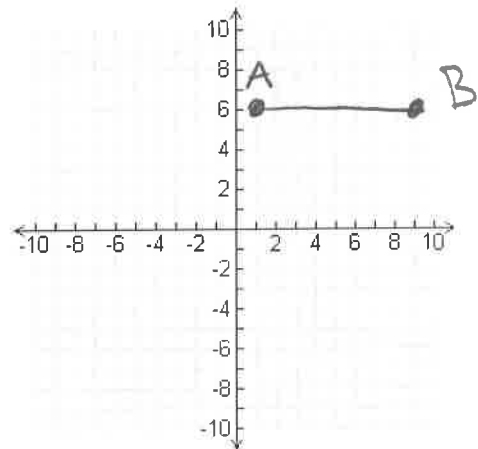**5-3 Midpoint and Distance Formula**

- *I can find the distance between two points.*
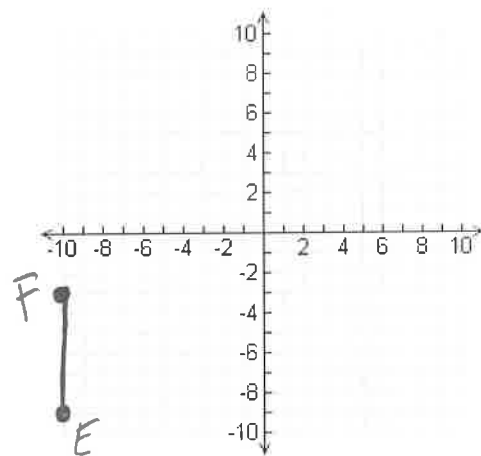- *I can find the midpoint of a line segment.*

<u>Part 1: Graphing</u>

1. Graph the points A (1, 6) and B (9, 6). Find the midpoint of $\overline{AB}$. Find the distance of $\overline{AB}$.

8 units

(count)

2. Graph the points E (-10, -9) and F (-10, -3). Find the midpoint of $\overline{EF}$. Find the distance $\overline{EF}$.

6 units

(count)

3. Graph the points C (2, 2) and D (6, 5). Find the midpoint of $\overline{CD}$. Find the distance of $\overline{CD}$.
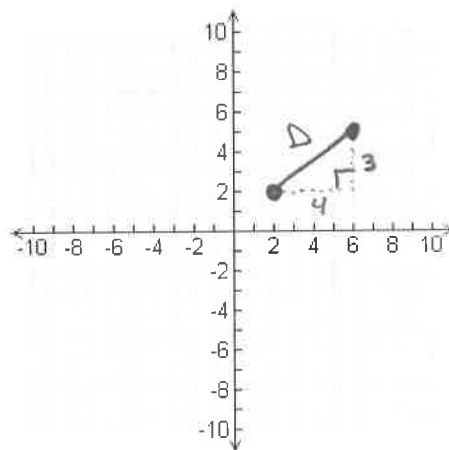
Distance

$D^2 = 4^2 + 3^2$

$D^2 = 16 + 9$

$D^2 = 25$

$D = 5$ units

Distance

Notes:

To find distance of...

vertical / horizontal segments: just count!

Diagonal segments: Pythagorean Theorem

Distance
Formula

$D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Part 2: Finding Midpoint

Find the midpoint for each line segment using the formula (no graphing needed). Show the formula and all work.

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

4.   G (6, 5) and H (9, 2)

$$X = \frac{6+9}{2} = \frac{15}{2} = 7.5 \quad \Big| \quad Y = \frac{5+2}{2} = \frac{7}{2} = 3.5$$

$(7.5, 3.5)$

5.   I (1, 1) and J (-3, -3)

$$X = \frac{1+^{-3}}{2} = \frac{-2}{2} = -1 \quad \Big| \quad Y = \frac{1+^{-3}}{2} = \frac{-2}{2} = -1$$

$(-1, -1)$

6.   K (1, -1) and L (8, -7)

$$X = \frac{1+8}{2} = \frac{9}{2} = 4.5 \quad \Big| \quad Y = \frac{-1+^{-7}}{2} = \frac{-8}{2} = -4$$

$(4.5, -4)$

Part 3: Finding Distance

Find the distance between each set of points. Show work.

7.   (0, 0) and (4, 3)

$$D = \sqrt{(4-0)^2 + (3-0)^2}$$
$$= \sqrt{4^2 + 3^2}$$
$$= \sqrt{25}$$
$$= 5 \text{ units}$$

8.   (3, -3) and (2, 7)

$$D = \sqrt{(3-2)^2 + (-3-7)^2}$$
$$= \sqrt{1^2 + (-10)^2}$$
$$= \sqrt{1 + 100}$$
$$\approx 10.05 \text{ units}$$

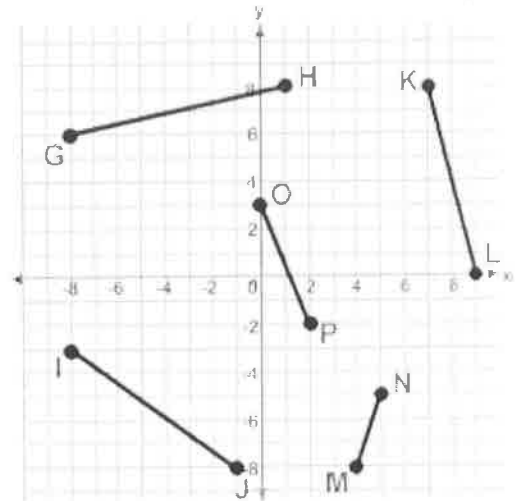9. Determine the coordinates of the points needed. Then find the distance of each line segment.

a) GH   G(-8, 6)   H(1, 9)

$D = \sqrt{(-8-1)^2 + (6-9)^2}$

$= \sqrt{(-9)^2 + (-3)^2}$

$= \sqrt{81 + 9}$

$= \sqrt{90} \approx \boxed{9.487 \text{ units}}$

b) KL   K(7, 9)   L(9, 0)

$D = \sqrt{(7-9)^2 + (9-0)^2}$

$= \sqrt{(-2)^2 + 9^2}$

$= \sqrt{4 + 81}$ $= \sqrt{85}$

$\approx \boxed{9.22 \text{ units}}$

Part 4: Putting it All Together

10. Triangle ABC has coordinates A (3, 9), B (5,1) and C (9, 5). **D is the midpoint of AB** and E is the **midpoint of AC.**

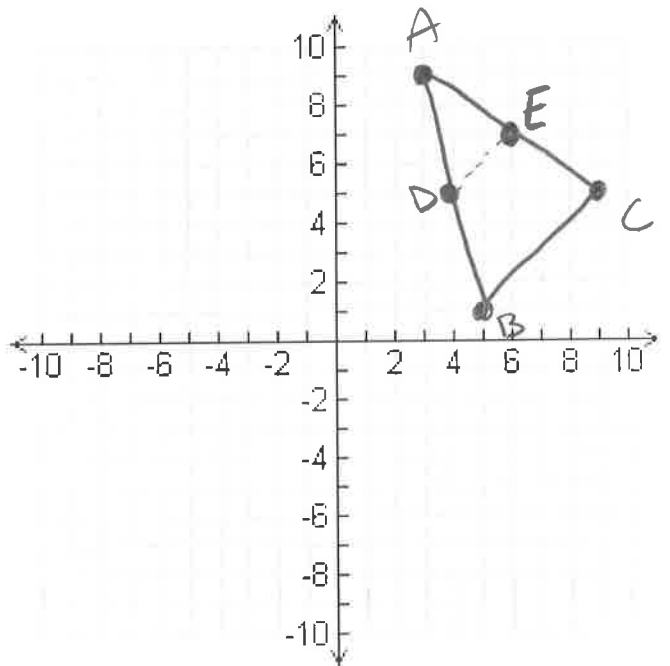a) Graph the points A, B, and C (make sure you label them). Find the coordinates of points D and E. Show all work.

$D = \left(\dfrac{3+5}{2}, \dfrac{9+1}{2} \right)$

$= \left(\dfrac{8}{2}, \dfrac{10}{2} \right)$

$= \boxed{(4, 5)}$

$E =$

$\left(\dfrac{3+9}{2}, \dfrac{9+5}{2} \right)$

$= \left(\dfrac{12}{2}, \dfrac{14}{2} \right) = \boxed{(6, 7)}$

b) Plot points D and point E on the graph and label.

c) Find the **length of DE. Show all work.**

$\overline{DE} = \sqrt{(4-6)^2 + (5-7)^2}$

$= \sqrt{2^2 + 2^2}$ $= \sqrt{8}$

$\approx \boxed{2.828 \text{ units}}$