Distance Formula

Finding the shortest distance between two points

Ex 1) Find the distance between A(10,7) and B(6, 4)

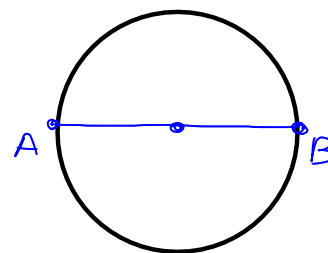$x_1 \, y_1$ $x_2 \, y_2$

Use distance formula

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

$$= \sqrt{(10 - 6)^2 + (7 - 4)^2}$$

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

$$= \sqrt{16 + 9}$$

$$= \sqrt{25}$$

$$= 5$$
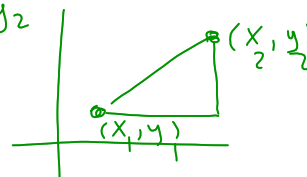
Ex 2) Endpoints of a diameter of a circle are A(5,4) and B(-1,-4). Find its length.

$x_1 \, y_1$ $x_2 \, y_2$

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

$$= \sqrt{(5 - (-1))^2 + (4 - (-4))^2}$$

$$= \sqrt{36 + 64}$$

$$= \sqrt{100}$$

$$= 10$$

Midpoint of a Line Segment

On the line segment below, identify the midpoint.

$$\left(\frac{0+10}{2}\right)$$
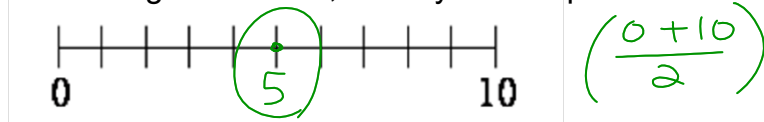
The midpoint is found by the mean (average) of the 2 endpoints.
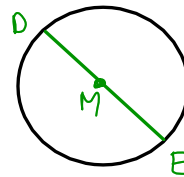
Midpoint formula

$$M(x , y) = (\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$$
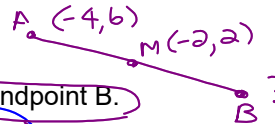
Ex 1) Find the midpoint of A(-4, 2) and B (-8, -6).

$$M = \left(\frac{-8+(-4)}{2}, \frac{-6+2}{2}\right)$$

$$= \left(\frac{-12}{2}, \frac{-4}{2}\right)$$

$$= (-6, -2)$$

$x_2 \ y_2$ $x_1 \ y_1$

Ex 2) Find the center of the circle whose endpoints of the diameter are D(3, -2) and E(-2, 4).

$x_1 \ y_1$ $x_2 \ y_2$

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

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

$$M (0.5, 1)$$

or $M (\frac{1}{2}, 1)$

Ex 3) One of the endpoints of AB is A(-4,6).
If the midpoint is (-2, 2), find the other endpoint B.

A (-4,6)   M (-2,2)   B ?

$$M (-2, 2) = \left(\frac{-4+x}{2}, \frac{6+y}{2}\right)$$

$x_1 \ y_1$

x-coordinate

$$(2)-2 = \frac{-4+x}{2}(2) \qquad (2) 2 = \frac{6+y}{2}(2)$$

$$\begin{array}{c} +4 \\ -4 = -4+x \end{array} \qquad \begin{array}{c} -6 \\ 4 = 6+y \end{array}$$

$$0 = x \qquad\qquad -2 = y$$

$$\therefore B(0, -2)$$

Therefore

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#1-5