

10-3 Distance and Midpoints

Find the distance between each pair of points.

12. $A(-3, 1), B(7, 13)$

13. $P(2, -1), Q(10, -7)$

Find the coordinates of the midpoint of a segment with the given endpoints.

14. $L(-3, 16), M(17, 4)$

15. $C(32, -1), D(0, -12)$

Find the coordinates of the missing endpoint if M is the midpoint of $\overline{XY}$.

16. $X(-11, -6), M(15, 4)$

17. $M(-4, 8), Y(19, 0)$

18. **HIKING** Moza and Maha are hiking in a state park and decide to take separate trails. The map of the park is set up on a coordinate grid. Moza's location is at the point $(7, 13)$ and Maha is at $(3, 5)$.

- a. Find the distance between them.
- b. Find the coordinates of the point midway between their locations.

Example 3Find the distance between $X(5, 7)$ and $Y(-7, 2)$.

Let $(x_1, y_1) = (5, 7)$ and $(x_2, y_2) = (-7, 2)$.

$$\begin{aligned} d &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(-7 - 5)^2 + (2 - 7)^2} \\ &= \sqrt{(-12)^2 + (-5)^2} \\ &= \sqrt{169} \text{ or } 13 \end{aligned}$$

The distance from X to Y is 13 units.**Example 4**Find the coordinates of the midpoint between $P(-4, 13)$ and $Q(6, 5)$.

Let $(x_1, y_1) = (-4, 13)$ and $(x_2, y_2) = (6, 5)$.

$$\begin{aligned} M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) &= M\left(\frac{-4 + 6}{2}, \frac{13 + 5}{2}\right) \\ &= M(1, 9) \end{aligned}$$

The coordinates of the midpoint are $(1, 9)$.