Math 9 – Unit 7: Coordinate Geometry

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Lesson 7.3: Slope of a Line

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Learning Goal: We are learning how slope impacts a linear equation. It's all downhill from here!

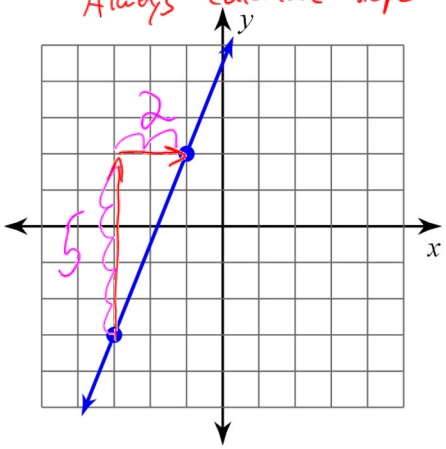
In this lesson, we will explore the most significant property of a linear relationship: the slope! The slope of a line tells us how the relationship is changing and can be thought of as how slanted/steep the line is. It has many important applications such as engineering the initial climb of a roller coaster to making safe ramps, but today we will focus on the algebra and understanding how to calculate the slope of a line.

First, let's look at the slope from a geometric perspective. The slope, defined by the letter *m* for no apparent reason, is: $m = \frac{Rise}{Run}$ → how the line increases or decreases vertically; → how the line inc/dec horizontally

(m = slope)

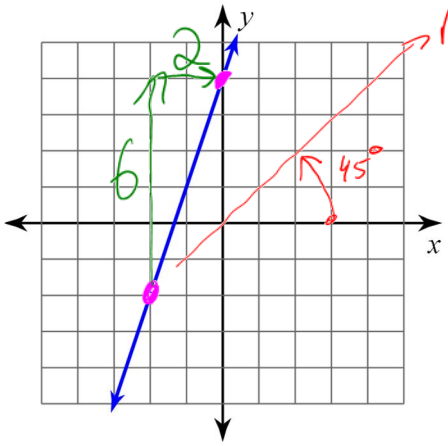
Example 1: Given the line with two points, calculate the slope.

Always calculate slope left to right.



$$m = \frac{Rise}{Run} = \frac{5}{2}$$

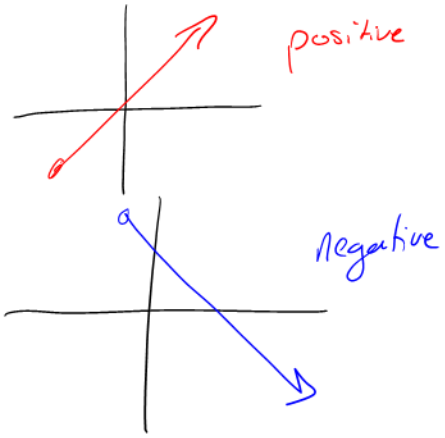
Example 2: Given the line, locate two points, then calculate the slope.

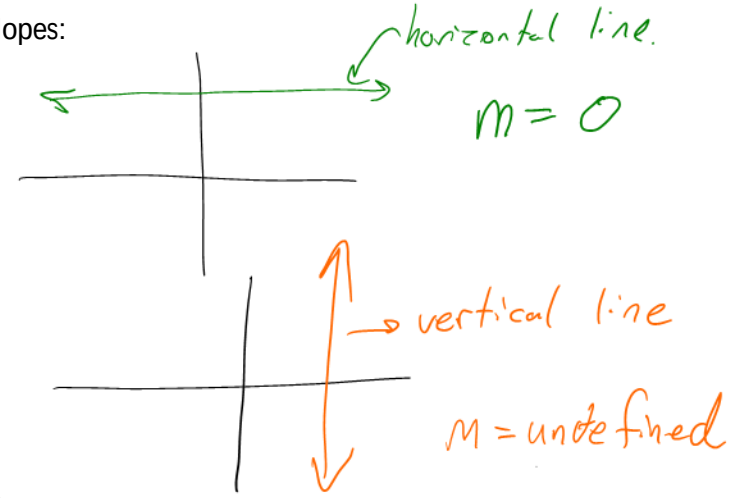


m = 1

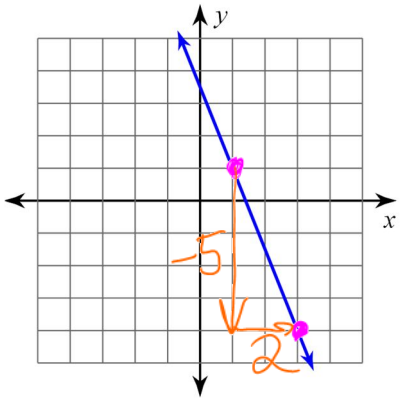
$$m = \frac{6}{2} = \frac{3}{1} \text{ or } 3$$

Are slopes always positive? There are 4 possible slopes:

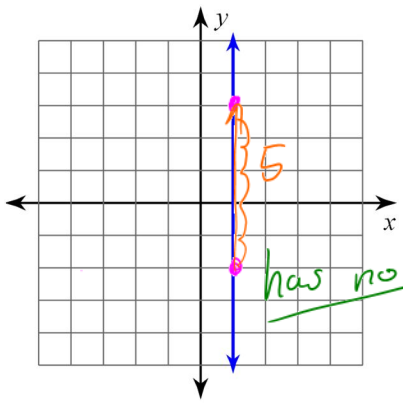




Example 3 and 4: Calculate the slopes of each line.

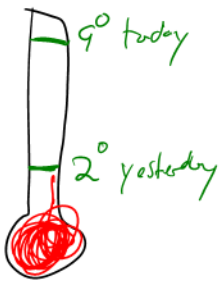


$m = \frac{-5}{2}$



$m = \frac{5}{0}$ = undefined

Now that we know about slope, we can derive a formula so that we do not need a graph.



The change in temperature is $9 - 2 = 7°C$

The change in temp is $-3 - 8 = -11°C$

Note: Change = today − yesterday

= 2nd temp − 1st temp

= $temp_2 - temp_1$

Rise = the change in y's

Run = the change in x's

↳ Δ → delta

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

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

2nd point 1st point

Examples 5-8: Given the points, calculate the slope.

5. $(7,-10),(9,-7)$

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

$m = \frac{-7 - (-10)}{9 - 7}$

$m = \frac{3}{2}$

6. $(-6,-17),(-20,11)$

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

$m = \frac{11 - (-17)}{-20 - (-6)} = \frac{28}{-14} = \frac{-2}{1}$

7. $(6,-12),(6,1)$

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

$m = \frac{1 - (-12)}{6 - 6} = \frac{13}{0}$

m = undefined

8. $(-3,9),(3,9)$

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

$m = \frac{9 - 9}{3 - (-3)} = \frac{0}{6}$ $m = 0$

Example 9: A ramp needs to be constructed to go from the ground to a doorway. The doorway is 90 cm from the ground and the ramp needs a slope of $\frac{2}{9}$.

a) Calculate how far the ramp will start from the edge of the house.

b) Calculate the length of the ramp.

Example 10 and 11: Calculate the missing coordinate.

10. $(2, y)$ and $(-3, -2)$; slope: $\frac{3}{5}$

11. $(x, 4)$ and $(-5, 10)$; slope: $\frac{3}{2}$

Success Criteria

- I can identify the four types of slope: positive, negative, zero, undefined
- I can find the slope of a line graphically by studying its $\frac{rise}{run}$
- I can calculate the slope of a line algebraically by using the formula $m = \frac{y_2 - y_1}{x_2 - x_1}$
- I can find a missing coordinate, if given the slope