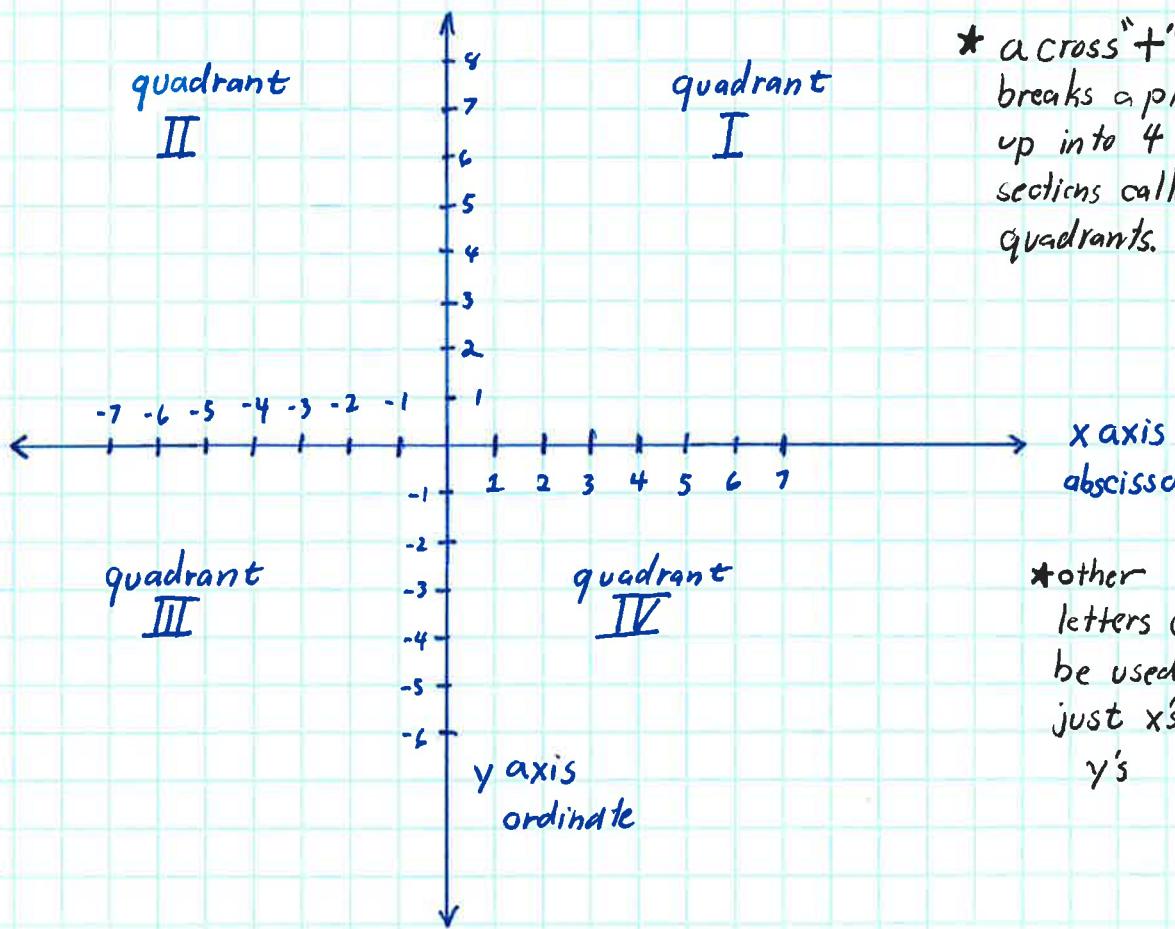


Chapter 2.1

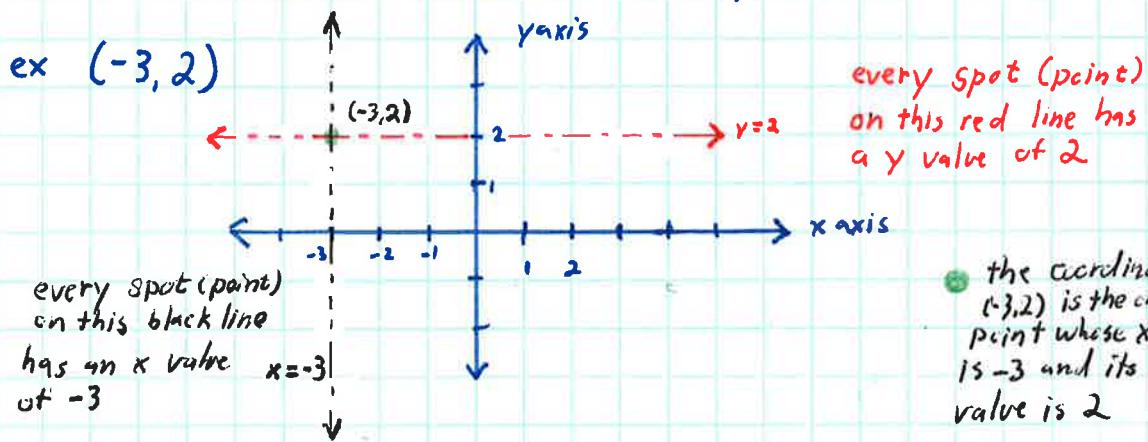
► The Cartesian Coordinate System



* across "+"
breaks a plane
up into 4 different
sections called
quadrants.

* other
letters could
be used not
just x's and
y's

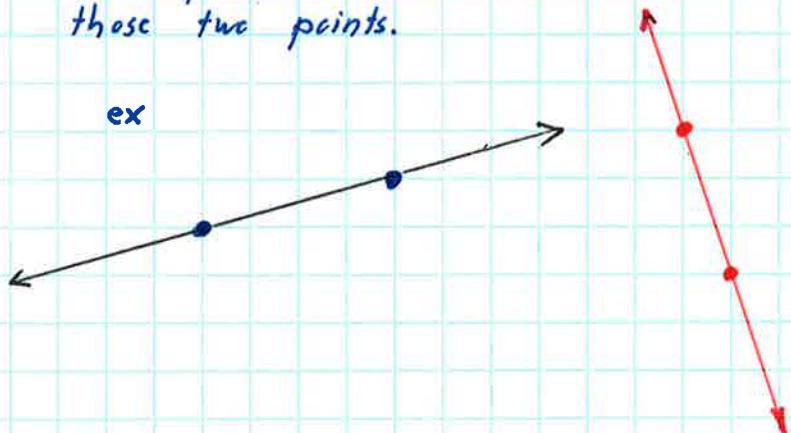
ordered pair: two values given in the form (x, y) where the x represents a particular value on the abscissa (x axis) and the y represents a particular value on the ordinate (y axis). The spot on the Cartesian Plane that corresponds to both of those values is called the coordinates of the ordered pair.



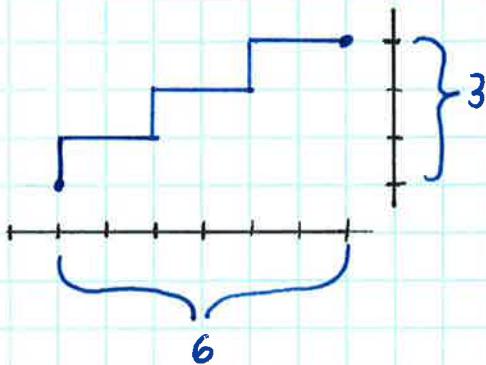
Slope of a Line

an axiom in geometry is that "two points determine a straight line." What that means is: given any two points, there is a unique line that goes through those two points.

ex

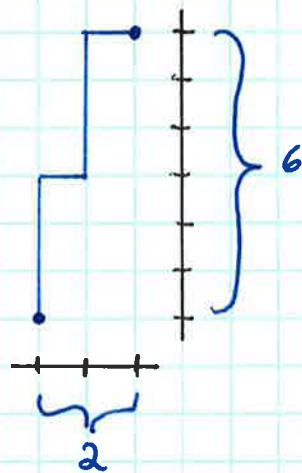


every line has a slope. Slope asks the question how much does a line rise or fall (vertical) over a certain horizontal distance. stairs have slopes. ex.



this staircase has a vertical rise of 3 units for every 6 units of a horizontal distance

rise of 3
run of 6



this staircase has a vertical rise of 6 units for every 2 units of a horizontal distance

rise of 6
run of 2

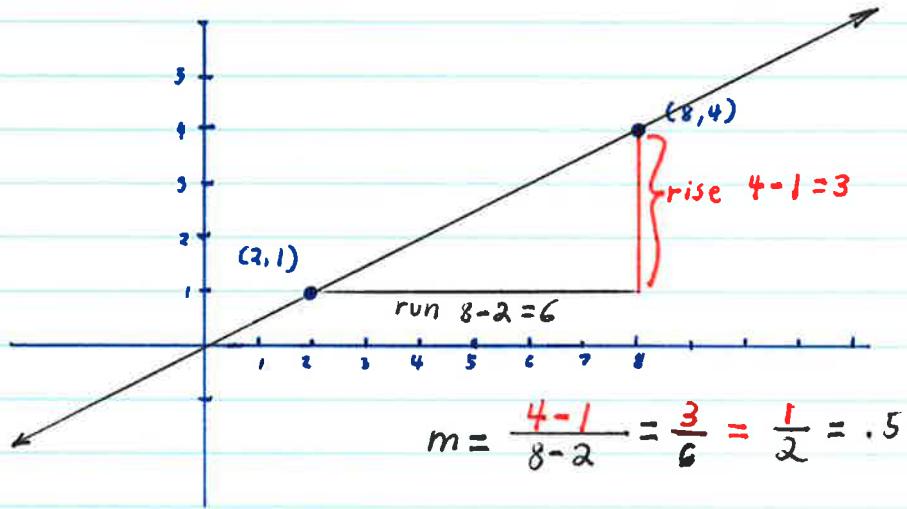
in mathematical terms we define slope in the following way

$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y \text{ value}}{\text{change in } x \text{ value}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

↓
we usually
use the letter "m" to represent
slope

ex. 1

* on points that land exactly on grid lines one can visually determine the slope. When points do not land exactly on the grid lines it is easier



to use the formula to work Algebraically - pick a point and call it point 1 - pick the other point & call it point 2 - label the values

Let point 1 be $(2, 1)$

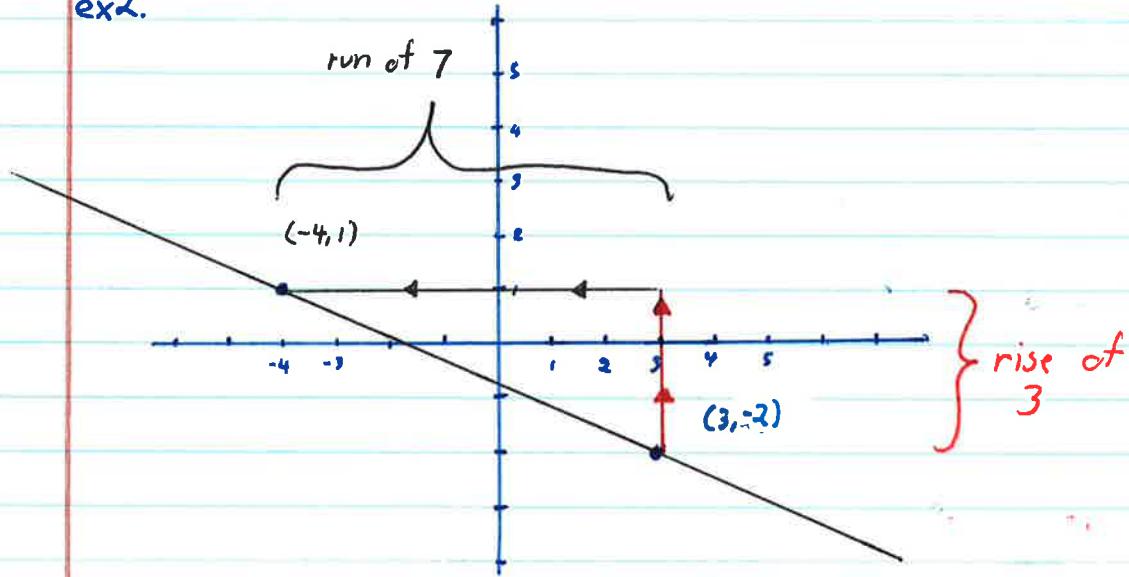
$(2, 1)$
 x_1, y_1

Let point 2 be $(8, 4)$

$(8, 4)$
 x_2, y_2

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4-1}{8-2} = \frac{3}{6} = \frac{1}{2}$$

ex2.



If we find the slope of the line above algebraically it would be.

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 1}{3 - (-4)} = \frac{-3}{7}$$

Why the negative? When we have a run towards the right it is positive. When we have a run towards the left it is negative $\rightarrow (+), \leftarrow (-)$

a vertical change upward is $(+)\uparrow$, a vertical change downward is $(-) \downarrow$

- * a positive slope is always up and towards the right
- * a negative slope is always up and towards the left.

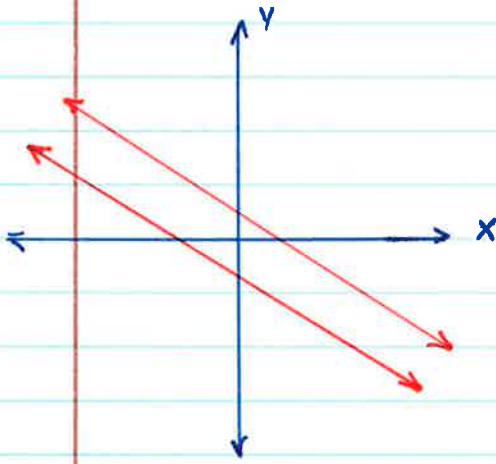
ex 3. Find the slope of the line that goes through the points $(-1.75, 2.21)$ and $(3.82, 8.75)$

$$\text{1) Label } (-1.75, 2.21) \quad (3.82, 8.75)$$

$$x_1 \quad y_1 \qquad \qquad x_2 \quad y_2$$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8.75 - 2.21}{3.82 - -1.75} = \frac{6.54}{5.57}$$

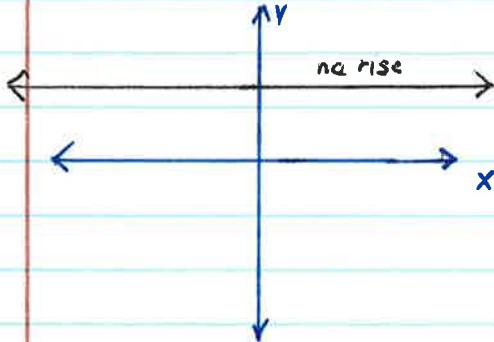
Two lines are parallel if and only if their slopes are equal or their slopes are undefined.



? what does this mean?

a horizontal line has a slope of zero

$$m = \frac{\text{rise}}{\text{run}} = \frac{0}{\text{run}} = 0$$



a vertical line has an undefined slope $m = \frac{\text{rise}}{\text{run}} = \frac{\text{rise}}{0} = \infty$

