

Lesson 8-1

Example 1 Find a Midpoint

Find the midpoint of the line segment with endpoints at $(-2, 1.4)$ and $(0, -6.8)$.

$$\begin{aligned} \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) &= \left(\frac{-2 + 0}{2}, \frac{1.4 + (-6.8)}{2} \right) && \text{Let } (x_1, y_1) = (-2, 1.4) \text{ and} \\ & && (x_2, y_2) = (0, -6.8). \\ &= \left(-\frac{2}{2}, \frac{-5.4}{2} \right) \text{ or } (-1, -2.7) && \text{Simplify.} \end{aligned}$$

The midpoint of the line segment with endpoints at $(-2, 1.4)$ and $(0, -6.8)$ is $(-1, -2.7)$.

Example 2 Find the Distance Between Two Points

What is the distance between $C\left(-\frac{3}{4}, \frac{1}{5}\right)$ and $D\left(2, -\frac{3}{5}\right)$.

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} && \text{Distance Formula} \\ &= \sqrt{\left[2 - \left(-\frac{3}{4}\right)\right]^2 + \left[-\frac{3}{5} - \frac{1}{5}\right]^2} && \text{Let } (x_1, y_1) = \left(-\frac{3}{4}, \frac{1}{5}\right) \text{ and } (x_2, y_2) = \left(2, -\frac{3}{5}\right). \\ &= \sqrt{\left(\frac{11}{4}\right)^2 + \left(-\frac{4}{5}\right)^2} && \text{Subtract.} \\ &= \sqrt{\frac{3281}{400}} \text{ or } \frac{\sqrt{3281}}{20} && \text{Simplify.} \end{aligned}$$

The distance between the points is $\frac{\sqrt{3281}}{20}$ units.

Example 3 The Closest Point
Multiple-Choice Test Item

Which of the following points is closest to $(4, -6)$?

- A. $(-2, 1)$ B. $(0, 0)$ C. $(1, -1)$ D. $(2, 1)$

Read the Test Item

The word *closest* refers to the least distance.

Solve the Test Item

Use the Distance Formula to find the distance from $(4, -6)$ to each point.

$$\begin{aligned} & \text{Distance to } (-2, 1) \\ d &= \sqrt{(-2 - 4)^2 + [1 - (-6)]^2} \\ &= \sqrt{(-6)^2 + 7^2} \text{ or } \sqrt{85} \end{aligned}$$

$$\begin{aligned} & \text{Distance to } (0, 0) \\ d &= \sqrt{(0 - 4)^2 + [0 - (-6)]^2} \\ &= \sqrt{(-4)^2 + 6^2} \text{ or } 2\sqrt{13} \end{aligned}$$

$$\begin{aligned} & \text{Distance to } (1, -1) \\ d &= \sqrt{(1 - 4)^2 + [-1 - (-6)]^2} \\ &= \sqrt{(-3)^2 + 5^2} \text{ or } \sqrt{34} \end{aligned}$$

$$\begin{aligned} & \text{Distance to } (2, 1) \\ d &= \sqrt{(2 - 4)^2 + [1 - (-6)]^2} \\ &= \sqrt{(-2)^2 + 7^2} \text{ or } \sqrt{53} \end{aligned}$$

The least distance is $\sqrt{34}$ units. So, the closest point to $(4, -6)$ is $(1, -1)$.