Unit 5 Lesson 2

Warm Up: Identify the following as linear or non-linear. Justify your reasoning.

Every time x goes up by 2, y goes down by 3

(Note: when x goes up by 4 y goes down by 6 which is equivalent to going down by 3 for every 2 x goes up) ∴ LINEAR

x	y	
-6	11	8 − 11 = −3
-4	8	2 − 8 = −6
0	2	−1 − 2 = −3
2	-1	−4 + 1 = −3
4	-4	−7 + 4 = −3
6	-7	−10 + 7 = −3
8	-10	

(2, 4, 2, 2, 2 mark the changes in x between consecutive rows)

Unit 5 – Linear Relations I

Day 2 – Slope

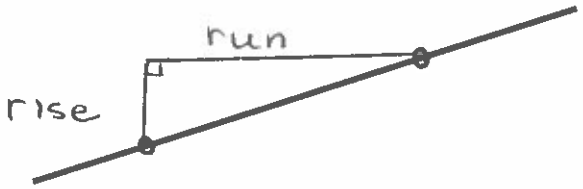
Today we will:

1. Define slope.
2. Identify different methods to determine slope of a line.

Lines and Slope

The slope of a line is the steepness of the line.

To calculate the slope, we look at the change in distance, both vertically and horizontally, from one point to another point on the line.



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

Note: Instead of writing the word slope all of the time, in math we use a lower case m. This comes from the French word "monter" which means to climb or to go up!

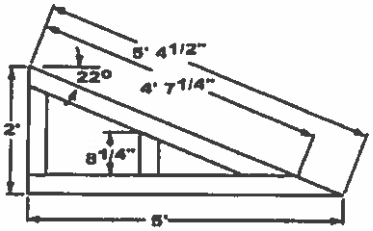
Why is being able to determine the steepness of a line an important skill? *see next page*

- safety when designing a ramp or a road.
- "pitch" of roof in high snowfall areas.

What is the slope of the skateboard ramp above?

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

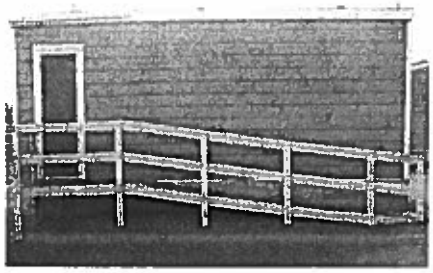
$$= \frac{2}{5}$$



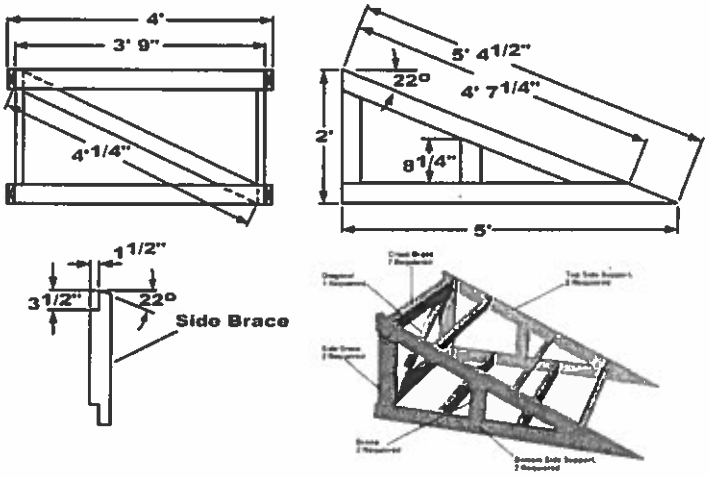
Explain the meaning of the slope in this situation.

There is a vertical rise of 2 feet for a horizontal run of 5 feet.

Why is being able to determine the steepness of a line an important skill?



Skateboard Ramp Plans



What is the slope of the skateboard ramp above?

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$

slope =

Explain the meaning of the slope in this situation.

Example 1: Determine the slope of each line segment given on the graph below.

$m_{AB} = \frac{5}{4}$

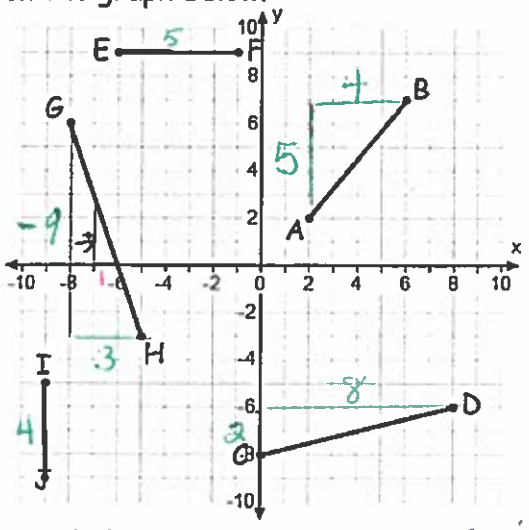
$m_{CD} = \frac{2}{8} = \frac{1}{4}$

$m_{EF} = \frac{0}{5} = 0$

$m_{GH} = \frac{-9}{3} = \frac{-3}{1} = -3$

$m_{IJ} = \frac{4}{0}$ = undefined

* reduce all slopes to lowest terms



Is there a way to calculate the slope if we are not given the graph, but instead just have two points that are on the line?

$m = \frac{\text{Change in } y\text{-values}}{\text{Change in } x\text{-values}}$

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

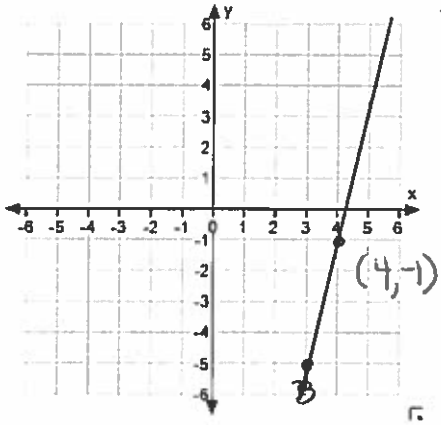
$m = \frac{y_2 - y_1}{x_2 - x_1}$

A (2,2)
B (6,7)

$m_{AB} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{7-2}{6-2} = \frac{5}{4}$

Example 2: Given that a line has a slope of 4 and goes through the point B(3, -5), find the coordinates of another possible point on the line.

Method 1: Using a graph



* plot point B(3,-5)

$m = 4$

$m = \frac{4}{1}$ rise / run

rise 4, run 1 from B

Method 2: Using the coordinate $m = \frac{4}{1}$

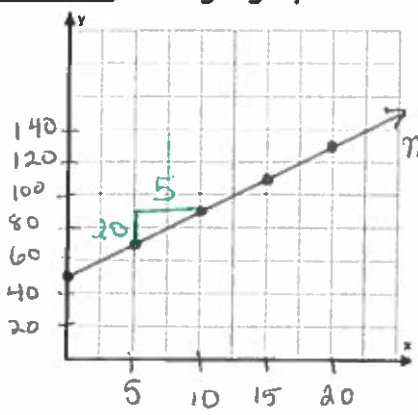
run (x direction) is 1
rise (y-direction) is 4

Add these to the x and y values of the given point.

(3+1, -5+4)
= (4, -1)

Example 3: Determine the slope of the line given by the table of values.

Method 1: Using a graph



$m = \frac{\text{rise}}{\text{run}} = \frac{20}{5} = 4$

Method 2: Using the table

Δx	x	y	Δy
	0	50	
5			20
	5	70	
5			20
	10	90	
5			20
	15	110	
5			20
	20	130	

← same as 'first differences'

$m = \frac{\Delta y}{\Delta x} = \frac{20}{5} = 4$

OR Pick 2 points and use $m = \frac{y_2 - y_1}{x_2 - x_1}$

(0,50) (5,70) $m = \frac{70-50}{5-0} = \frac{20}{5} = 4$
x_1 y_1 x_2 y_2