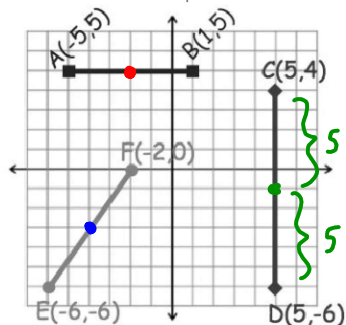


Geometry CC - Mr. Valentino
Unit 10 Lesson 2: Midpoint Formula

Name: _____
Date: _____ Per: _____

Aim: What is the midpoint formula?

Do Now: Find the midpoint of each line below!



AB: (-2, 5)

CD: (5, -1)

EF: (-4, -3)

What do you notice about the coordinates of the midpoint and the two endpoints?

The coordinates of the midpoint are halfway between the coordinates of the endpoints.

★ Midpoint Formula:

$$\begin{matrix} (x, y) \\ \text{midpoint} \end{matrix} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

1. What is the midpoint of the line segment with endpoints (-4, 4) and (5, -1)?

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \rightarrow \left(\frac{-4 + 5}{2}, \frac{4 + (-1)}{2} \right) \rightarrow \left(\frac{1}{2}, \frac{3}{2} \right)$$

(0.5, 1.5)

2. What is the midpoint of the line segment with endpoints (2, 4) and (1, -3)?

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

3. Find the other endpoint of the line segment with the given endpoint and midpoint.

Endpoint: (-1, 9), midpoint: (-9, -10)

x-coordinate

$$-1 \xrightarrow{-8} -9 \xrightarrow{-8} (-17)$$

$$\frac{x_1 + x_2}{2} = \text{x coord. of my midpt.}$$

$$\frac{-1 + x_2}{2} = -9$$

$$\begin{aligned} -1 + x_2 &= -18 \\ +1 & \quad +1 \\ \hline x_2 &= -17 \end{aligned}$$

(-17, -29)

$$\frac{y_1 + y_2}{2} = \text{y coordinate of my midpt.}$$

$$\frac{9 + y_2}{2} = -10$$

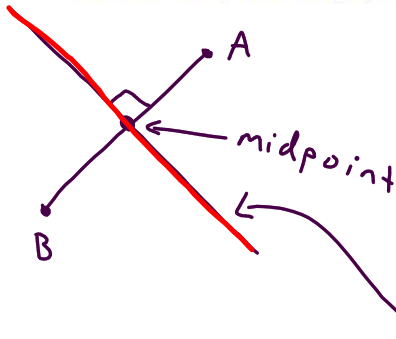
$$\begin{aligned} 9 + y_2 &= -20 \\ -9 & \quad -9 \\ \hline y_2 &= -29 \end{aligned}$$

Think - Pair - Share

If given the following question, what two things do we need to answer it?

What is the equation of the line that represents the perpendicular bisector of AB whose endpoints are A(8,2) and B(0,6)?

- ★ midpoint of AB
- ★ slope of AB



$$\frac{\Delta y}{\Delta x} = \frac{6-2}{0-8} = \frac{4}{-8} = -\frac{1}{2}$$

slope of: 2
our line:

midpoint

$$\left(\frac{8+0}{2}, \frac{2+6}{2}\right)$$

$$\left(\frac{8}{2}, \frac{8}{2}\right)$$

$$(4, 4)$$

Now you try!

If AB is defined by the endpoints A(4,2) and B(8,6), write an equation of the line that is the perpendicular bisector of AB.

Partner Practice

1. Find the midpoint of the line segment whose endpoints are:

a) (6, 1) and (2, 3)

b) (0, 3) and (-4, 1)

c) (-2, 3) and (2, 3)

d) (5, -3) and (5, 7)

e) (-4, -5) and (6, -3)

f) (-4, -3) and (-6, -2)

g) (3a, -b) and (a, b)

h) (4a, d) and (6a, 3d)

2) The midpoint of line segment AB is M. The coordinates of M are (3, -2) and the coordinates of A are (-1, 0). What are the coordinates of B?

3) The coordinates of the midpoint of a segment are (3, 7). If the coordinates of one endpoint are (-2, 4), find the coordinates of the other endpoint.

4) The midpoint M of AB has coordinates (4, 9). If the coordinates of A are (2, 8), what are the coordinates of B?

5) If the midpoint of a line segment is $(-5, -2)$ and one endpoint is $(-2, -2)$, what is the other endpoint?

6) Write an equation of the line that is the perpendicular bisector of the line segment having endpoints $(3, -1)$ and $(3, 5)$.

7) Write an equation of the perpendicular bisector of the line segment whose endpoints are $(-1, 1)$ and $(7, -5)$

Want something more challenging? Sure you do! (not extra credit)

8. Find the point that is one-fourth of the way from $(2, 4)$ to $(10, 8)$.

9. One endpoint of a line segment is $(8, -1)$. The point $(5, -2)$ is one-third of the way from that endpoint to the other endpoint. Find the other endpoint.