

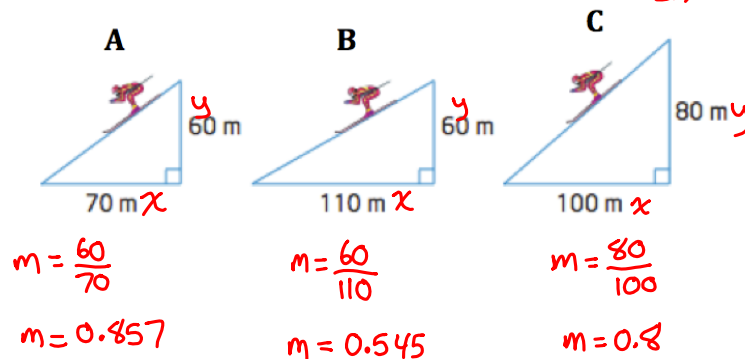
5.3a Slope

Investigation

Slope: A measurement of the steepness of a line.

The following diagrams represent ski hills.

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



1. Rank the hills in order of their steepness, from least to greatest.

- i. B ii. C iii. A

2. A hill rises 2 meters over a horizontal run of 8 meters. A second hill rises 4 meters over a horizontal run of 10 meters. Which is the steeper hill?

Hill 1

$$m = \frac{2}{8}$$

$$m = 0.25$$

Hill 2

$$m = \frac{4}{10}$$

$$m = 0.4$$

Hill 2 is steeper

3. Describe your method for determining steepness:

Calculated the rate of change.

A larger rate of change = steeper slope.

Part 1: How do we find the slope of a line?

The steepness of a line segment is measured by its SLOPE. The slope is the ratio of the RISE to the RUN and is often represented by the letter m.

You should maybe be starting to make a connection; what else did we use the letter m to represent?

RISE: the vertical distance between two points (Δy)

RUN: the horizontal distance between two points (Δx)

$$\text{Slope} = m = \frac{\text{rise}}{\text{run}} \quad \text{or} \quad \frac{\Delta y}{\Delta x}$$

When determining the rise and run of a line from its graph you must know that:

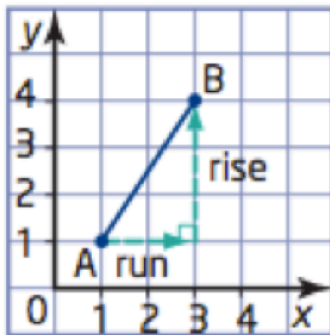
Counting units in the upward direction gives a POSITIVE rise

Counting units in the downward direction gives a NEGATIVE rise

Counting units to the right gives a POSITIVE run

Counting units to the left gives a NEGATIVE run

Example 1: Count the units on the grid to determine the rise and run.



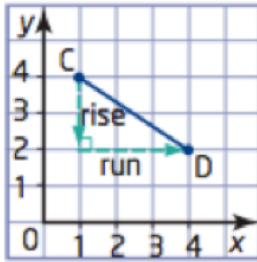
$$\text{rise} = \underline{3}$$

$$\text{run} = \underline{2}$$

What's the slope of this line?

$$m = \frac{\text{rise}}{\text{run}} = \frac{3}{2}$$

Example 2: Count the units on the grid to determine the rise and run



$$\text{rise} = \underline{-2}$$

$$\text{run} = \underline{3}$$

What's the slope of this line?

$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{3}$$

Looking at example 1:

Is the slope positive or negative? POSITIVE

What direction does the line go? Up to the right

Looking at example 2:

Is the slope positive or negative? NEGATIVE

What direction does the line go? Down to the right

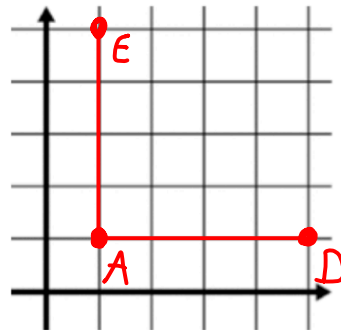
Conclusion about positive and negative slopes:

A line that goes up to the right has a positive slope.

A line that goes down to the right has a negative slope.

Part 2: Finding the slope of vertical and horizontal lines

Step 1: Plot the points A(1,1) and D(5,1) on the graph provided. Connect the points to form the line segment AD.



Step 2: Determine the rise and the run of line AD

rise = 0

run = 4

$$m = \frac{0}{4} = 0$$

The slope of any horizontal line is 0

Step 3: Plot the point E(1,5) on the same grid. Connect it to point A to form the line segment AE.

Step 4: Determine the rise and the run of line AE

$$\text{rise} = 4 \qquad \text{run} = 0 \qquad m = \frac{4}{0} = \text{undefined}$$

The slope of any vertical line is undefined

Part 3: Practice Finding Slopes

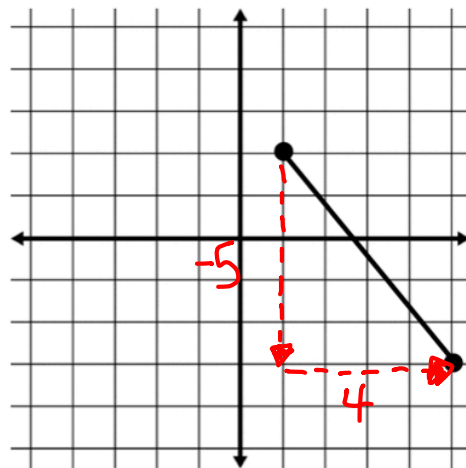
Calculate the slope of each line segments

Example 3:

rise is: -5

run is: 4

$$m = \frac{\text{rise}}{\text{run}} = \frac{-5}{4}$$

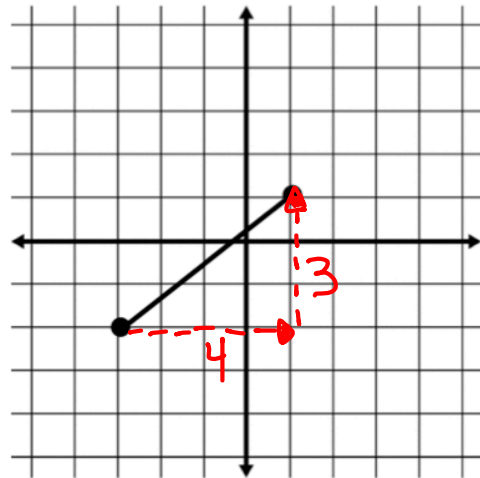


Example 4:

rise is: 3

run is: 4

$$m = \frac{3}{4}$$



Example 5: The ramp at a loading dock rises 2.5 meters over a run of 4 meters.

What is the slope of the ramp?

$$m = \frac{\text{rise}}{\text{run}} = \frac{2.5}{4} = 0.625$$

