Name: _____

Date: _____

MA20SA
COORDINATE GEOMETRY
WORKSHEET 2
CALCULATING SLOPE, HORIZONTAL LINES, VERTICAL LINES

1.   The **slope** of a line is the same as the slope (or *direction*) between any two points on the line.

2.   The **slope** of the line has been defined as how much a line **rises divided** by how much it *runs to the right*. $slope \equiv m \equiv \dfrac{rise}{run}$

3.   In other words the slope of a line is the **change** in the *y* divided by the change in the *x* between any two points on the line.

$$slope \equiv m \equiv \dfrac{increase\ in\ y}{increase\ in\ x}$$

4.   Slope can now be *defined* as: $m = \dfrac{(y_2 - y_1)}{(x_2 - x_1)}$; as shown below.

5.   **Example**: line $y = 2x - 6$
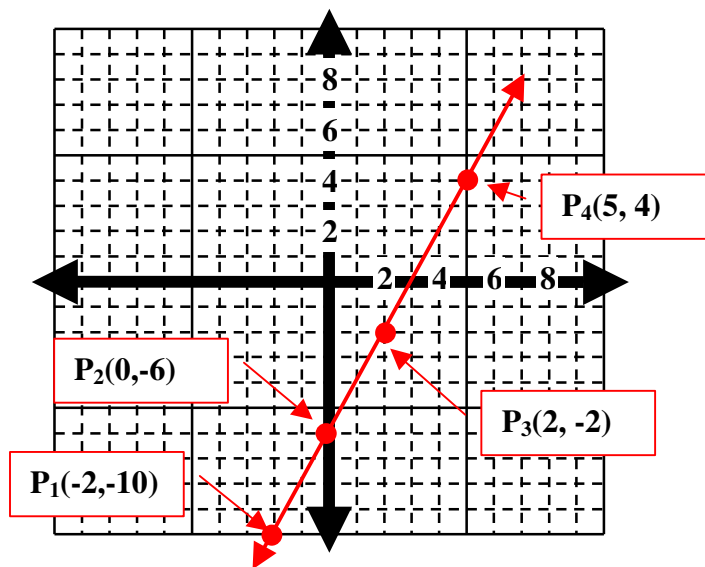
Point	x	y
P_1	-2	-10
P_2	0	-6
P_3	2	-2
P_4	5	4

P₄(5, 4) · P₂(0,-6) · P₃(2, -2) · P₁(-2,-10)

Lets pick any two points; say P_1 and P_2

The change in *y* to go from P_1 to P_2 is +4

The change in *x* to go from P_1 to P_2 is +2

So the slope is **4/2** or **m = 2**

6.   You don't actually have to count lines on a graph!. You can just find the difference between the *x* coordinates and then the *y* coordinates of two points. (remember how *difference* means *subtract*!). Let's do it for P_1 and P_2 above.

$$slope = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-6-(-10)}{0-(-2)} = \frac{+4}{+2} = 2$$

7.   **You** try finding the slope between P_3 and P_4 now. It should be exactly the same as above since a line has a constant slope. Use the slope formula to calculate the slope.
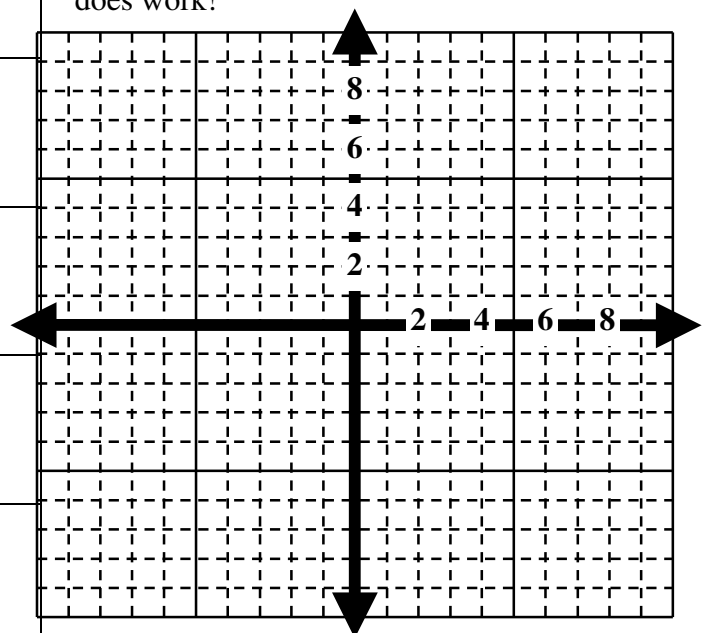
$$slope = m = \frac{y_4 - y_3}{x_4 - x_3} =$$

8.   Find the slope for different lines that have the following points on them:

P₁	P₂	Slope
(0, 0)	(2, 8)	
(0, 4)	(2, 6)	
(-3,-3)	(7, 2)	
(-5, 2)	(-3,-3)	
(3, 2)	(5, -2)	

Caution!! Watch those 'minus minuses'. Subtracting a negative is the same as adding!

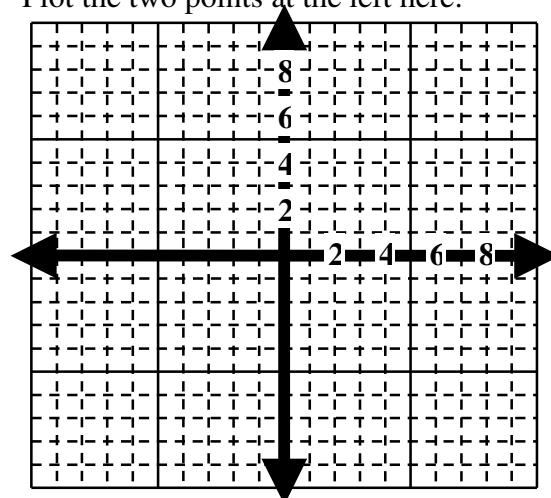Plot the points on the graph paper below also to see that the slope formula does work!

HORIZONTAL LINES

9.   Calculate the **slope** of the line between the points **P₁(-2, 4)** and **P₂(5, 4).** Write it below showing formula!:

10.   Try these points too:
P₁(-5, 7) and **P₂(2, 7)**

Plot the two points at the left here:

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11.   Notice the points on the lines above have the same y value. All points on the lines will have the same y-value. The lines are **Horizontal**. Both have a **slope of zero**. So their formula given **y=m*x* + b** is just **y = b**. In other words, *y* is a constant no matter what the *x* is! That is a **Horizontal line**!

12. The equation for a *horizontal* line is just **y = [a constant]**

13.   Plot the following *horizontal* lines on the graph to the right

a.	y = 8
b.	y = -2
c.	y = 3
d.	y = -7.25
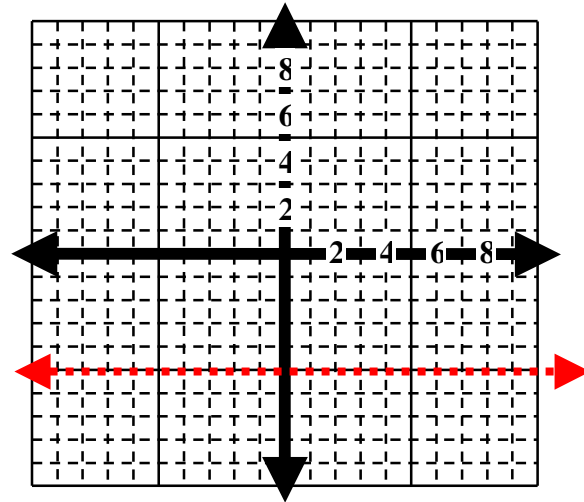
14.   What is the equation for the dotted line?

VERTICAL LINES

15.   What is the slope of the line that contains the points P_1(-5, -3) and P_2(-5, 7)?

16.   In mathematics, you can never get an answer by dividing by zero. (how can you *divide* something into zero bunches??).   We say that the operation of dividing by **0** is ***undefined***. $\frac{3}{0} = ?$ would mean that 0*? = 3. We have no way of having 0 bunches of something that makes 3 total

17.   The equation for a **Vertical** line is just **x = [a constant].** All points on that vertical line have the same *x* value.   The *x* value never changes for any specific vertical line.

18.   Plot the following vertical lines:

a.	x = -5
b.	x = 0
c.	x = 7
d.	x = -8.25
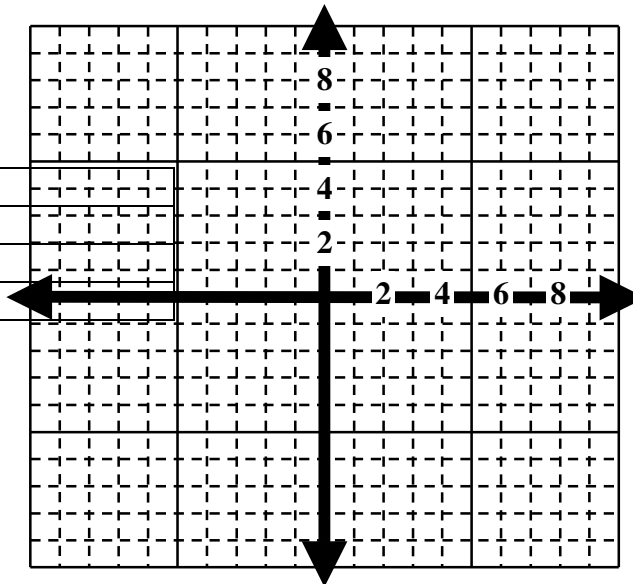
SUMMARY

$$m = slope = \frac{rise}{run} = \frac{change\ in\ y}{change\ in\ x} = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

The slope of the dashed line to the right is

$$m = \frac{(7-3)}{(4-(-5))} = \frac{4}{9}\ or\ 0.444\overline{4}$$

Horizontal Line at right is: **y = -5**

Vertical Line at right is: **x = -8**

$P_1(x_1,y_1)$

$P_2(x_2,y_2)$

rise

run
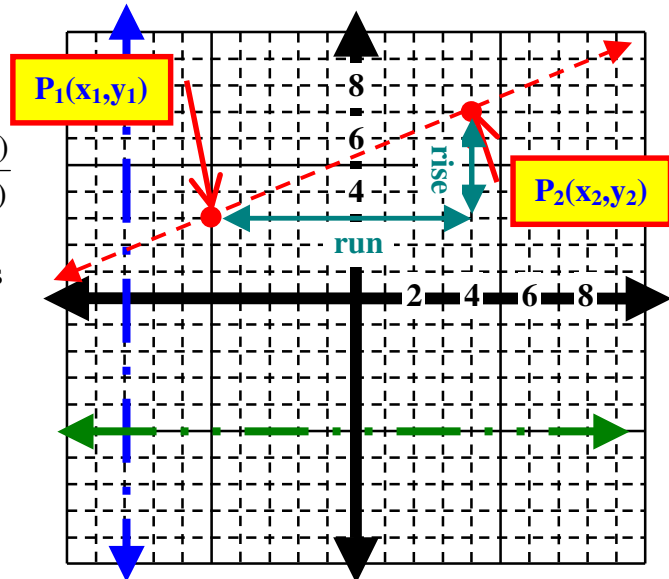
THINKING AHEAD – BRAIN TEASERS

Given a line: **y = 3x +2** , can you give an equation of a parallel line? (hint: a line that goes the same direction!)

How many different lines are there that are parallel to the one given above **(y = 3x +2)** ?

What is another way to think about dividing by zero? (hint: can we divide by a number close to zero instead)

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