

Assignment Self-Monitoring Sheet

Welcome 9th Grade!	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: <u>9/11</u> Topic: _____	0 1 2	I read more about Dr. Okikiolu
Tuesday Date: _____ Topic: _____	0 1 2	
Wednesday Date: _____ Topic: _____	0 1 2	
Thursday Date: _____ Topic: _____	0 1 2	
Friday Date: _____ Topic: _____	0 1 2	



Class Plan:

1. Assess work on IB Rubric
2. Warm-up
3. What is Gradient (Slope)?
4. Types of Gradient and how do we solve?
5. Joke Break
6. Develop formula
7. Choice of Practice

Assess using an IB Rubric

UNIT 1: Linear Relationships

Key Concept: Relationships

Related Concept(s): Change, Measurement

Global Context: Scientific and technical innovation

Statement of Inquiry: Measuring the relationship between a teacher's height and the constant change of units.

Task Title: Measuring Cups

Task Description: Students will estimate a teacher's height using Styrofoam cups and multiple representations of linear relationships.

Complete: All necessary pieces are a part of the final work.

Coherent: Descriptions and explanations are understood using the language developed in the unit.

Concise: Not including unnecessary pieces of information.

Assess using an IB Rubric

Criterion	IB Level	IB Descriptors <i>(from subject guide)</i>	S	T	Task Descriptors
Criterion C: Communication	0	<ul style="list-style-type: none"> The student does not reach a standard described by any of the descriptors below 			<ul style="list-style-type: none"> Work is missing, or... has not reached a standard described by any of the descriptors given below
	1	The student is able to: <ul style="list-style-type: none"> Use limited mathematical language. Use limited forms of mathematical representation to present information. 			<ul style="list-style-type: none"> Some representations are present: <ul style="list-style-type: none"> - Graph - Table - Equation - Mathematical Language - Real-life Context Little or no consistency between representations Incomplete hypothesis or summary Table & graph are scaled incorrectly on axis The piece of work is difficult to understand. The piece of work is unorganized.
	2	<ul style="list-style-type: none"> Communicate through lines of reasoning that are difficult to interpret 			

Assess using an IB Rubric

Criteria	3	The student is able to:	<ul style="list-style-type: none">• Most representations are present:<ul style="list-style-type: none">- Graph- Table- Equation- Mathematical Language- Real-life Context• Some consistency between representations• Contains hypothesis or summary• Table & graph are scaled incorrectly on axis• Written work is complete:
	4	<ul style="list-style-type: none">• Use some appropriate mathematical language• Use appropriate forms of mathematical representation to present information adequately.• Communicate through lines of reasoning that are complete.	

Assess using an IB Rubric

5	<p>The student is able to:</p> <ul style="list-style-type: none"> • Usually use appropriate mathematical language. • Usually use appropriate forms of mathematical representation to present information correctly. 		<ul style="list-style-type: none"> • All 5 representations are present: <ul style="list-style-type: none"> - Graph - Table - Equation - Mathematical Language - Real-life Context • Consistency between representations is evident • Contains hypothesis and summary • Table & graph are scaled on axis • Written work is complete and coherent: <p>Complete: All necessary pieces are a part of the final work.</p> <p>Coherent: The work is understood using the language developed in the unit.</p> <ul style="list-style-type: none"> • The piece of work is mostly organized and neat.
6	<ul style="list-style-type: none"> • Usually move between different forms of mathematical representation. • Communicate through lines of reasoning that are complete and coherent. • Present work that is usually organized using a logical structure. 		

Assess using an IB Rubric

7	<p>The student is able to:</p> <ul style="list-style-type: none"> • Consistently use appropriate mathematical language • Use appropriate forms of mathematical representation to consistently present information correctly. • Move effectively between different forms of mathematical representation. • Communicate through lines of reasoning that are complete, coherent, and concise. • Present work that is consistently organized using a logical structure. 				
8					

- All 5 representations are accurate:
 - Graph
 - Table
 - Equation
 - Mathematical Language
 - Real-life Context
- Consistency between representations is evident
- Clearly communicates hypothesis and summary
- Table & graph use appropriate scaling on axis
- Written work is complete, coherent, and concise:

Complete: All necessary pieces are a part of the final work.

Coherent: The work is understood using the language developed in the unit.

Concise: The work does not include unnecessary pieces of information.

- The piece of work is organized and neat.

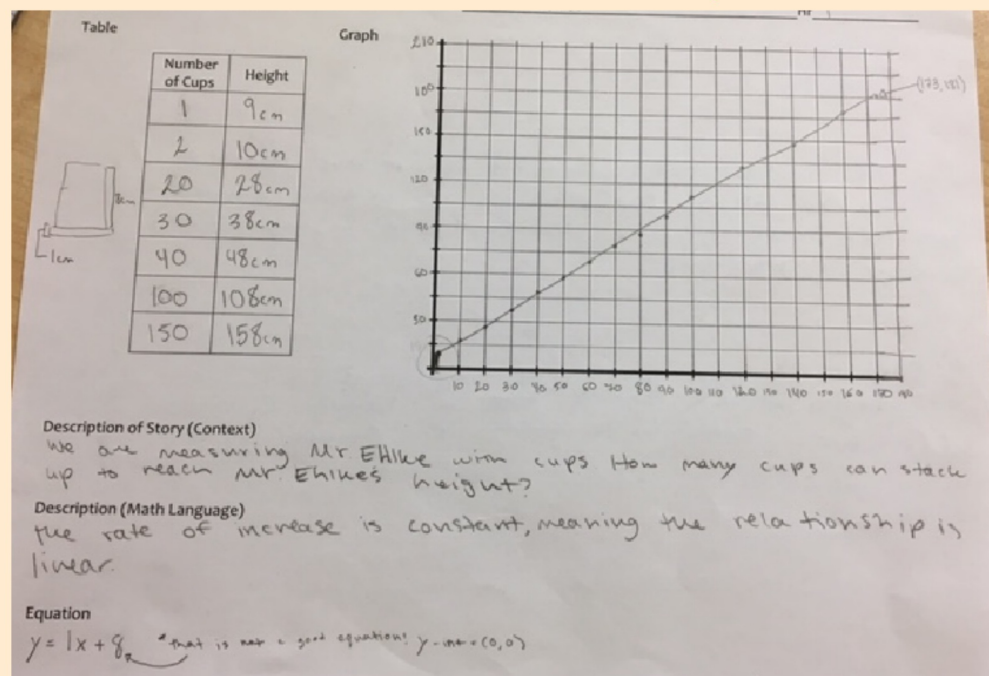
Assess using an IB Rubric 9/19

- Rubrics are given out **before** assessments so you can see how you will be assessed.
- **Far right column** indicates how you can achieve the scores.

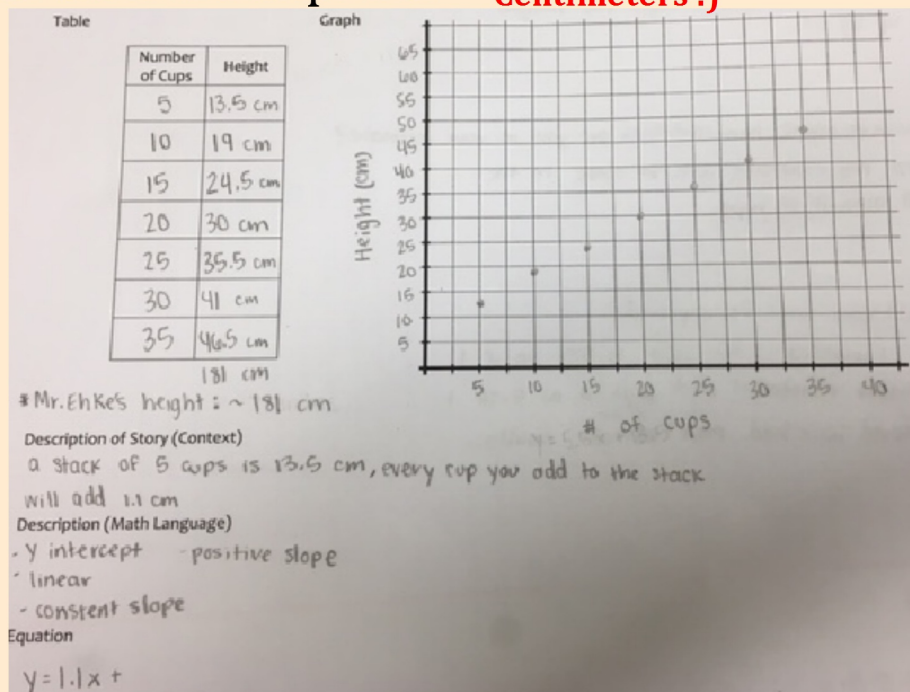
7	The student is able to: <ul style="list-style-type: none">• Consistently use appropriate mathematical language• Use appropriate forms of mathematical representation to consistently present information correctly.• Move effectively between different forms of mathematical representation.• Communicate through lines of reasoning that are complete, coherent, and concise.• Present work that is consistently organized using a logical structure.	<ul style="list-style-type: none">• All 5 representations are accurate:<ul style="list-style-type: none">- Graph- Table- Equation- Mathematical Language- Real-life Context• Consistency between representations is evident• Clearly communicates hypothesis and summary• Table & graph use appropriate scaling on axis• Written work is complete, coherent, and concise: <p>Complete: All necessary pieces are a part of the final work.</p> <p>Coherent: The work is understood using the language developed in the unit.</p> <p>Concise: The work does not include unnecessary pieces of information.</p> <ul style="list-style-type: none">• The piece of work is organized and neat.
---	---	--

IB
Language

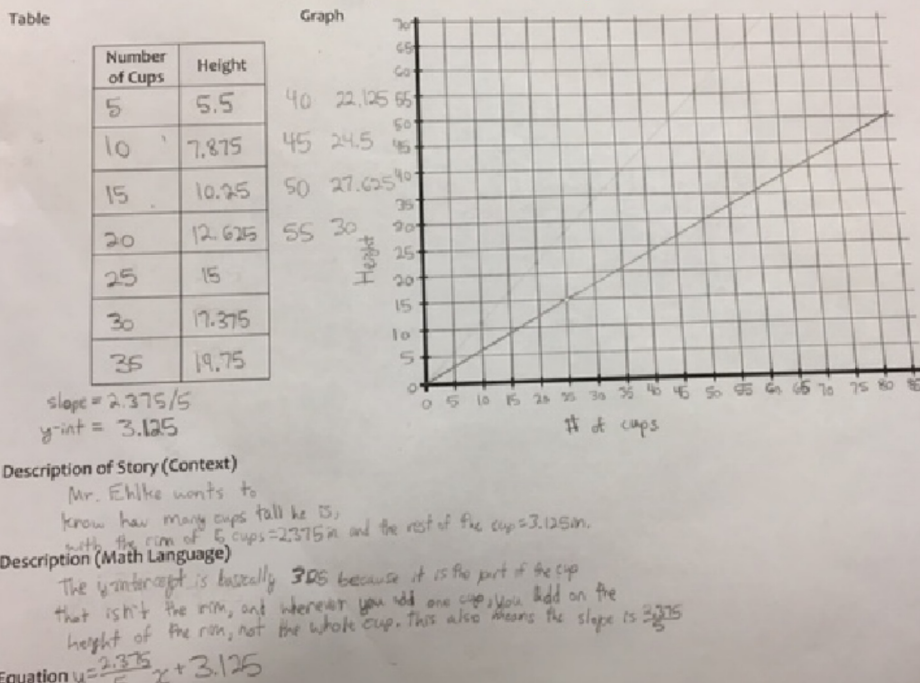
Student Exemplars! Centimeters :)



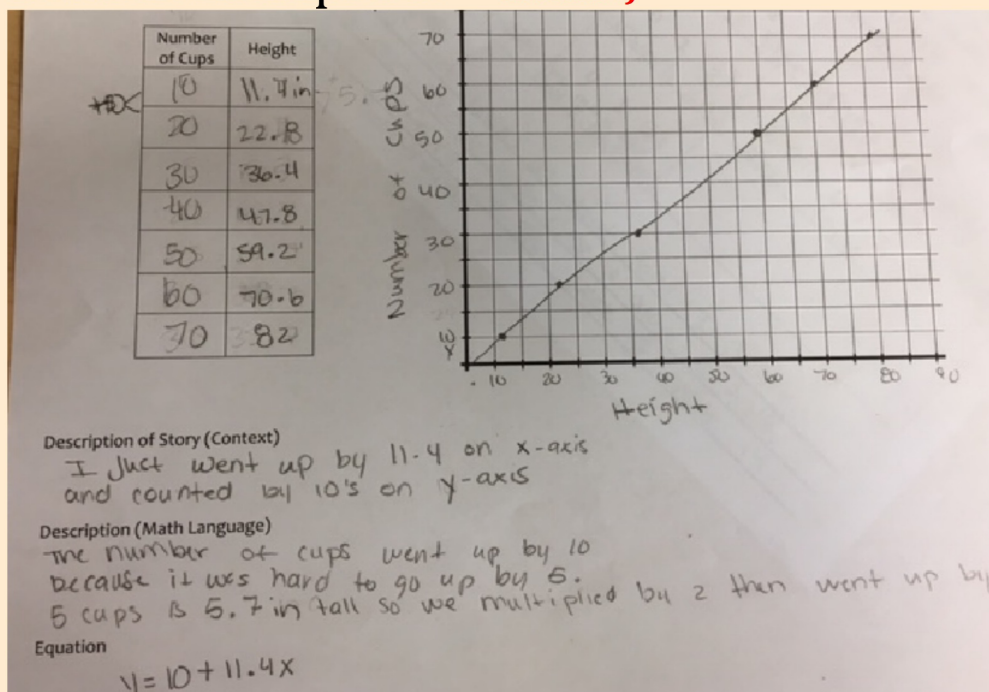
Student Exemplars! Centimeters :)



Student Exemplars! Inches :)



Student Exemplars! Inches :)



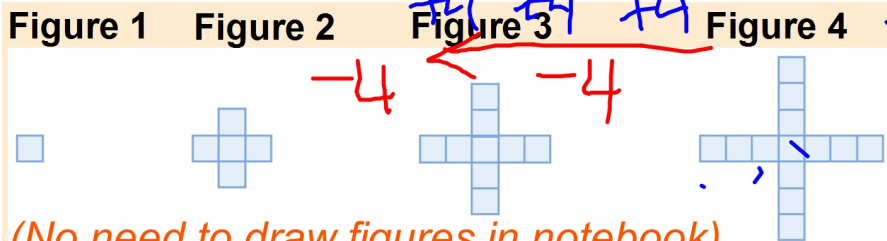
Warm-up: Gradient

Notebook

Write and complete the table.

Figure Number	0	1	2	3	4	5	6	100
Number of tiles	-3	1	5	9	13	17	21	?

Handwritten notes: $+4$ above the transition from Figure 2 to 3, $+4$ above the transition from Figure 3 to 4, and 397 written next to the question mark.



Done? What rule would model this pattern?

$$y = 4x - 3$$

Warm-up: Gradient (Solution)

Write and complete the table.

Figure Number	0	1	2	3	4	5	6	100
Number of tiles	-3	1	5	9	13	17	21	397

Figure 1



Figure 2



Figure 3

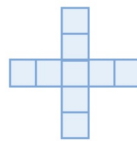
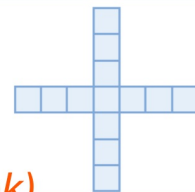


Figure 4



(No need to draw figures in notebook)

Done? What rule would model this pattern?

Rule: Start at -3, add 4 tiles to the previous figure.

Equation: $y = -3 + 4x$

What is Gradient? \approx Slope

- Gradient tells you steepness of a line.
- Gradient is a constant rate of change.
- Gradient tells you how much y increases as x increases.

Equivalent Terms:

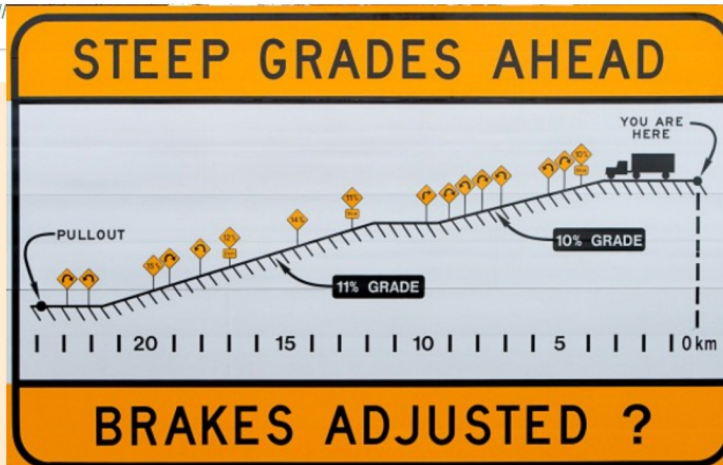
- Slope
- Rise/Run
- Steepness
- Rate of Change

The **grade** (also called slope, incline, gradient, mainfall, pitch or rise) of a physical feature, landform or constructed **line** refers to the tangent of the angle of that surface to the horizontal. It is a special case of the slope, where zero indicates horizontality.



[Grade \(slope\) - Wikipedia](https://en.wikipedia.org/wiki/Grade_(slope))

<https://>



dback

Definition of Gradient Slope



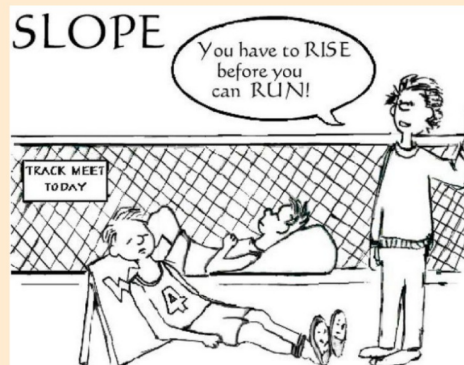
Gradient represents how steep a slope is :
Uphill is Positive, and Downhill slopes are Negative.

The Gradient symbol is “m” for how “mountainous” a slope is.
Rene Descartes invented Gradient, and assigned the letter
“m” as “montagne”, which is French for Mountain.

What types of slopes are represented in lines?

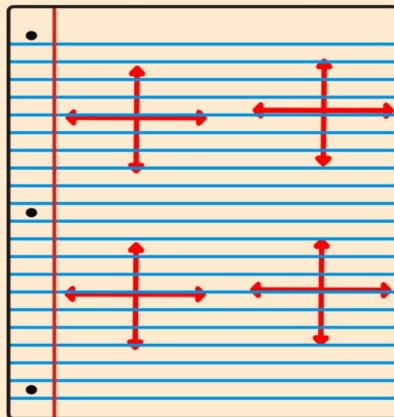


zero
positive
negative
undefined



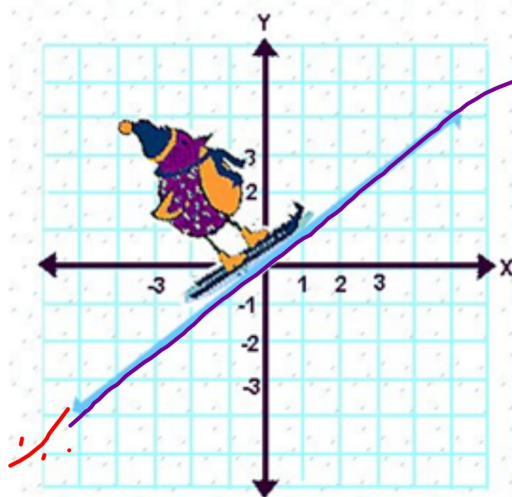
Types of Gradient (Slope)

- 1) Draw 4 x-y axes in notebook
- 2) Draw and label each type of slope



Types of Gradient (Slope)

Positive slope: (Incline) A line that goes up from left to right.



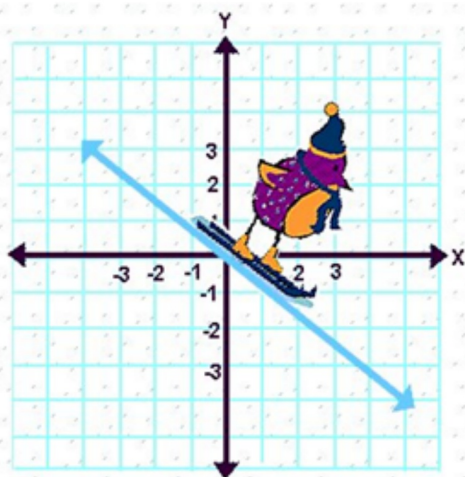
Positive Slope

Lines that have positive slope, slant "up hill" (as viewed from left to right).

SkiBird has to work hard to make it up the hill. He needs to use positive (+) energy to get up the hill.

Types of Gradient (Slope)

Negative slope: (Decline) A line that goes down from left to right.

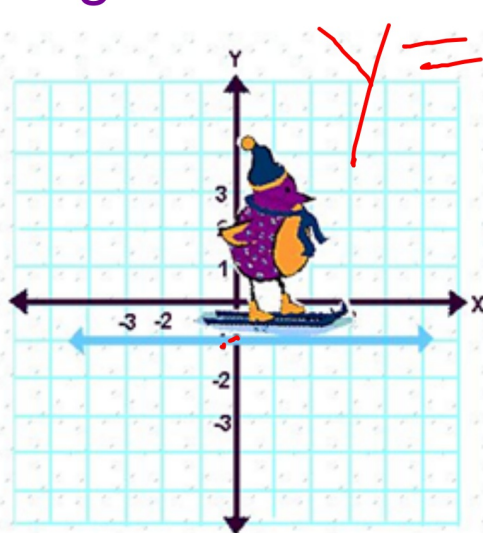


Negative Slope

Lines that have negative slope, slant "down hill" (as viewed from left to right).

SkiBird enjoys the ride down the hill. He needs to occasionally use negative (-) energy to try to slow down.

Types of Gradient (Slope) = $y = c$
Zero slope: (Horizontal line)
Straight line from left to right.



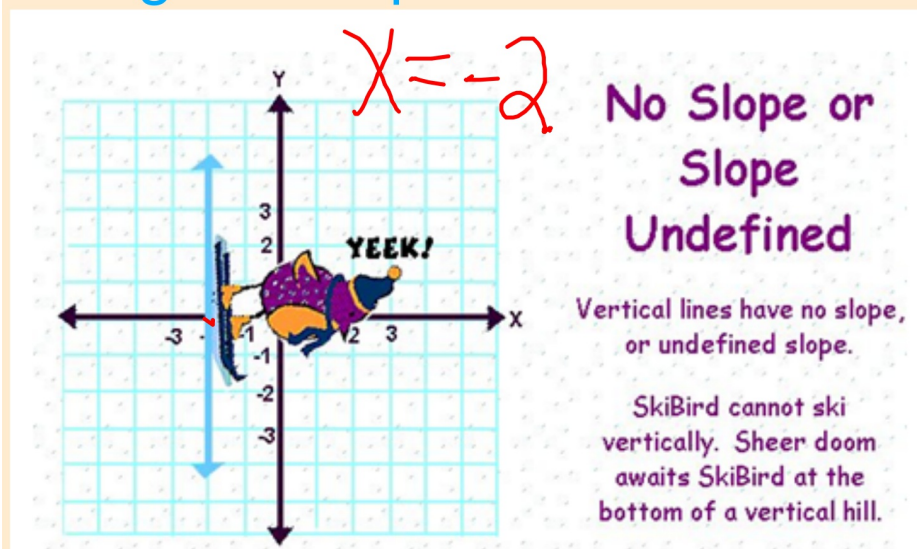
Zero Slope

Lines that are horizontal have zero slope.

SkiBird is cross-country skiing on level ground. He is not working hard to get up a hill, nor is he trying to slow down. His energy level (and his enjoyment level) is at zero.

Types of Gradient (Slope) " $x=c$ "

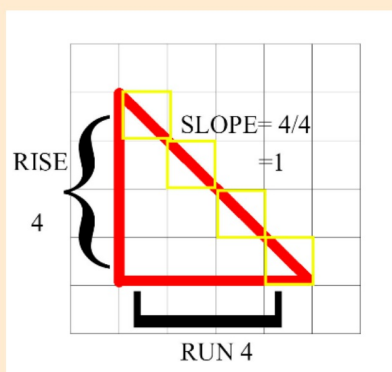
Undefined slope: (Vertical line)
Straight line up and down.



How do we solve for Slope/Gradient?

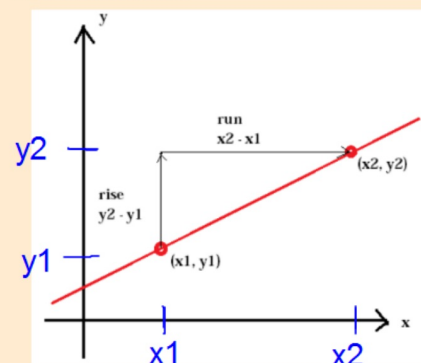


1. Rise/Run Slope Triangle



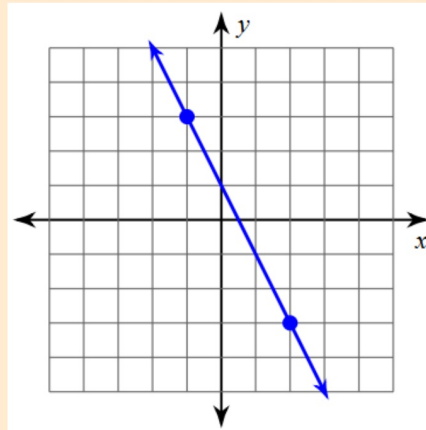
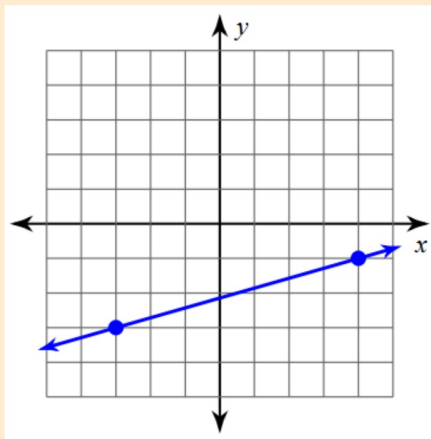
2. Slope/Gradient Formula

**Understand - not just memorize!*

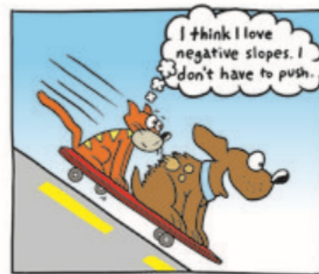
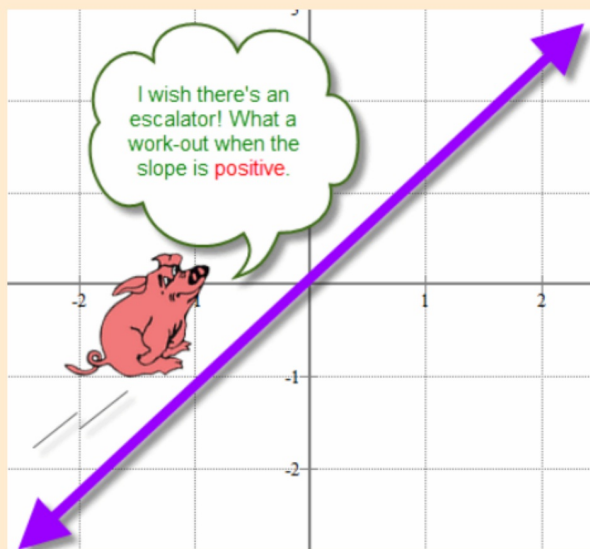


Example: What are the gradients?
Which line is *steeper*?

Don't write. Discuss at your table.



Joke Break :)



"I estimate that we are on a slope of about -0.625 . What do you think?"

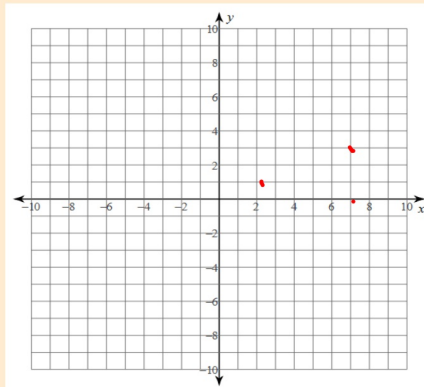


"My math teacher keeps asking me questions. You'd think she'd know all that stuff by now."

Develop a Formula...

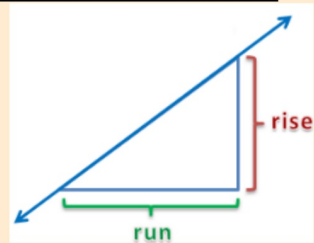
1. Tape a graph into your notebook.
2. Write down points $(2, 1)$ and $(7, 3)$,
and plot them. (x, y) (x, y)
3. Draw a slope triangle and label
side lengths.

**What do you notice
about the points and
the side lengths?**



Develop a Slope/Gradient Formula...

3. Find the rate of change.



4. Find the difference between the x and y values. (*should be side lengths of triangles*)

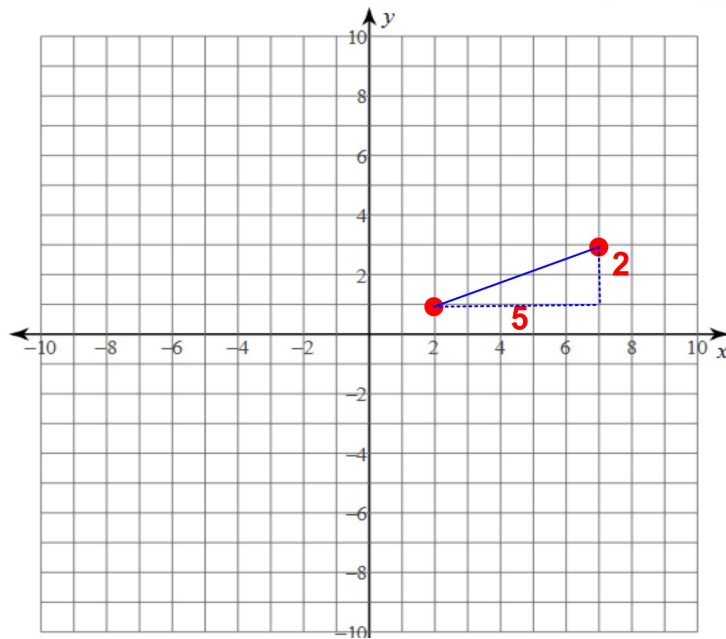
5. Label left point (x_1, y_1) , right point (x_2, y_2)

6. Using (x_1, y_1) and (x_2, y_2) record formula.

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

Develop a Slope/Gradient Formula...

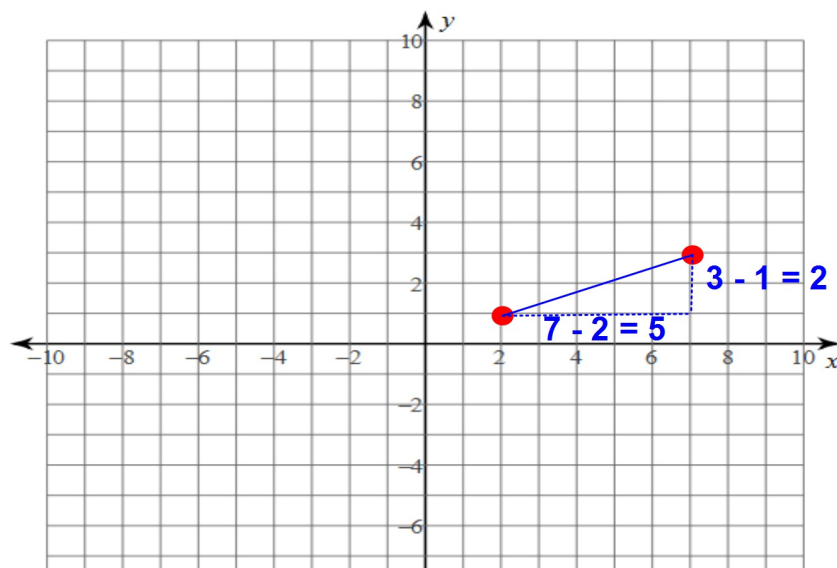
3. Find the rate of change. (2, 1) and (7, 3)



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

Develop a Slope/Gradient Formula...

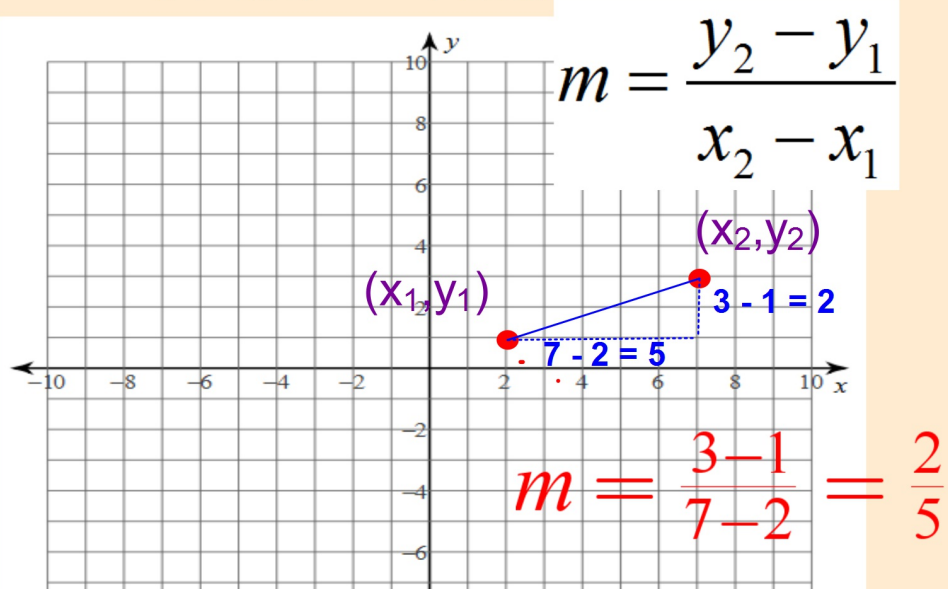
4. Find the difference between the x and y values. (should be side lengths of triangles)



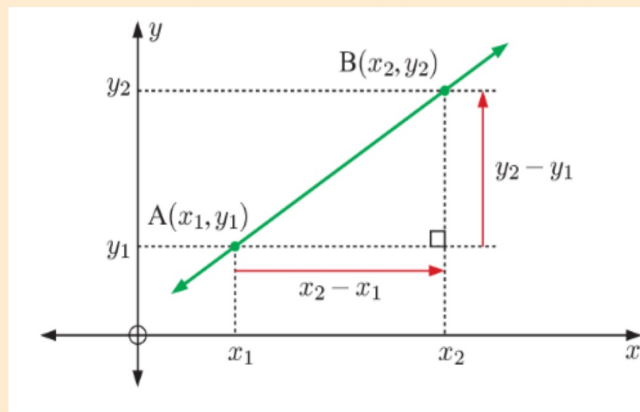
Develop a Slope/Gradient Formula...

5. Label left point (x_1, y_1) , right point (x_2, y_2)

6. Using (x_1, y_1) and (x_2, y_2) record formula.

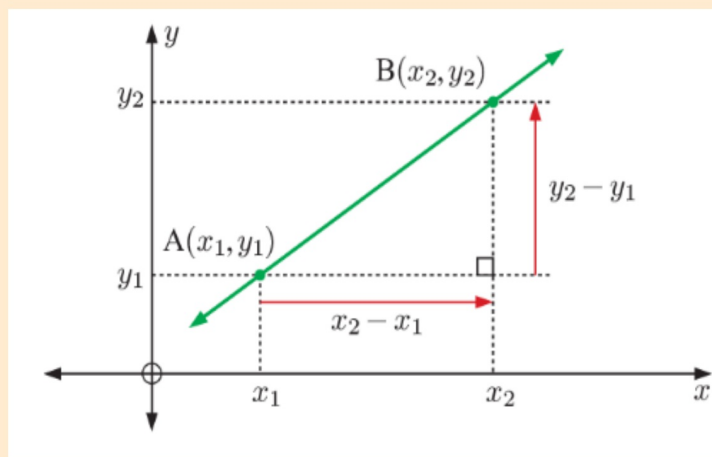


Gradient Formula



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

The Gradient Formula



The **gradient** of the line through (x_1, y_1) and (x_2, y_2) is $\frac{y_2 - y_1}{x_2 - x_1}$.

Exercises....Choose a level where you will be challenged!

1: Textbook problems

(Handout)

8C.1 #2 & #4

8C.2 #1, #3, #4

(#5 a,b)

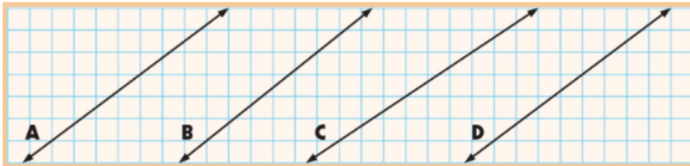
2: Additional Problems

- 1) Find the gradient of the line segment connecting the following points:
 - a. $(-4, 2)$ and $(1, 2)$
 - b. $(1, 13)$ and $(4, -8)$
 - c. $(-18, 5)$ and $(-12, 12)$
 - d. $(-2\frac{1}{2}, -3)$ and $(4\frac{1}{2}, 5\frac{1}{2})$
 - e. $(\frac{11}{2}, -3\frac{1}{5})$ and $(5\frac{1}{2}, 2\frac{1}{2})$
 - f. $(-\frac{3}{2}, \frac{7}{5})$ and $(\frac{7}{3}, \frac{11}{6})$
- 2) What is the gradient of the line $-7y + 8x = 9$? Explain how you found the gradient.
- 3) A line passes through $(2, 4)$ and $(-2, 2)$. Find the value of y if $(6, y)$ lies on the line.
- 4) A line with gradient of -3 passes through $(-8, p)$ and $(2, 3p)$. Find the value of p .
- 5) Given the gradient and a point, find another point that would be on the same line. Show work to support this:
 - a. $m = -3$ and $(-2, 1)$
 - b. $m = \frac{2}{3}$ and $(1, -5)$
- 6) Graph a family of lines of the form $y = 3x + c$ on the same x - y plane, where c is any real number. Describe the pattern in the graph.

**Tonight: Check your work
online with solutions!!**

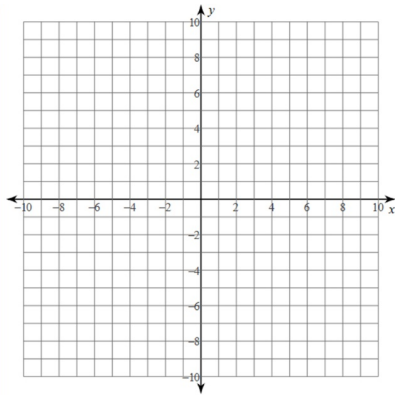
8C.1 #2 & #4

2) Consider the lines:



a) Which 2 lines have the same gradient? _____ b) Steepest line? _____

4) On the same set of axes, draw lines through (0, 0) with gradients 0 , $\frac{1}{3}$, $\frac{3}{4}$, 1 , $\frac{3}{2}$, and 5 .



8C.2 #2 , #3, #4, #5

Show your
teacher any
letter in #2

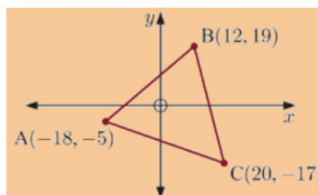
2) Find the gradient of the line segment connecting: [Show work in notebook!]

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

d) $(0, 0)$ and $(4, -3)$ e) $(5, -1)$ and $(5, 5)$ f) $(-4, 3)$ and $(-1, 3)$

3) For triangle ABC shown, find the gradient of:

a) [AB] b) [BC] c) [CA]



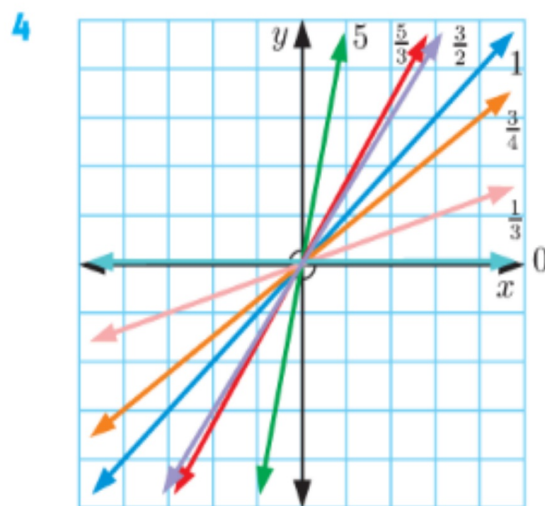
4) Consider points $A(1, 3)$ and $B(4, 5)$

a) Use the gradient formula to find the gradient of line segment:
i. [AB] ii. [BA]

b) Explain your results in a).

Textbook
(Level 1)
Solutions:

2 a A and D b B



Solutions:

2 **a** 5 **b** 4 **c** $\frac{1}{4}$ **d** $-\frac{3}{4}$ **e** undefined

f 0 **g** $\frac{7}{2}$ **h** $-\frac{7}{2}$ **i** 2

3 **a** $\frac{4}{5}$ **b** $-\frac{9}{2}$ **c** $-\frac{6}{19}$

4 **a** **i** $\frac{2}{3}$ **ii** $\frac{2}{3}$

b [AB] and [BA] are the same line segment and so must have the same gradient.

5 **a** gradient [AB] : $\frac{1}{2}$, gradient [BC] : $-\frac{1}{3}$, gradient [CD] : $\frac{8}{3}$,
gradient [AD] : -1

b **i** [AB] and [CD] **ii** [BC] and [AD]

Level 2: Additional Problems

1) Find the gradient of the line segment connecting the following points:

a. $(-4, 2)$ and $(1, 2)$

b. $(1, 13)$ and $(4, -8)$

c. $(-18, 5)$ and $(-12, 12)$

d. $(-2\frac{1}{2}, -3)$ and $(4\frac{1}{2}, 5\frac{1}{2})$

e. $(\frac{11}{2}, -3\frac{1}{5})$ and $(5\frac{1}{2}, 2\frac{1}{2})$

f. $(-\frac{3}{2}, \frac{7}{5})$ and $(\frac{7}{3}, \frac{11}{6})$

2) What is the gradient of the line $-7y + 8x = 9$? Explain how you found the gradient.

|

3) A line passes through $(2, 4)$ and $(-2, 2)$. Find the value of y if $(6, y)$ lies on the line.

4) A line with gradient of -3 passes through $(-8, p)$ and $(2, 3p)$. Find the value of p .

5) Given the gradient and a point, find another point that would be on the same line.

Show work to support this:

a. $m = -3$ and $(-2, 1)$

b. $m = \frac{2}{3}$ and $(1, -5)$

Level 2: Additional Problems (Solutions)

$$m = \frac{8}{7}$$

2) What is the gradient of the line $-7y + 8x = 9$? Explain how you found the gradient.

$$-7y = -8x + 9 \quad y = \frac{8}{7}x - \frac{9}{7} \quad \left. \begin{array}{l} \text{Write in} \\ \text{slope/int. form} \end{array} \right\}$$

3) A line passes through $(2, 4)$ and $(-2, 2)$. Find the value of y if $(6, y)$ lies on the line.

$$m = \frac{4-2}{2-(-2)} = \frac{2}{4} = \frac{1}{2}$$

$$\frac{y-4}{6-2} = \frac{1}{2}$$

$$\frac{y-4}{4} = \frac{1}{2}$$

$$y-4 = 2$$

$$\boxed{y=6}$$

one method!

Level 2: Additional Problems

- 4) A line with gradient of -3 passes through $(-8, p)$ and $(2, 3p)$. Find the value of p .

$$\frac{3p - p}{2 - (-8)} = -3 \quad 2p = -30 \quad \boxed{p = -15}$$

- 5) Given the gradient and a point, find another point that would be on the same line.
Show work to support this:

a. $m = -3$ and $(-2, 1)$ $(-1, -2)$ b. $m = \frac{2}{3}$ and $(1, -5)$ $(4, -3)$

$$\frac{y - 1}{x - (-2)} = -3$$

$$y - 1 = -3 \quad | \quad x + 2 = 1$$
$$\boxed{y = -2} \quad | \quad \boxed{x = -1}$$

$$\frac{y - (-5)}{x - 1} = \frac{2}{3}$$

$$y + 5 = 2 \quad | \quad x - 1 = 3$$
$$\boxed{y = -3} \quad | \quad \boxed{x = 4}$$

Remember....there are an infinite amount of points you could find on the line!!