Do Now:

Write down everything you know about Perpendicular Lines.

① Intersect to make 4 90° angles.

② Straight lines.

③ Only intersect at 1 pt.

90 | 90

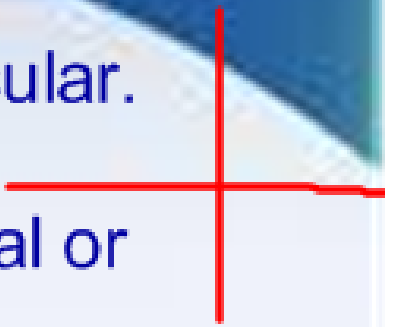
180

Lines are perpendicular if they meet to form congruent adjacent angles.

MVP Section 6.2a

Slopes Perpendicular & Parallel

FACT: Horizontal & Vertical lines are perpendicular.



But... what if a line or segment is NOT horizontal or vertical?

How do we determine the slope of a line or segment that will be perpendicular to it?

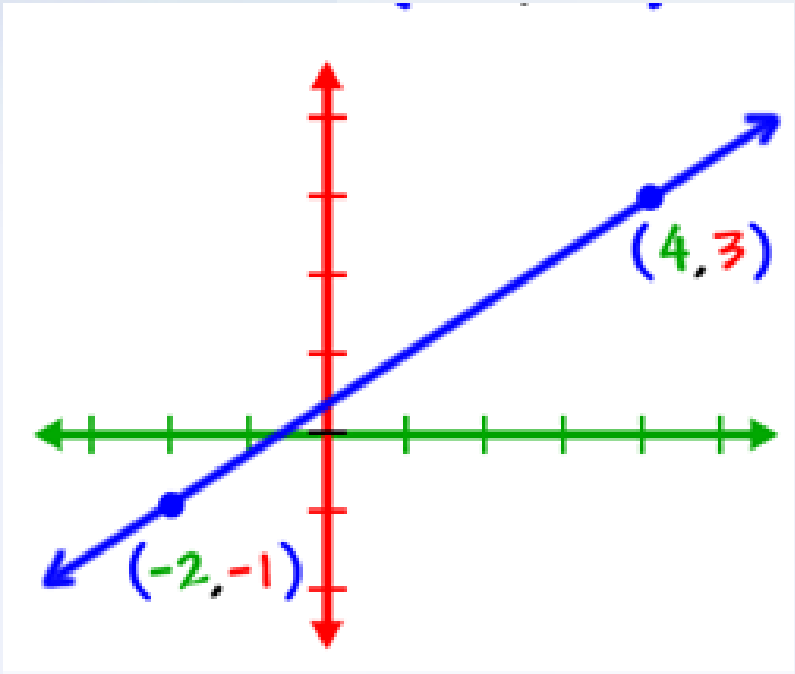
$$\text{Slope}(m) = \frac{\Delta y}{\Delta x} = \frac{y - y}{x - x} = \frac{\text{rise}}{\text{run}}$$

y-int. → equation of line. $y = mx + b$

Δ means the change in...

Let's look at the line going through the points

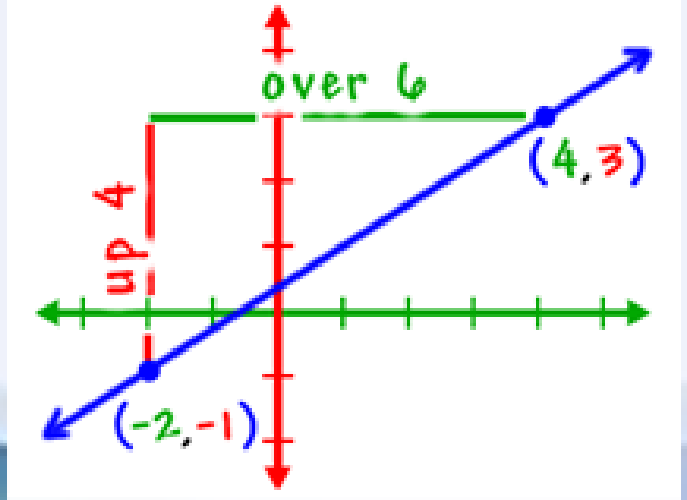
$(-2,-1)$ and $(4,3)$



The simplest way to look at the slope is

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

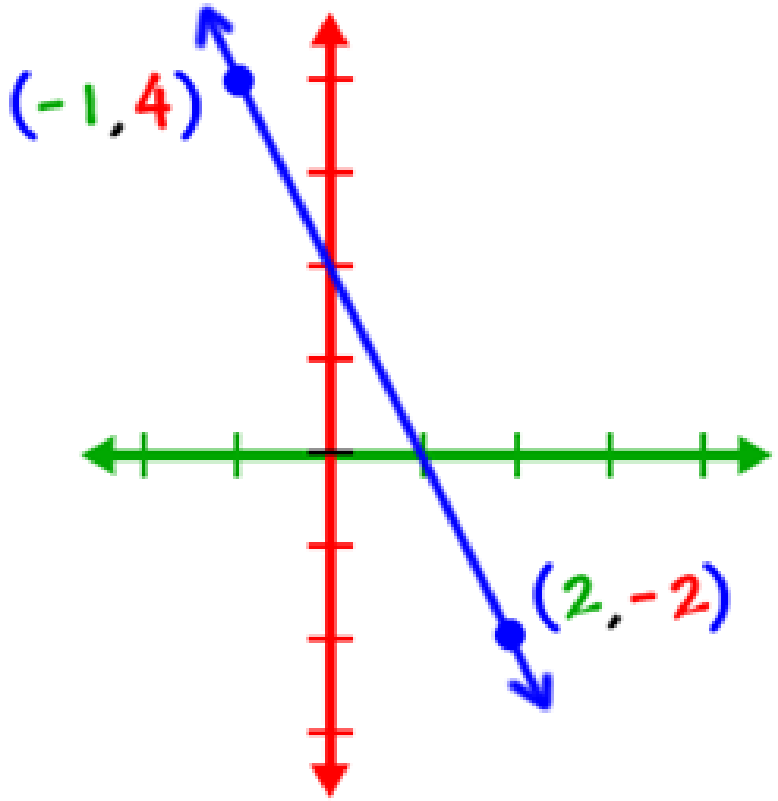
(rise over run)

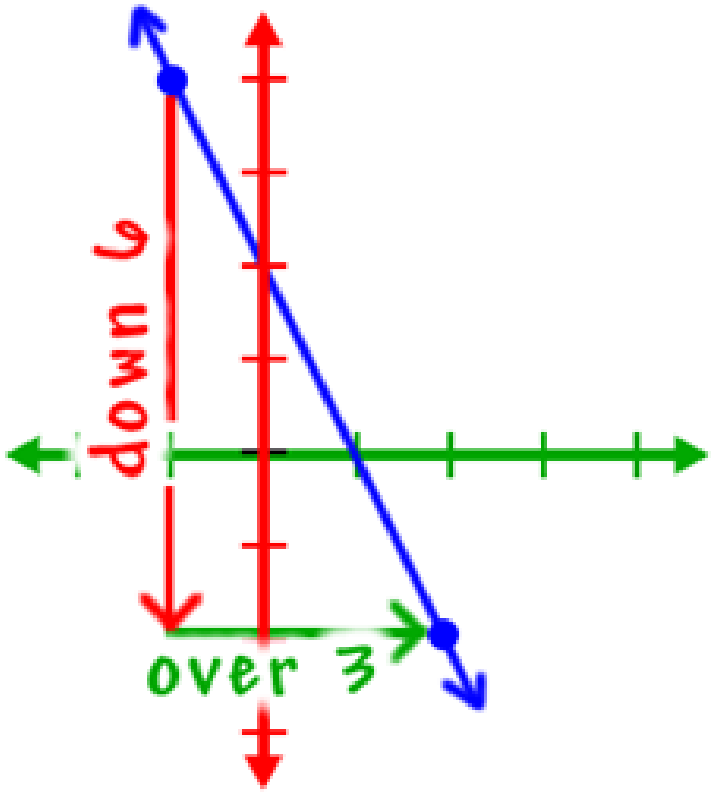


The slope is

$$\frac{\text{rise}}{\text{run}} = \frac{4}{6} = \frac{2}{3}$$

Let's find the slope of this line:



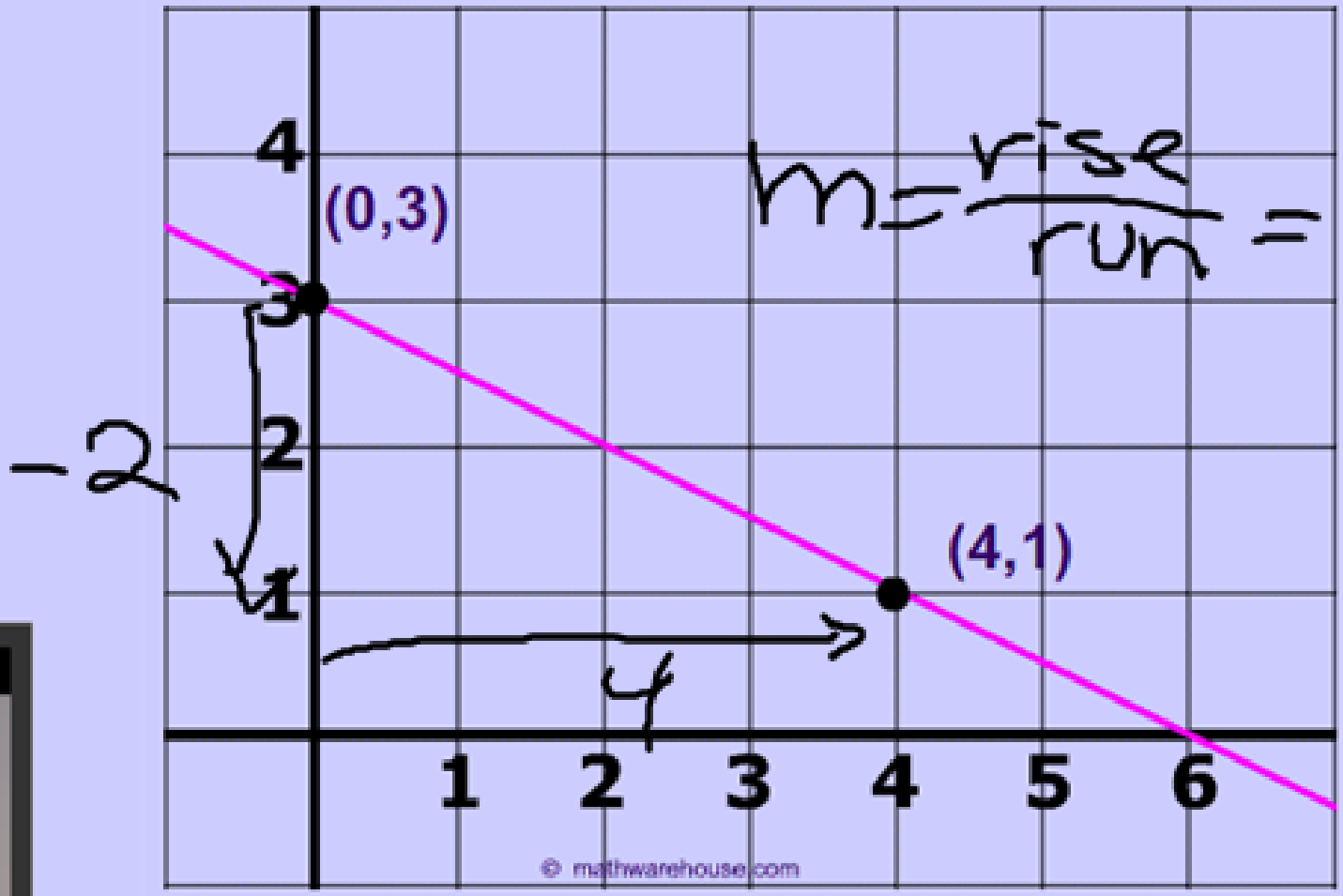


$$\text{slope} = \frac{\text{rise}}{\text{run}} = \frac{-6}{3} = -2$$

Negative -- and the line is going downhill

Example 1

Find the slope of the line in the graph below

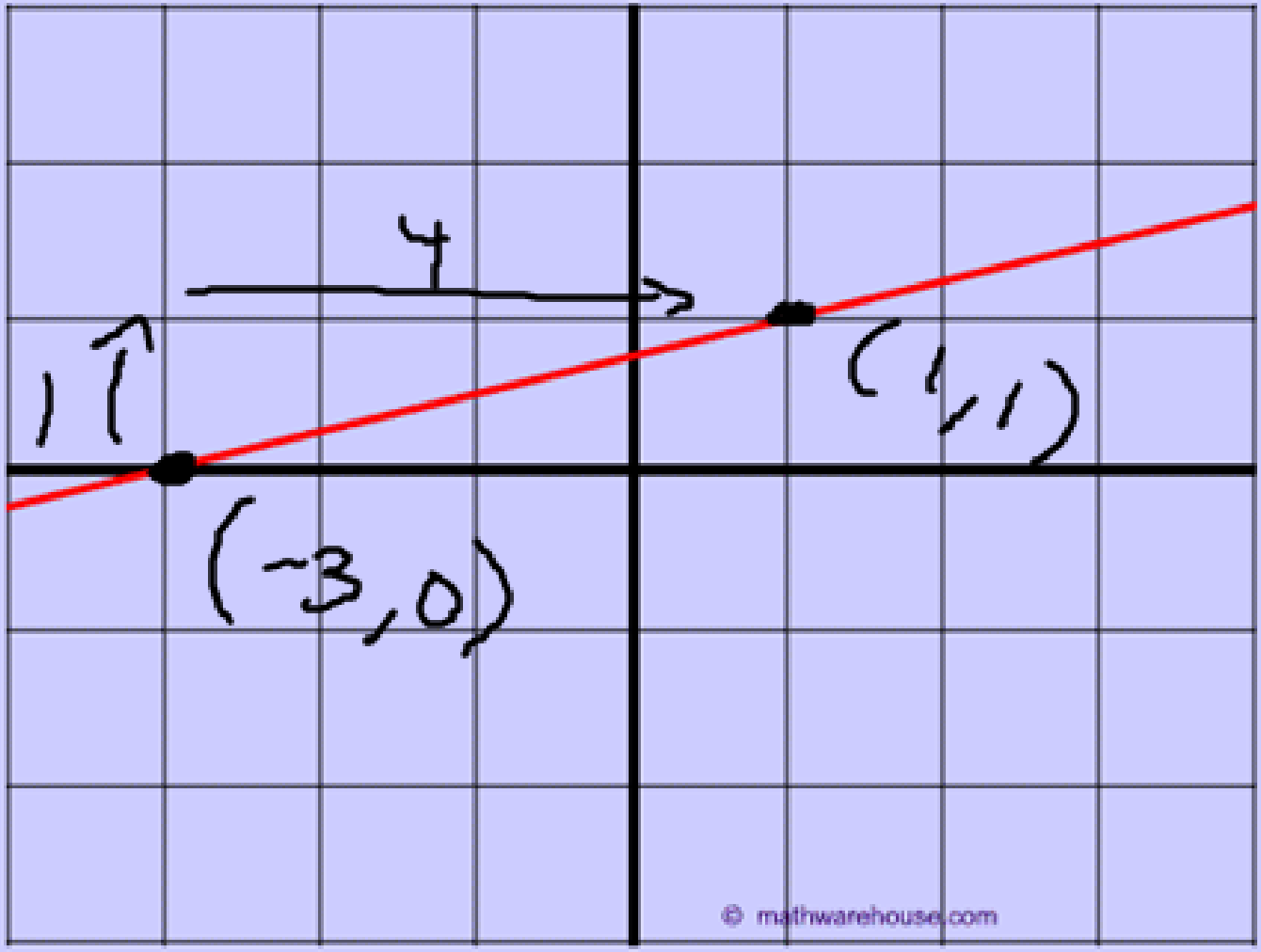


$$m = \frac{\text{rise}}{\text{run}} = \frac{-2}{4}$$

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

$$y = -\frac{1}{2}x + b$$

Find the slope of the line in the picture below.



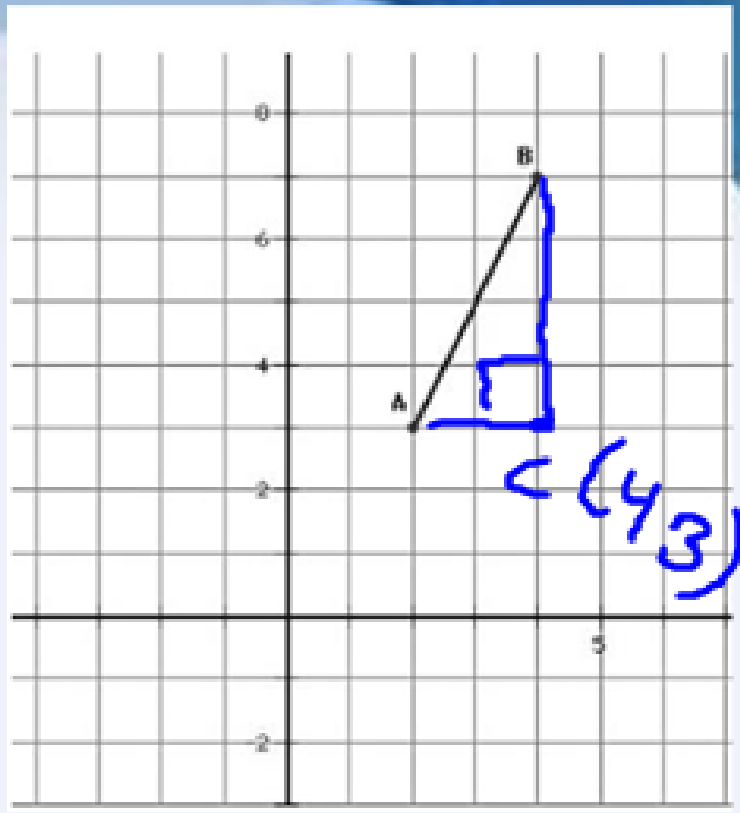
$$m = \frac{\text{rise}}{\text{run}} = \frac{1}{4}$$

$$y = \frac{1}{4}x + b$$

Experiment 1

1. Consider the points A (2, 3) and B (4, 7) and the line segment, $\overline{AB}$, between them. What is the slope of this line segment?

$$m = \frac{\text{rise}}{\text{run}} = \frac{4}{2} = \boxed{2}$$



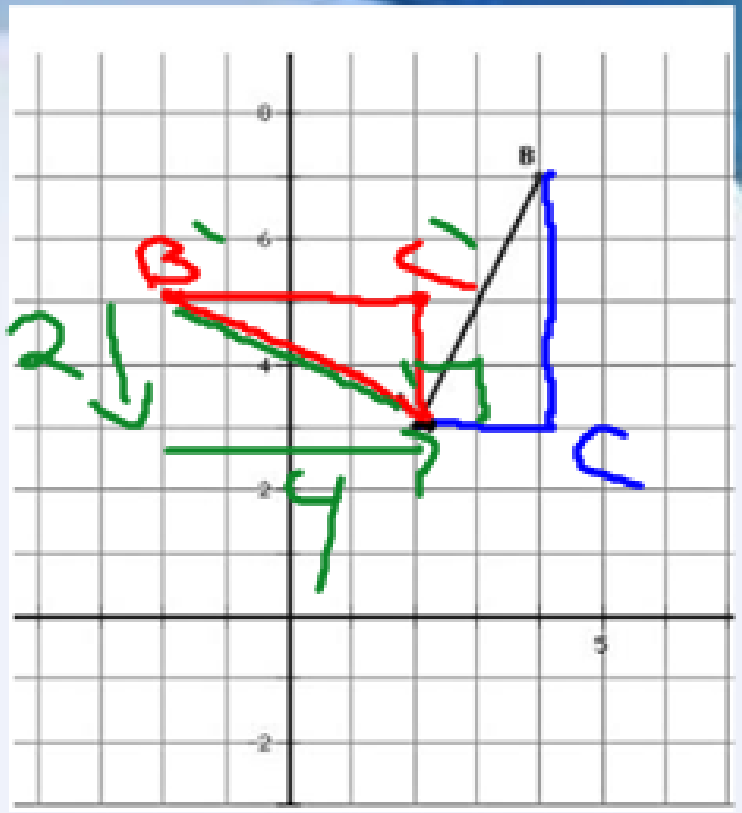
2. Locate a third point C (x, y) on the coordinate grid, so the points A (2, 3), B (4, 7) and C (x, y) form the vertices of a right triangle, with $\overline{AB}$ as its hypotenuse.

3. Explain how you know that the triangle you formed contains a right angle?

- 2 $\perp$ lines intersect, Box

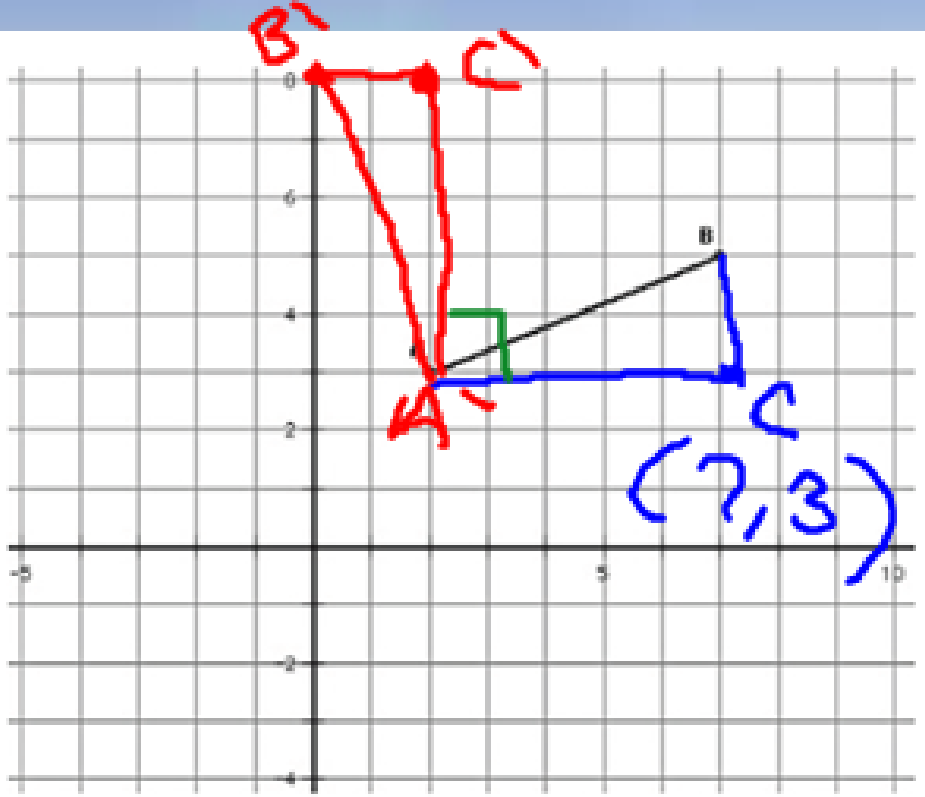
4. Now rotate this right triangle 90° about the vertex point (2, 3). Explain how you know that you have rotated the triangle 90°.

$AC \perp AC'$



5. Compare the slope of the hypotenuse of this rotated right triangle with the slope of the hypotenuse of the pre-image. What do you notice?

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



Experiment 3

Repeat steps 1-5 above for the points A (2, 3) and B (7, 5).

① $m = \frac{2}{5}$

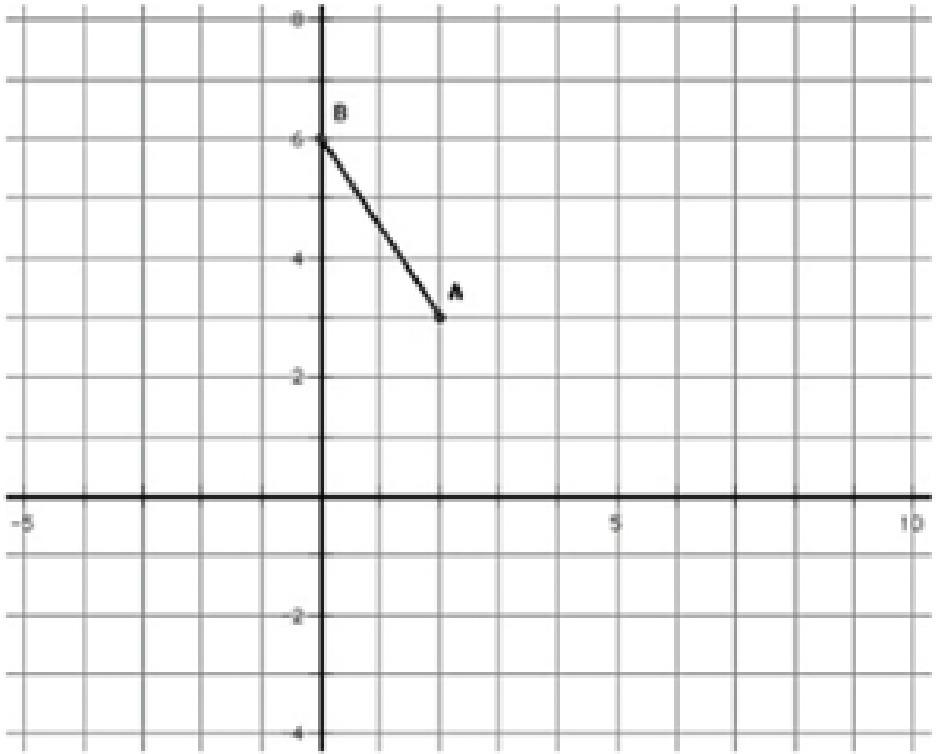
② $AC \perp BC$

④ $AC \perp A'C'$

⑤ $m = \frac{-5}{2}$ ⇐ $AB \perp A'B'$

Experiment 4

Repeat steps 1-5 above for the points A (2, 3) and B (0, 6).



Based on our experiments, what do you notice about the slopes of 2 perpendicular lines?

Perpendicular lines have negative reciprocals.

ex: $\frac{2}{3}$ & $\frac{-3}{2}$

$-\frac{2}{3} \rightarrow -\left(-\frac{3}{2}\right) = \frac{3}{2}$