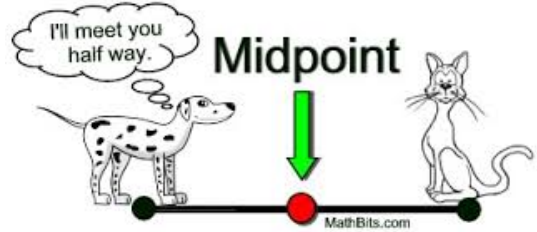


Friday, February 28, 2020

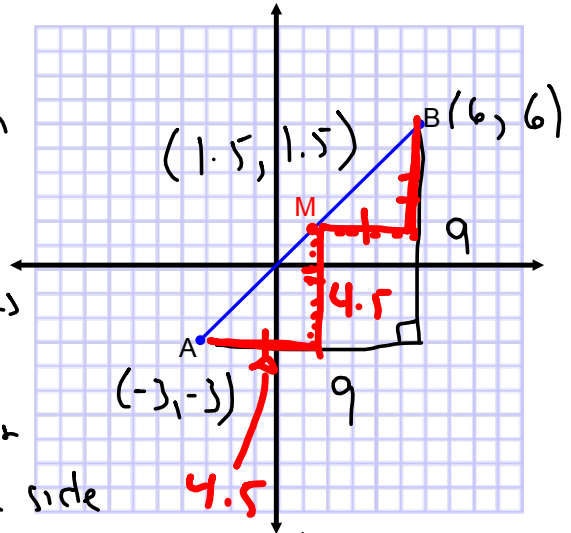
## 2.1 Midpoint of a Line Segment

Bellwork:



Look at the diagram provided below. How can we find the coordinates of the midpoint, M, of line segment AB?

- find the rise and run for line segment AB
- the rise/run for half of the line is the same as that for the whole line.
- start from an endpoint + add  $\frac{1}{2}$  of the length of the side of the triangle to get the new coordinate.



Now look at the endpoints:

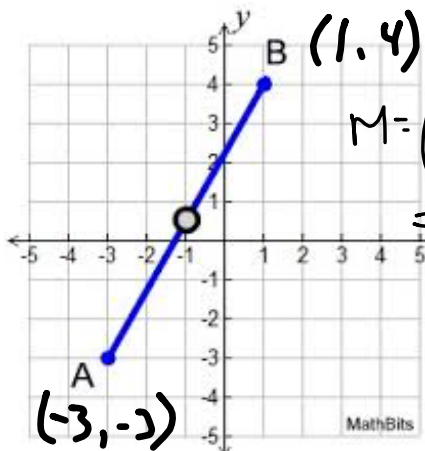
$$\begin{array}{l} A(-3, -3) \\ B(6, 6) \end{array} \quad \left( \frac{6 + (-3)}{2}, \frac{6 + (-3)}{2} \right) \quad \text{we want: } (1.5, 1.5)$$
$$= \left( \frac{3}{2}, \frac{3}{2} \right)$$

To find the midpoint of a line segment without a graph, use the formula:

$$(x, y) = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Practice Problems:

1) Find the midpoint of line segment AB.



$$M = \left( \frac{-3+1}{2}, \frac{-3+4}{2} \right)$$

$$= \left( -1, \frac{1}{2} \right)$$

2) Find the midpoint of a line segment with endpoints L(-3, 9) and N(4, -1).

$$(x, y) = \left( \frac{-3+4}{2}, \frac{9-1}{2} \right)$$

$$= \left( \frac{1}{2}, 4 \right)$$

Sometimes you will be given a midpoint and one endpoint. You will be asked to find the coordinates of the other endpoint. How can we figure this out? Use the example below to help your thinking!

Example: A line segment has a midpoint, M(2, -2) and an endpoint, A(6, -5). Determine the coordinates of the other endpoint.

Option 2: Algebra

$$M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$(2, -2) = \left( \frac{6 + x_2}{2}, \frac{-5 + y_2}{2} \right) \times 2$$

$$(4, -4) = (6 + x_2, -5 + y_2)$$

To get  $x_2$ :

$$4 = 6 + x_2$$

$$-2 = x_2$$

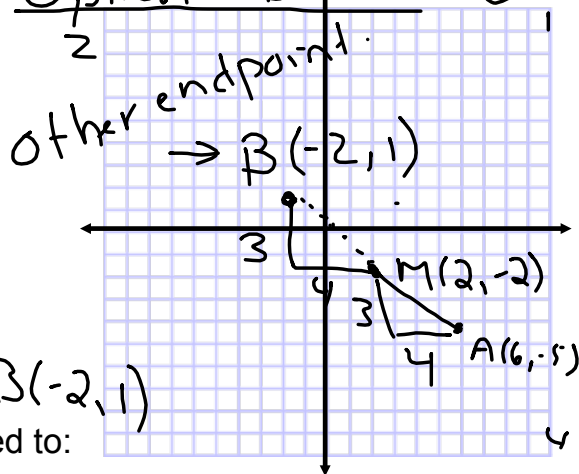
To get  $y_2$ :

$$-4 = -5 + y_2$$

$$1 = y_2$$

B(-2, 1)

Option 1: Draw it!



Summary - To find an endpoint, we need to:

① Graph the midpoint + endpoint, then use slope to find the other end.

OR

② Rearrange the formula to solve for  $(x_2, y_2)$ .

