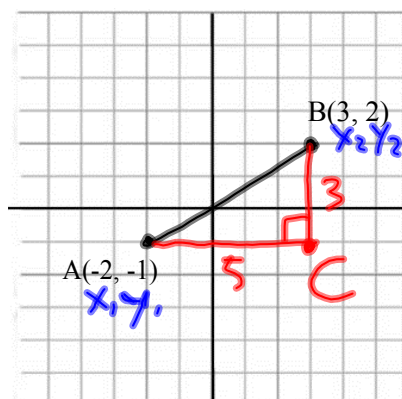


11.5 Apply the Distance and Midpoint Formulas

$$AB^2 = AC^2 + BC^2$$
$$\sqrt{AB^2} = \sqrt{AC^2 + BC^2}$$
$$AB = \sqrt{AC^2 + BC^2}$$
$$= \sqrt{5^2 + 3^2}$$
$$= \sqrt{25 + 9}$$
$$AB = \sqrt{34}$$

$AC = 5$
 $BC = 3$



The Distance Formula The distance between any two points (x_1, y_1) & (x_2, y_2) is

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

Find the distance between two points. $(-1, 3)$ and $(5, 2)$
 (x_1, y_1) (x_2, y_2)

$$= \sqrt{(5 - (-1))^2 + (2 - 3)^2}$$
$$= \sqrt{6^2 + (-1)^2}$$
$$= \sqrt{36 + 1} = \sqrt{37}$$

Find a Missing Coordinate

The distance between $(3, -5)$ and $(7, b)$ is 5 units. Find the value of b .

Find the distance between the points.

1. $(3, 0), (3, 6)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$\sqrt{(3-3)^2 + (6-0)^2}$$

$$= \sqrt{0^2 + 6^2}$$

$$= \sqrt{36}$$

$$\boxed{= 6}$$

2. $(-2, 1), (2, 5)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$\sqrt{(2-(-2))^2 + (5-1)^2}$$

$$= \sqrt{4^2 + 4^2}$$

$$= \sqrt{16 + 16}$$

$$= \sqrt{32}$$

$$\boxed{= 4\sqrt{2}}$$

3. $(6, -2), (-4, 7)$
 $x_1 \ y_1 \ x_2 \ y_2$

$$\sqrt{(-4-6)^2 + (7-(-2))^2}$$

$$= \sqrt{(-10)^2 + (9)^2}$$

$$= \sqrt{100 + 81}$$

$$\boxed{= \sqrt{181}}$$

4. The distance between $(1, a)$ and $(4, 2)$ is 3 units. Find the value of a .

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

$$3 = \sqrt{(4-1)^2 + (2-a)^2}$$

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

$$9 = 9 + (2-a)^2$$

$$0 = (2-a)^2$$

$$0 = \sqrt{(2-a)^2}$$

$$0 = 2 - a$$

$$a = 2$$

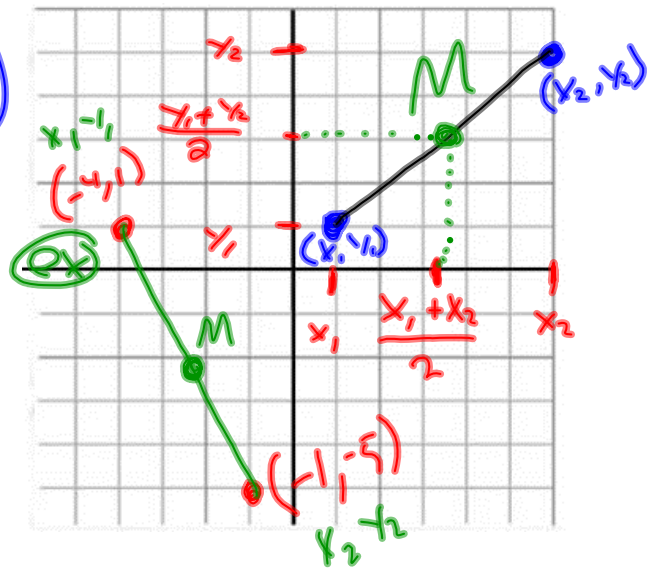
The Midpoint Formula

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

(ex)

$$M = \left(\frac{-4 + (-1)}{2}, \frac{1 + (-5)}{2} \right)$$

$$(-2.5, -2)$$



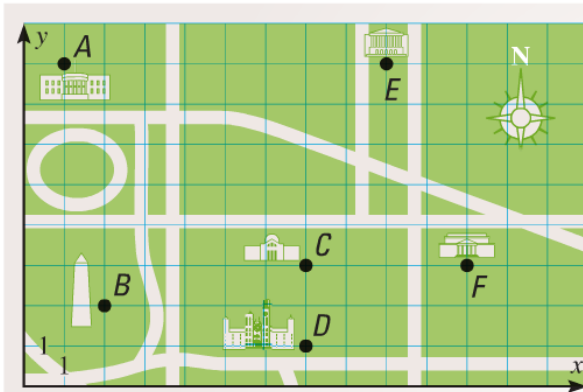
FINDING THE MIDPOINT Find the midpoint of the line segment with the given endpoints.

$$\begin{array}{l}
 x_1, y_1, x_2, y_2 \\
 22. (0, 1), (8, 3) \\
 \left(\frac{0+8}{2}, \frac{1+3}{2} \right) \\
 (4, 2)
 \end{array}$$

$$\begin{array}{l}
 x_1, y_1, x_2, y_2 \\
 24. (-5, 0), (1, 14) \\
 \left(\frac{-5+1}{2}, \frac{0+14}{2} \right) \\
 (-2, 7)
 \end{array}$$

$$\begin{array}{l}
 x_1, y_1, x_2, y_2 \\
 26. (-6, 6), (4, -4) \\
 \left(\frac{-6+4}{2}, \frac{6+(-4)}{2} \right) \\
 (-1, 1)
 \end{array}$$

SIGHTSEEING You and a friend are sightseeing in Washington, D.C. You are at the National Gallery of Art, and your friend is at the Washington Monument, as shown on the map. You want to meet at the landmark that is closest to the midpoint of your locations. At which landmark should you meet?



SIGHTS IN WASHINGTON, D.C.

- A) White House
- B) Washington Monument
- C) Natural History Museum
- D) Smithsonian Institution
- E) National Portrait Gallery
- F) National Gallery of Art