## 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 3

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

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

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

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 $(x_2, y_2) = (6, 5)$.

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

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