Name ____ Date __________

1.3 Using Midpoint and Distance Formulas

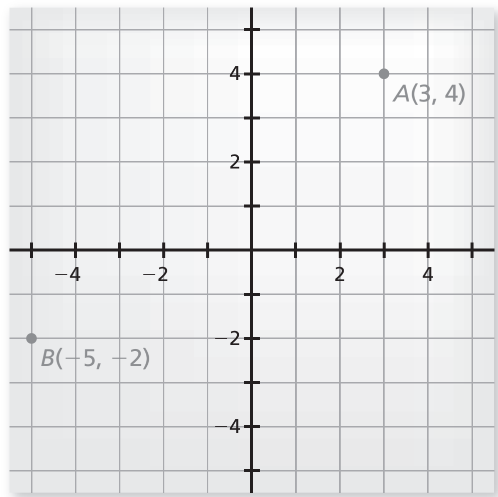
For use with Exploration 1.3

Essential Question How can you find the midpoint and length of a line segment in a coordinate plane?

1 EXPLORATION: Finding the Midpoint of a Line Segment

Work with a partner. Use centimeter graph paper.

a. Graph $\overline{AB}$, where the points A and B are as shown.



b. Explain how to *bisect* $\overline{AB}$, that is, to divide $\overline{AB}$ into two congruent line segments. Then bisect $\overline{AB}$ and use the result to find the *midpoint M* of $\overline{AB}$.

c. What are the coordinates of the midpoint M?

d. Compare the x-coordinates of A, B, and M. Compare the y-coordinates of A, B, and M. How are the coordinates of the midpoint M related to the coordinates of A and B?

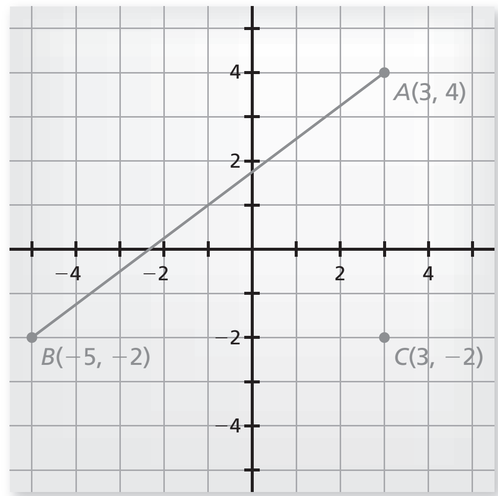
Name____ Date__________

2 EXPLORATION: Finding the Length of a Line Segment

Work with a partner. Use centimeter graph paper.

a. Add point C to your graph as shown.

b. Use the Pythagorean Theorem to find the length of $\overline{AB}$.



c. Use a centimeter ruler to verify the length you found in part (b).

d. Use the Pythagorean Theorem and point M from Exploration 1 to find the lengths of $\overline{AM}$ and $\overline{MB}$. What can you conclude?

Communicate Your Answer

3. How can you find the midpoint and length of a line segment in a coordinate plane?

4. Find the coordinates of the midpoint M and the length of the line segment whose endpoints are given.

a. $D(-10, -4), E(14, 6)$

b. $F(-4, 8), G(9, 0)$

Name ____ Date __________

1.3 Notetaking with Vocabulary

For use after Lesson 1.3

In your own words, write the meaning of each vocabulary term.

midpoint

segment bisector

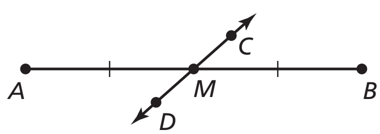
Core Concepts

Midpoints and Segment Bisectors

The **midpoint** of a segment is the point that divides the segment into two congruent segments.

M is the midpoint of $\overline{AB}$.
So, $\overline{AM} \cong \overline{MB}$ and $AM = MB$.

A **segment bisector** is a point, ray, line, line segment, or plane that intersects the segment at its midpoint. A midpoint or a segment bisector *bisects* a segment.



$\overleftrightarrow{CD}$ is a segment bisector of $\overline{AB}$.
So, $\overline{AM} \cong \overline{MB}$ and $AM = MB$.

Notes:

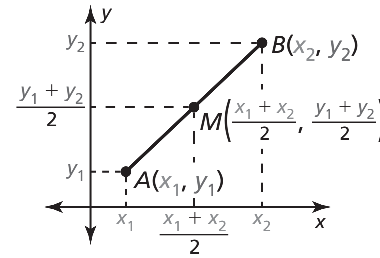
1.3 Notetaking with Vocabulary (continued)

The Midpoint Formula

The coordinates of the midpoint of a segment are the averages of the x-coordinates and of the y-coordinates of the endpoints.

If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the midpoint M of $\overline{AB}$ has coordinates

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

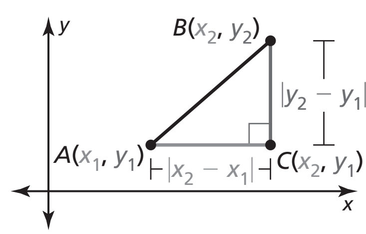


Notes:

The Distance Formula

If $A(x_1, y_1)$ and $B(x_2, y_2)$ are points in a coordinate plane, then the distance between A and B is

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



Notes:

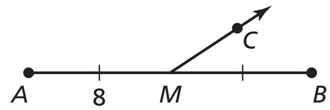
Name ____ Date _________

Extra Practice

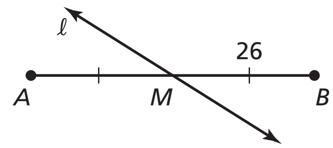
In Exercises 1–3, identify the segment bisector of $\overline{AB}$. Then find *AB*.

1.

2.

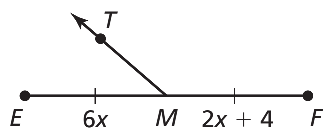


3.

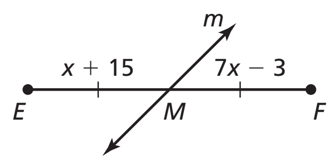


In Exercises 4-6, identify the segment bisector of $\overline{EF}$. Then find *EF*.

4.



5.



6.

In Exercises 7–9, the endpoints of $\overline{PQ}$ are given. Find the coordinates of the midpoint *M*.

7. $P(-4, 3)$ and $Q(0, 5)$

8. $P(-2, 7)$ and $Q(10, -3)$

9. $P(3, -15)$ and $Q(9, -3)$

In Exercises 10–12, the midpoint *M* and one endpoint of $\overline{JK}$ are given. Find the coordinates of the other endpoint.

10. $J(7, 2)$ and $M(1, -2)$

11. $J(5, -2)$ and $M(0, -1)$

12. $J(2, 16)$ and $M\left(-\frac{9}{2}, 7\right)$