NAME _____ DATE _____

6-7 Midpoint of a Line Segment (Pages 369–374)

Midpoint of a Line Segment	The **midpoint** of a line segment is the point that is halfway between the endpoints of the segment. The coordinates of the midpoint of a line segment whose endpoints are at (x_1, y_1) and (x_2, y_2) are given by $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$.

EXAMPLE

The midpoint of a segment is $M(2, 3)$ and one endpoint is $B(-1, 5)$. Find the coordinates of the other endpoint.

Let $M(2, 3) = (x, y)$ and $B(-1, 5) = (x_1, y_1)$.

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

$\left(\frac{-1 + x_2}{2}, \frac{5 + y_2}{2}\right) = (2, 3)$

Form two equations by setting the x-coordinates equal to each other and the y-coordinates equal to each other.

$\frac{-1 + x_2}{2} = 2$ $\qquad$ $\frac{5 + y_2}{2} = 3$

$-1 + x_2 = 4$ $\qquad$ $5 + y_2 = 6$

$x_2 = 5$ $\qquad$ $y_2 = 1$

Coordinates of the other endpoint: (5, 1)

Try These Together

1. Find the coordinates of the midpoint of the segment that joins $A(8, 4)$ and $B(17, 9)$.
HINT: Let $(x_1, y_1) = (8, 4)$ and $(x_2, y_2) = (17, 9)$.

2. The midpoint of a segment is $(-1, -2)$ and one endpoint is $(4, -5)$. Find the coordinates of the other endpoint.
HINT: Let $(x, y) = (-1, -2)$ and $(x_1, y_1) = (4, -5)$.

PRACTICE

Find the coordinates of the midpoint of a segment with each pair of endpoints.

3. $U(7, -5), V(9, -1)$

4. $S(-8, 4), T(3, -4)$

5. $A(-1.8, 1.9), B(1.1, 2.8)$

6. $G(x, 4y), H(2x, 2y)$

Find the coordinates of the other endpoint of a segment given one endpoint and the midpoint M.

7. $C(-9, 7), M(-2, 3)$

8. $K(9.5, -2), M(3.6, 5)$

9. $Q(-6, -1), M(-5, -9)$

10. $I\left(\frac{1}{2}, -\frac{1}{3}\right), M\left(-\frac{5}{2}, \frac{2}{3}\right)$

11. Landscaping Carl would like to place an arbor midway between the two oak trees in his back yard. If the trees are represented by (4, 7) and (2, 15) on a coordinate plane, where should the arbor be placed?

12. **Standardized Test Practice** What is the midpoint of the segment with endpoints $(-8, 0)$ and $(2, -6)$?

A $(-6, -6)$ **B** $(-3, -3)$ **C** $(5, -3)$ **D** $(-10, 3)$

Answers: **1.** (12.5, 6.5) **2.** (−6, 1) **3.** (8, −3) **4.** (−2.5, 0) **5.** (−0.35, 2.35) **6.** $\left(\frac{3}{2}x, 3y\right)$ **7.** (5, −1) **8.** (−2.3, 12) **9.** (−4, −17) **10.** $\left(-\frac{11}{2}, \frac{5}{3}\right)$ **11.** (3, 11) **12.** B