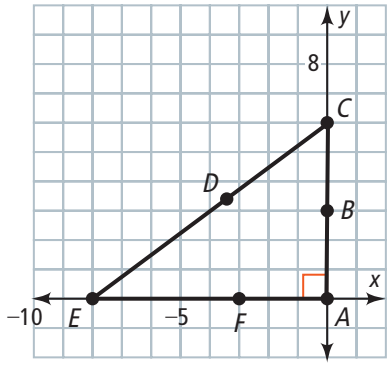
1-7 Midpoint and Distance in the Coordinate Plane

Vocabulary

Review

Use the figure at the right for Exercises 1–6. Write T for *true* or F for *false*.



_____ **1.** Points A and B are both at the *origin*.

_____ **2.** If $AB = BC$, then B is the midpoint of $\overline{AC}$.

_____ **3.** The *midpoint* of $\overline{AE}$ is F.

_____ **4.** The *Pythagorean Theorem* can be used for any triangle.

_____ **5.** Point C is at $(6, 0)$.

_____ **6.** Point E has a *y-coordinate* of -8.

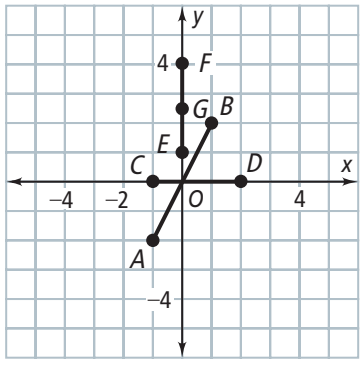
Vocabulary Builder

midpoint (noun) MID poynt

Definition: A *midpoint* of a segment is a point that divides the segment into two congruent segments.

Use Your Vocabulary

Use the figure at the right for Exercises 7–9.



7. The *midpoint* of $\overline{EF}$ is G(,).

8. The *midpoint* of $\overline{AB}$ is (,), or the origin.

9. The *midpoint* of $\overline{CD}$ is (,).

take note

Key Concept Midpoint Formulas

On a Number Line	In the Coordinate Plane
The coordinate of the midpoint M of $\overline{AB}$ with endpoints at a and b is $\frac{a+b}{2}$.	Given $A(x_1, y_1)$ and $B(x_2, y_2)$, the coordinates of the midpoint of $\overline{AB}$ are $M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$

Find the coordinate of the midpoint M of each segment with the given endpoints on a number line.

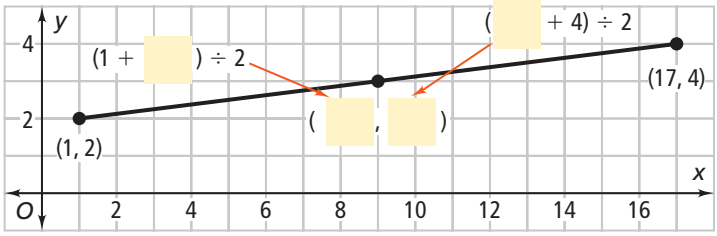
10. endpoints 5 and 9

11. endpoints -3 and 5

12. endpoints -10 and -3

13. endpoints -8 and -1

14. Complete the diagram below.



Problem 2 Finding an Endpoint

Got It? **The midpoint of $\overline{AB}$ has coordinates $(4, -9)$. Endpoint A has coordinates $(-3, -5)$. What are the coordinates of B?**

15. Complete the equations below.

Endpoint A Coordinates

(,)

Midpoint Formula

$\left(\frac{x_1 + \square}{2}, \frac{y_1 + \square}{2}\right)$

Midpoint Coordinates

(,)

$\frac{x_1 + \square}{2} = \square$

$x_1 + \square = \square$

$x_1 = \square$

← Solve two equations. →

$\frac{y_1 + \square}{2} = \square$

$y_1 + \square = \square$

$y_1 = \square$

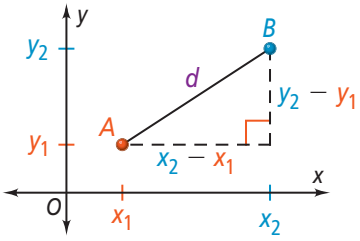
16. The coordinates of endpoint B are ( ).

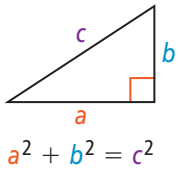
take note

Formula The Distance Formula

The distance between two points $A(x_1, y_1)$ and $B(x_2, y_2)$ is $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$.

The Distance Formula is based on the Pythagorean Theorem.





$a^2 + b^2 = c^2$

Use the diagrams above. Draw a line from each triangle side in Column A to the corresponding triangle side in Column B.

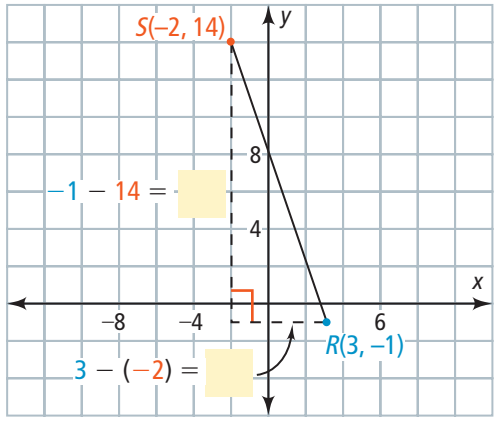
Column A	Column B
17. $y_2 - y_1$	a
18. $x_2 - x_1$	b
19. distance, d	c

Problem 3 Finding Distance

Got It? $\overline{SR}$ **has endpoints** $S(-2, 14)$ **and** $R(3, -1)$**. What is** SR **to the nearest tenth?**

20. Complete the diagram at the right.

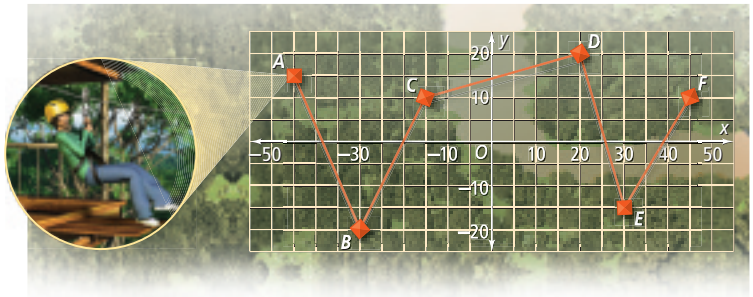
21. Let $S(-2, 14)$ be (x_1, y_1) and let $R(3, -1)$ be (x_2, y_2). Use the justifications and complete the steps below to find SR.



$d = \sqrt{(\quad - x_1)^2 + (\quad - y_1)^2}$	Use the Distance Formula.
$SR = \sqrt{(\quad - (-2))^2 + (\quad - 14)^2}$	Substitute.
$= \sqrt{(\quad)^2 + (\quad)^2}$	Subtract.
$= \sqrt{\quad + \quad}$	Simplify powers.
$= \sqrt{\quad}$	Add.
$\approx$	Use a calculator.

Problem 4 Finding Distance

Got It? On a zip-line course, you are harnessed to a cable that travels through the treetops. You start at Platform *A* and zip to each of the other platforms. How far do you travel from Platform *D* to Platform *E*? Each grid unit represents 5 m.



22. The equation is solved below. Write a justification for each step.

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

_____

$$DE = \sqrt{(30 - 20)^2 + (-15 - 20)^2}$$

_____

$$= \sqrt{10^2 + (-35)^2} = \sqrt{100 + 1225} = \sqrt{1325}$$

_____

23. To the nearest tenth, you travel about _____ m.

Lesson Check • Do you UNDERSTAND?

Reasoning How does the Distance Formula ensure that the distance between two different points is positive?

24. A radical symbol with no sign in front of it indicates a positive / negative square root.

25. Now answer the question.

_____

Math Success

Check off the vocabulary words that you understand.

☐ midpoint ☐ distance ☐ coordinate plane

Rate how well you can *use the Midpoint and Distance Formulas.*

Need to review 0 2 4 6 8 10 Now I get it!