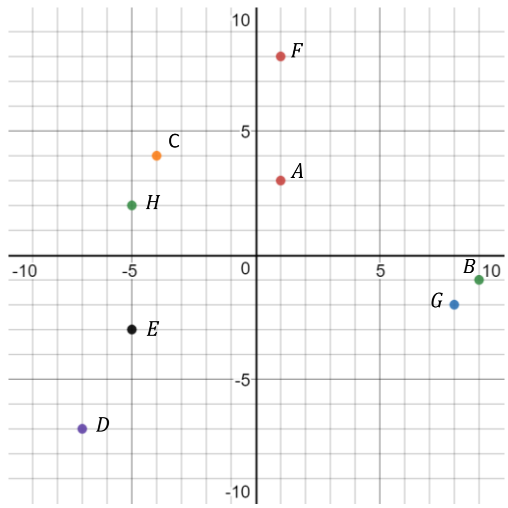


14. Slope: $-\frac{7}{3}$

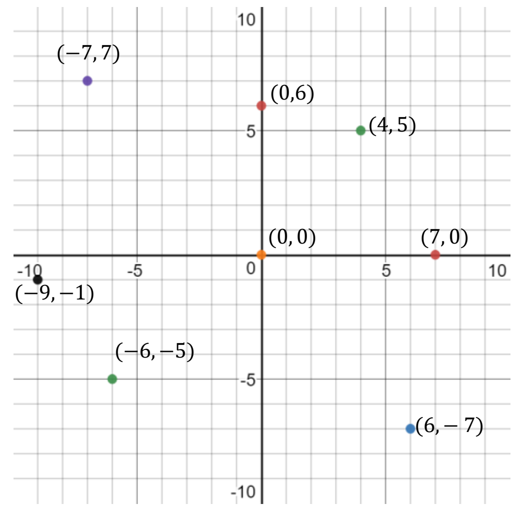


Answer Key – Section 7.1a

1.



2.



3. It means the (x, y) of a point sub into $y = mx + b$ for the x and y and the equation stays equal (OMIT)
4. Where the line goes through the $y - axis$; $x - coordinate$ always 0; $(0, 4)$
5. Where the line goes through the $x - axis$; $y - coordinate$ always 0; $(4, 0)$
6. $Slope = \frac{Change\ in\ Height}{Change\ in\ Length} = \frac{RISE}{RUN}$
7. i) Slope is: $\frac{3}{4}, y - int\ is\ (0, 3)$ ii) Slope is: $-\frac{1}{7}, y - int\ is\ (0, 4)$

   iii) Slope is: $-\frac{3}{7}, y - int\ is\ (0, -3)$ iv) Slope is: $1, y - int\ is\ (0, 0)$

8. a) $\frac{3}{-4} = -\frac{3}{4}$ b) $\frac{6}{1} = 6$ c) $\frac{3}{0} = Undefined$

   d) $\frac{-11}{-4} = \frac{11}{4}$ e) $\frac{0}{-10} = 0$ f) $\frac{-2}{12} = -\frac{1}{6}$

9. See Website Copy
10. See Website Copy
11. See Website Copy
12. See Website Copy
13. See Website Copy
14. See Website Copy

Extra Work Space