Assignment Self-Monitoring Sheet

Welcome 9th Grade!	Assignment Effort Grade (Circle One)	Comments (What was interesting or challenging?)
Monday Date: 9/11 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. Warm-up
2. What is Gradient (Slope)?
3. 4 Types of Gradient
4. How do we solve?
5. Joke Break
6. Develop formula
7. Example
8. Choice of Practice

Warm-up: Gradient

Notebook

Write and complete the table.

Figure Number	0	1	2	3	4	5	6	100
Number of tiles								?

Figure 1 **Figure 2** **Figure 3** **Figure 4**

(No need to draw figures in notebook)

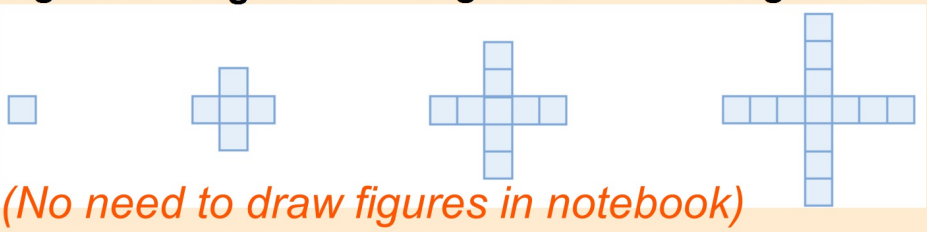
Done? What rule would model this pattern?

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?

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

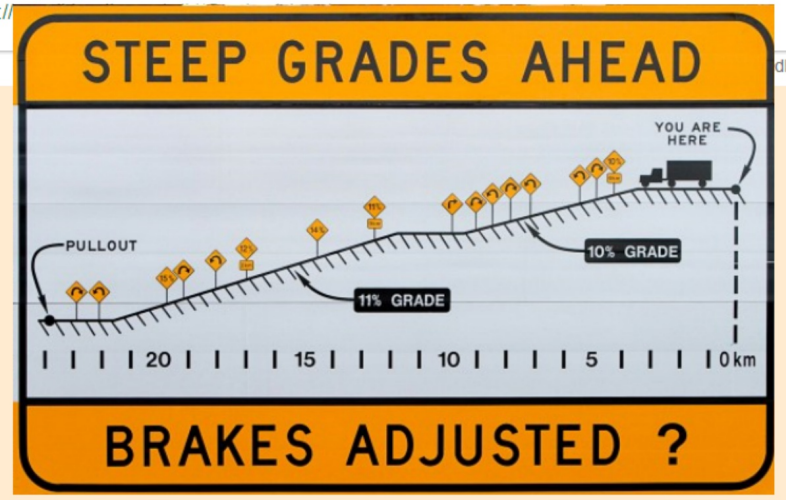
Equivalent Terms:

- 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://

dback



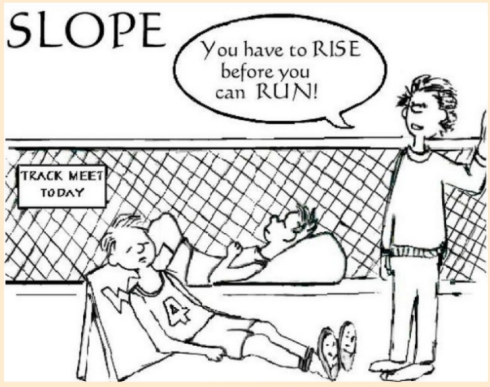
Definition of Gradient Slope

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.

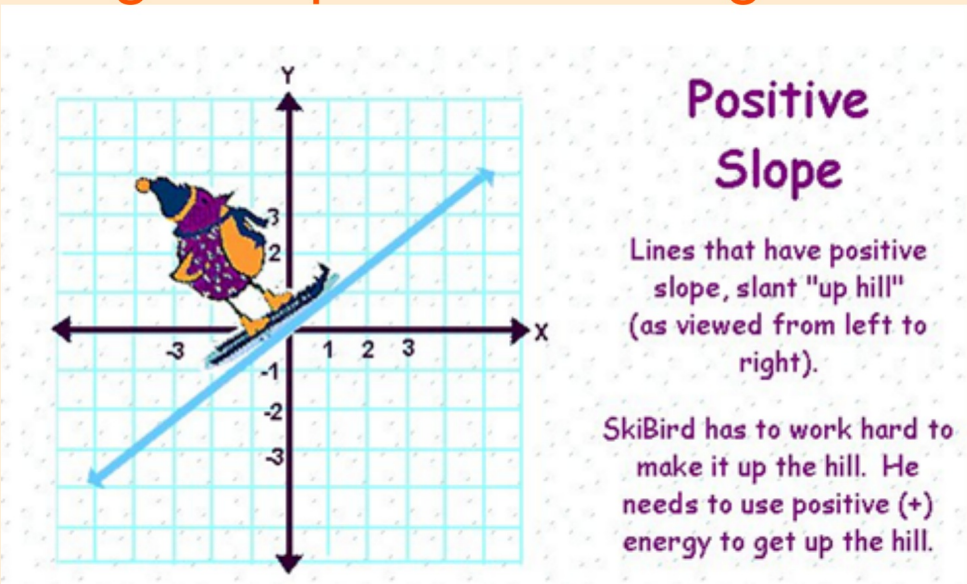
What types of slopes are represented in lines?

Positive
negative
Undefined



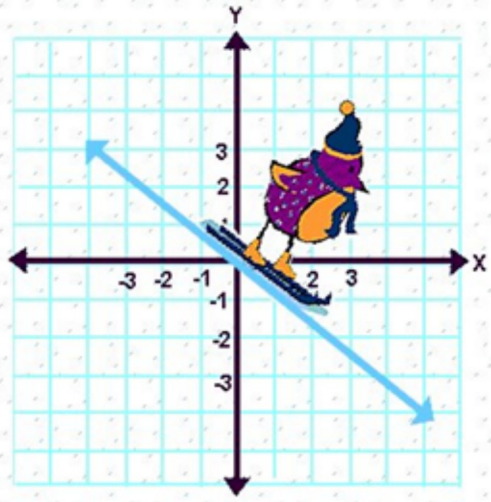
Types of Gradient (Slope)

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



Types of Gradient (Slope)

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



Negative Slope

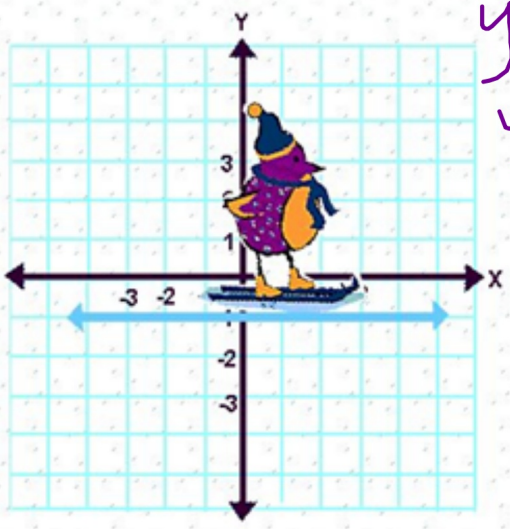
Lines that have negative slope, slant "down hill" (as viewed from left to right).

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

Types of Gradient (Slope)

Zero slope: (Horizontal line)

Straight line from left to right.



$y = -1$

$y = 2$

Zero Slope

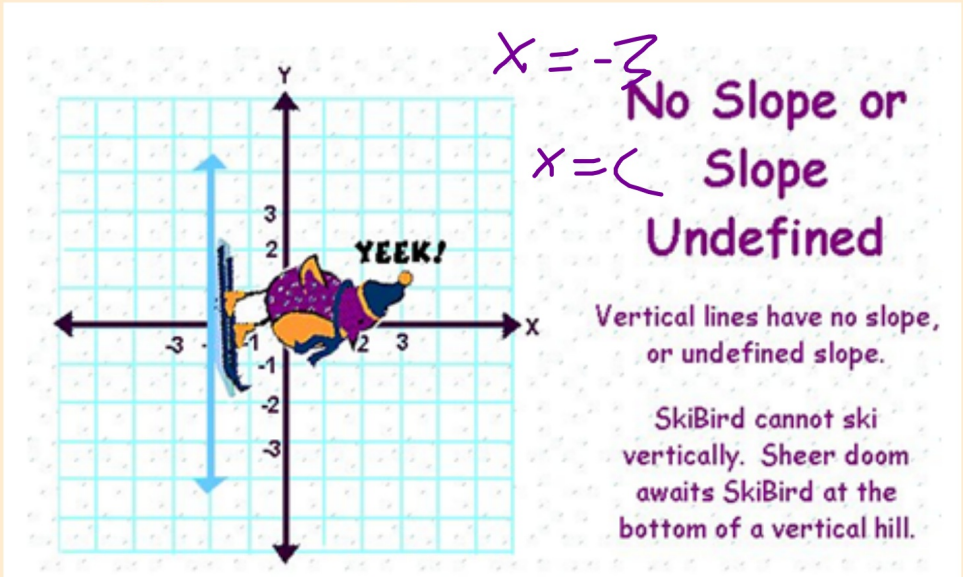
Lines that are horizontal have zero slope.

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.

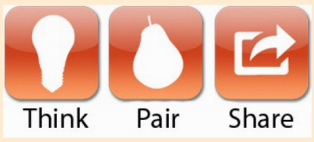
Types of Gradient (Slope)

Undefined slope: (Vertical line)

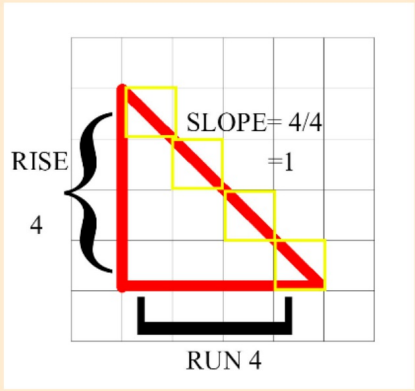
Straight line up and down.



How do we solve for Slope/Gradient?

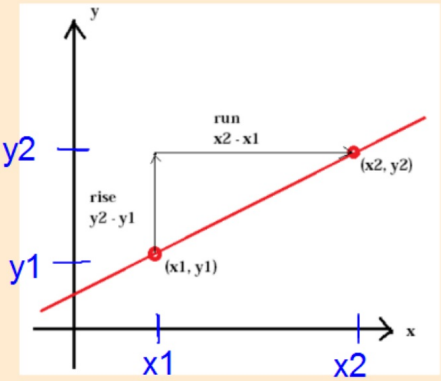


1. Rise/Run Slope Triangle



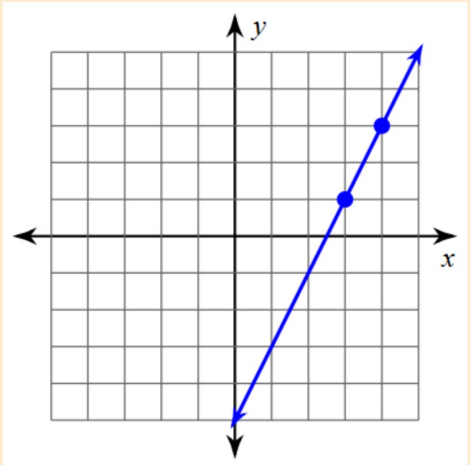
2. Slope/Gradient Formula

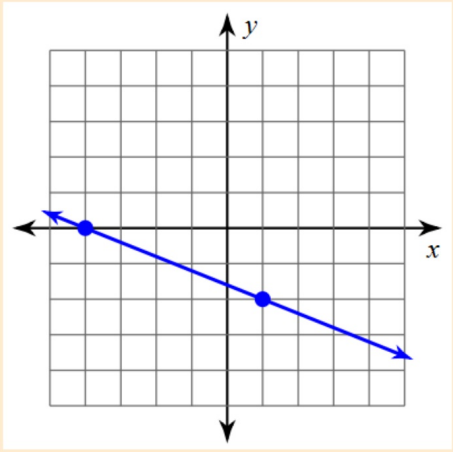
**Understand - not just memorize!*



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

Don't write. Discuss at your table.

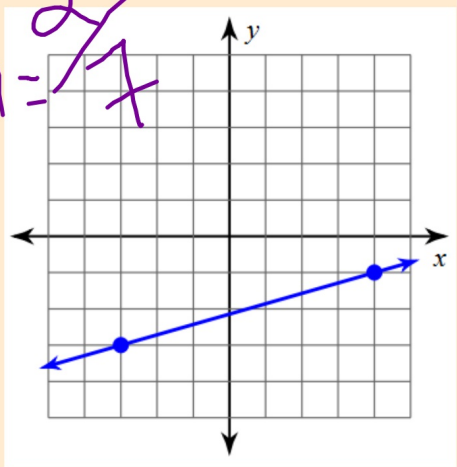




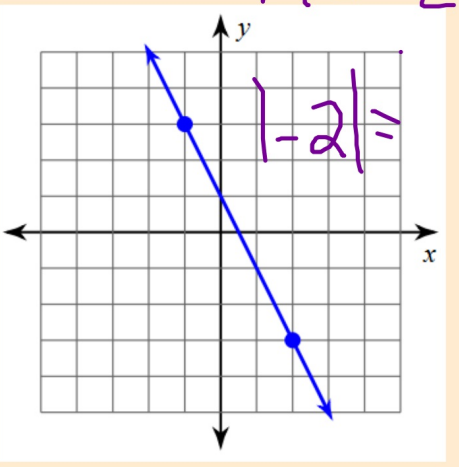
Example: What are the gradients?
Which line is *steeper*?

Don't write. Discuss at your table.

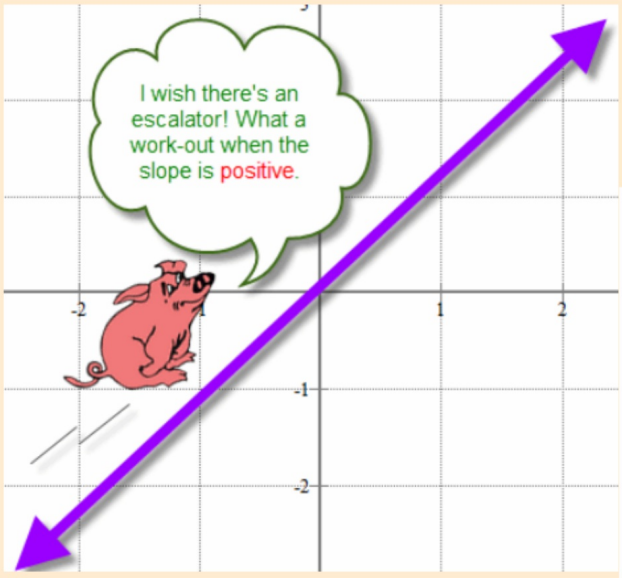
$m = \frac{2}{7}$



$m = -2$



Joke Break :)

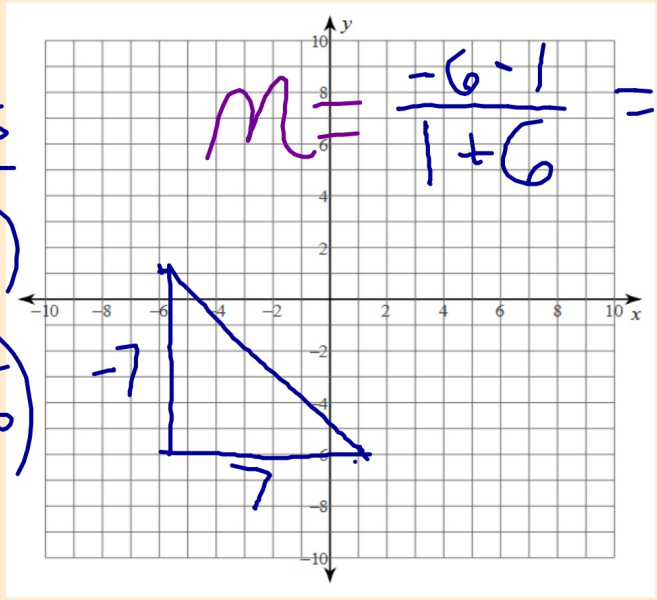


"I estimate that we are on a slope of about -0.625. What do you think?"

"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. As a table, choose two points and plot them.



points

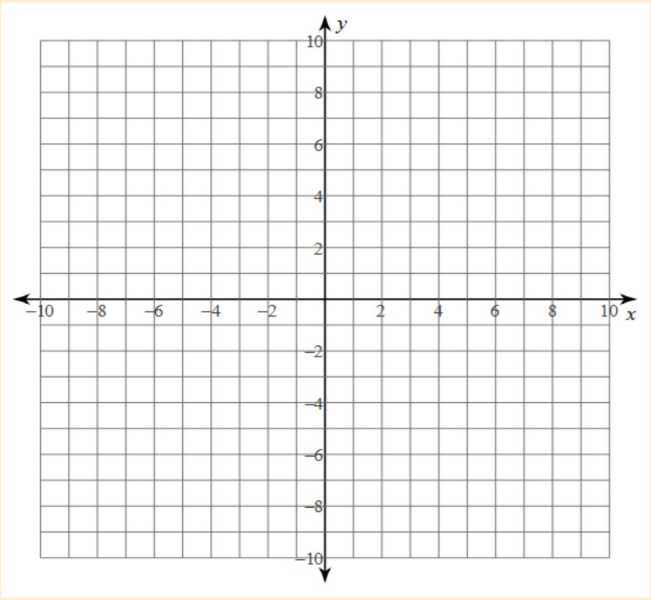
A(−6, 1)

B(1, −6)

$m = \frac{-6-1}{1+6} = \frac{-7}{7} = -1$

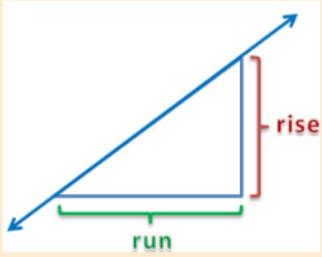
Develop a Formula...

1. Tape a graph into your notebook.
2. As a table, choose two points and plot them.



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 traingles)*

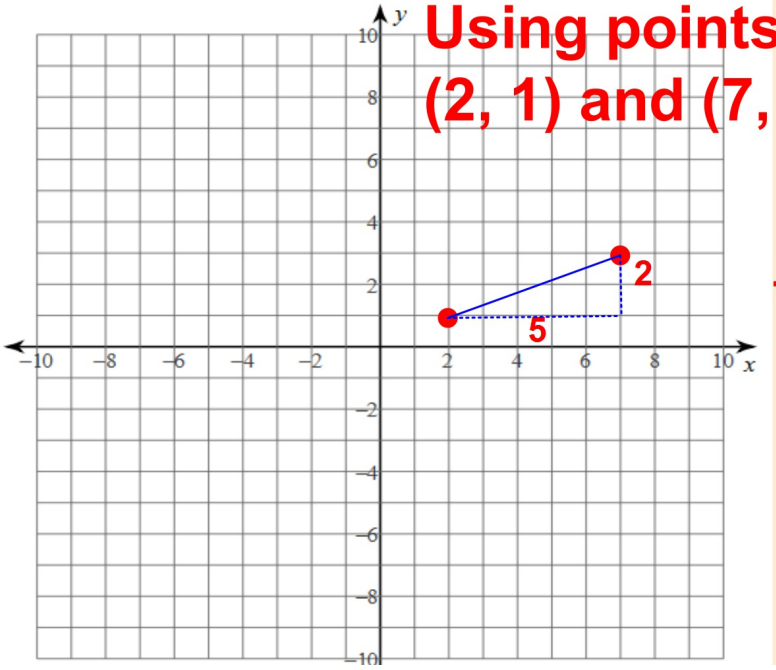
5. Label left point (x_1,y_1),right point (x_2,y_2)

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

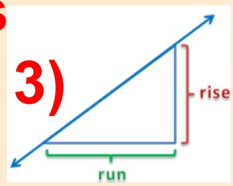
$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Develop a Slope/Gradient Formula...

3. Find the rate of change.



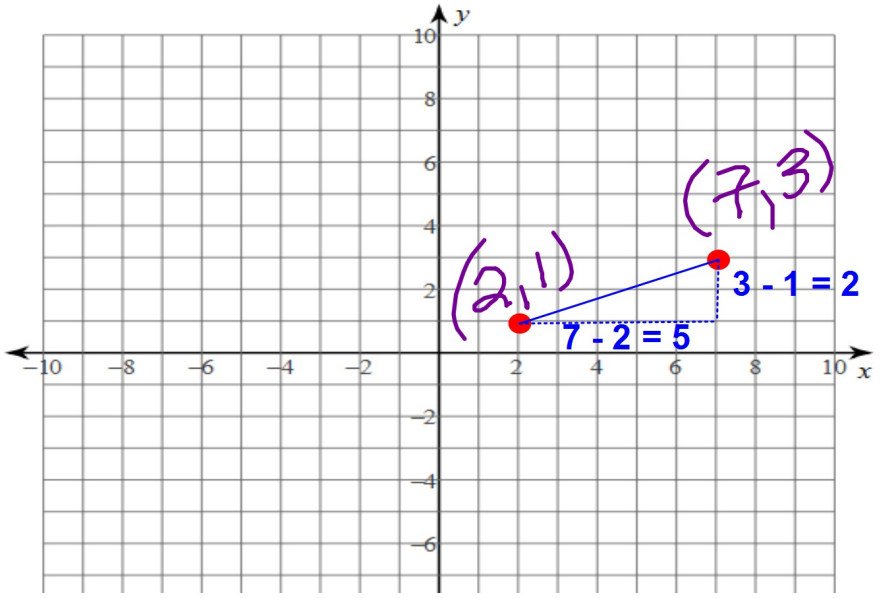
Using points (2, 1) and (7, 3)



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

Develop a Slope/Gradient Formula...

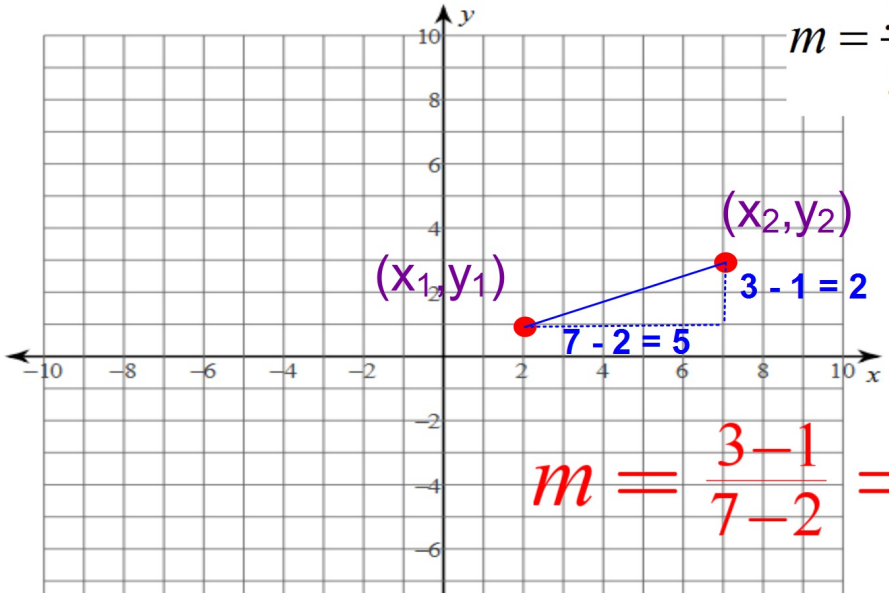
4. Find the difference between the x and y values. *(should be side lengths of traingles)*



Develop a Slope/Gradient Formula...

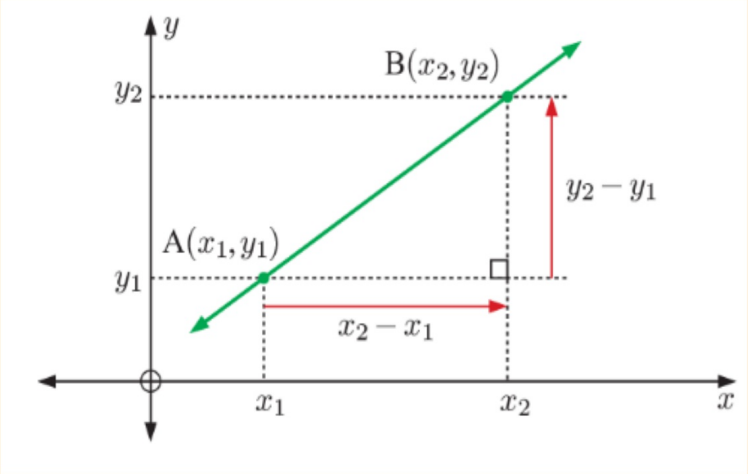
5. Label left point (x_1,y_1),right point (x_2,y_2)
6. Using (x_1,y_1) and (x_2,y_2) record formula.

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



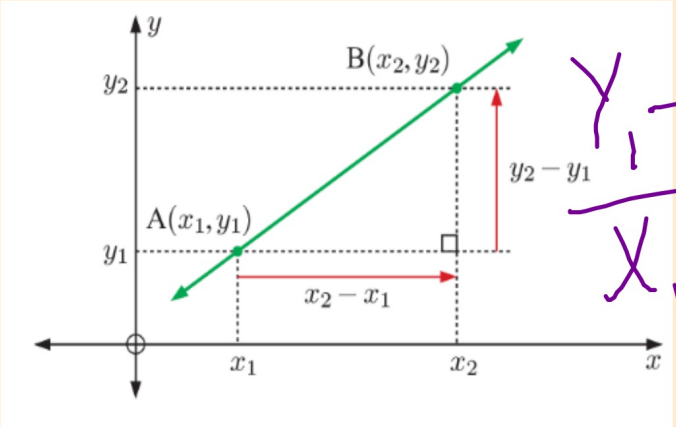
$$m = \frac{3-1}{7-2} = \frac{2}{5}$$

The Gradient Formula



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

Gradient Formula



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

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

Example:

The gradient of the line between (2, 10) and (x_2, 4) is -3. Use algebra to find x_2.

$$\frac{10-4}{2-x_2} = -3$$

$$(2-x_2)\frac{6}{2-x_2} = -3(2-x_2)$$

$$6 = -3(2-x_2)$$

$$6 = -6 + 3x_2$$

$$12 = 3x_2$$

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

$$-3 = \frac{10-4}{2-x}$$

$$-3(2-x) = 6$$

$$-6 + 3x = 6$$

$$3x = 12$$

$$x = 4$$

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)

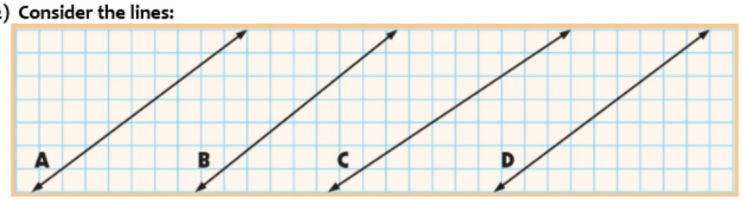
2: Additional Problems

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. $\left(-2\frac{1}{2}, -3\right)$ and $\left(4\frac{1}{2}, 5\frac{1}{2}\right)$
   e. $\left(\frac{11}{2}, -3\frac{1}{5}\right)$ and $\left(5\frac{1}{2}, 2\frac{1}{2}\right)$
   f. $\left(-\frac{3}{2}, \frac{7}{5}\right)$ and $\left(\frac{7}{3}, \frac{11}{6}\right)$
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!!

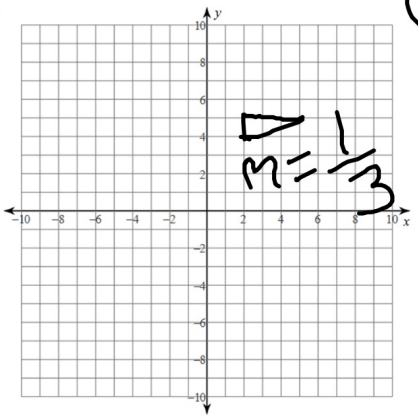
8C.1 #2 & #4

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

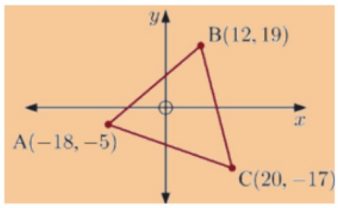
2) Find the gradient of the line segment connecting: [Show work in notebook!]

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).

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

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

a) Use the gradient formula to find the gradient of line segment:

i. [AB] $\frac{3-5}{1-4} = \frac{-2}{-3} = \frac{2}{3}$

ii. [BA] $\frac{5-3}{4-1} = \frac{2}{3}$

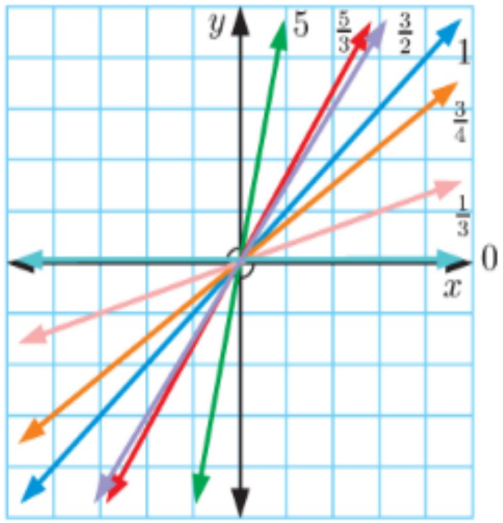
b) Explain your results in a).

Same line

Textbook (Level 1) Solutions:

2 **a** **A** and **D** **b** **B**

4



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. $\left(-2\frac{1}{2}, -3\right)$ and $\left(4\frac{1}{2}, 5\frac{1}{2}\right)$
   e. $\left(\frac{11}{2}, -3\frac{1}{5}\right)$ and $\left(5\frac{1}{2}, 2\frac{1}{2}\right)$
   f. $\left(-\frac{3}{2}, \frac{7}{5}\right)$ and $\left(\frac{7}{3}, \frac{11}{6}\right)$

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

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

$-2\frac{1}{2} = \frac{-3}{2}$

$\left(\frac{-3}{2}, \frac{-6}{2}\right)\left(\frac{9}{2}, \frac{11}{2}\right)$

$\frac{17}{12} = \frac{\frac{11}{2} - \frac{-6}{2}}{\frac{9}{2} - \frac{-3}{2}} = \frac{11+6}{9+3}$

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.

$-7y = -8x + 9$ $\quad y = \frac{8}{7}x - \frac{9}{7}$ {Write in slope/int. form

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.

$\frac{3p-p}{2--8}=-3$ $2p=-30$ $p=-15$

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)

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

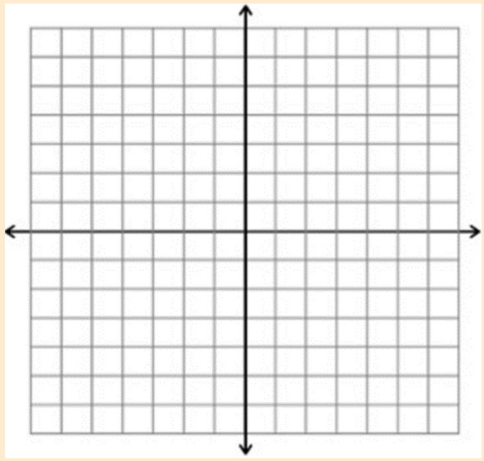
$y-1=-3$ $y=-2$ | $x+2=1$ $x=-1$

$y+5=2$ $y=-3$ | $x-1=3$ $x=4$

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

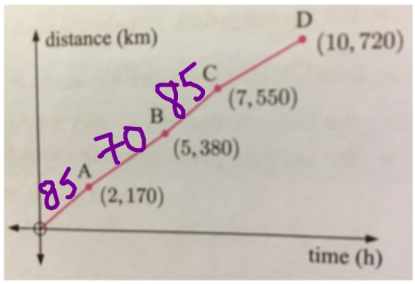
Level 2: Additional Problems

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.



Level 2: Additional Problems (Solutions)

7) The graph below indicates the distance travelled by a truck driver over time during a great journey.



AB: $\frac{380-170}{3}$

$\frac{70\text{ km}}{1\text{ h}}$

$\frac{720-550}{3}$

$\approx 56.7\frac{\text{km}}{\text{h}}$

Determine the average speed from:

i. A to B

ii. C to D

$\frac{85+70+85+56.7}{4}$

b. Find the average speed for the whole trip. ave $\approx 74.2\text{ km/h}$

c. Determine the time interval(s) over which the average speed was greatest.

Start to A and B to C

Level 2: Additional Problems (Solutions)

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

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

$\frac{2-2}{1-(-4)} = \frac{0}{5} = \boxed{0}$

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

$\frac{-8-13}{4-1} = \frac{-21}{3} = \boxed{-7}$

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

$\frac{12-5}{-12-(-18)} = \boxed{\frac{7}{6}}$

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

$\frac{5\frac{1}{2}-3}{4\frac{1}{2}-(-2\frac{1}{2})} = \frac{2\frac{1}{2}}{7} = \frac{\frac{5}{2}}{7} = \boxed{\frac{5}{14}}$

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

$\frac{2\frac{1}{2}-(-3\frac{1}{5})}{5\frac{1}{2}-\frac{11}{2}} = \frac{\frac{5}{2}+\frac{16}{5}}{\frac{11}{2}-\frac{11}{2}} = \frac{\frac{25}{10}+\frac{32}{10}}{0}$

undefined

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

$\frac{\frac{11}{6}-\frac{7}{5}}{\frac{7}{3}-(-\frac{3}{2})} = \frac{\frac{55}{30}-\frac{42}{30}}{\frac{14}{6}+\frac{9}{6}} = \frac{\frac{13}{30}}{\frac{23}{6}}$

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

$-7y + 8x = 9$

$-8x \quad -8x$

$\frac{-7y}{-7} = \frac{9-8x}{-7}$

$y = -\frac{9}{7} + \frac{8}{7}x$

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

$\frac{13}{20} \div \frac{23}{6}$

$= \frac{13}{20} \cdot \frac{6}{23}$

$= \frac{78}{460} = \boxed{\frac{39}{230}}$

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

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

$\frac{1}{2} = \frac{4-y}{2-6} \longrightarrow -4\left(\frac{1}{2}\right) = \left(\frac{4-y}{-4}\right)(-4) \rightarrow -2 = 4-y$

$-4 \quad -4$

$-6 = -y \rightarrow \boxed{y = 6}$

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

① $\frac{3p-p}{2-(-8)} = -3$ ② $\frac{2p}{2+8} = -3$ ③ $\frac{2p}{10} = -3$ ④ $\frac{2p}{2} = \frac{-30}{2}$

$\boxed{p = -15}$

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 $(-2, 1)$

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

Example answers:

(-1, -2) (-3, 4)

(0, -5)

$y - 1 = -3$

$+1 \quad +1$

$\boxed{y = -2}$

$\frac{x+2}{-2} = \frac{1}{-2}$ $\boxed{x = -1}$

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

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

Example answers:

(-2, -7)

(-5, -9)

(4, -3)

(7, -1)

$y + 5 = 2$

$-5 \quad -5$

$\boxed{y = -3}$

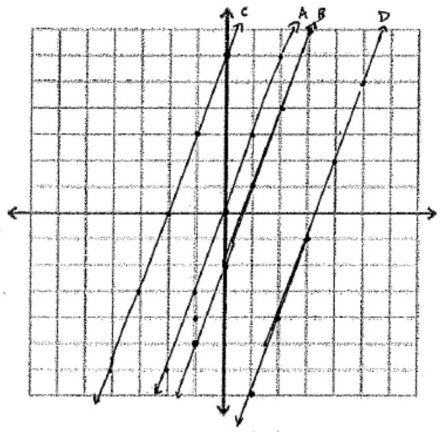
$x - 1 = 3$

$+1 \quad +1$

$\boxed{x = 4}$

Level 2: Additional Problems (Solutions)

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.



(A) $y = 3x$
(B) $y = 3x - 2$
(C) $y = 3x + 6$
(D) $y = 3x - 10$

Pattern: Changing "c" shifts the line up and down the y-axis, but doesn't change the slope.

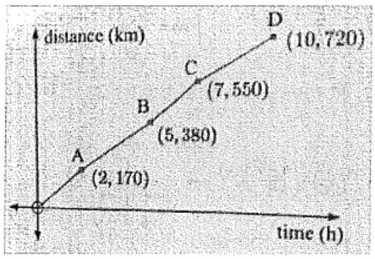
Another way to look at it: it moves left or right.

How much does it move left/right as "c" changes?

7) The graph below indicates the distance travelled by a truck driver over time during a

Level 2: Additional Problems (Solutions)

7) The graph below indicates the distance travelled by a truck driver over time during a great journey.



Determine the average speed from:

i. A to B

$\frac{380-170}{5-2} = \frac{210}{3} = 70 \frac{km}{h}$

ii. C to D

$\frac{720-550}{10-7} = \frac{170}{3} \frac{km}{h}$

b. Find the average speed for the whole trip.

$\frac{720-0}{10-0} = 72 \text{ km/h}$

c. Determine the time interval(s) over which the average speed was greatest.

B-C: $\frac{550-380}{7-5} = \frac{170}{2} = 85 \frac{km}{h}$

O-A: $\frac{170-0}{2-0} = 85 \frac{km}{h}$

O-A and B-C