

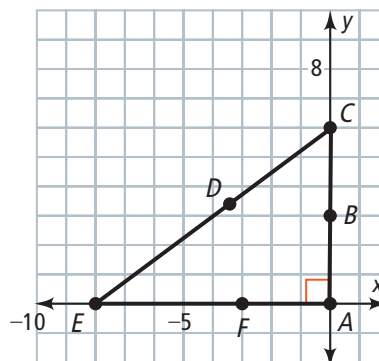


## Vocabulary

### Review

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

- Points  $A$  and  $B$  are both at the *origin*.
- If  $AB = BC$ , then  $B$  is the midpoint of  $\overline{AC}$ .
- The *midpoint* of  $\overline{AE}$  is  $F$ .
- The *Pythagorean Theorem* can be used for any triangle.
- Point  $C$  is at  $(6, 0)$ .
- Point  $E$  has a *y-coordinate* of  $-8$ .



### Vocabulary Builder

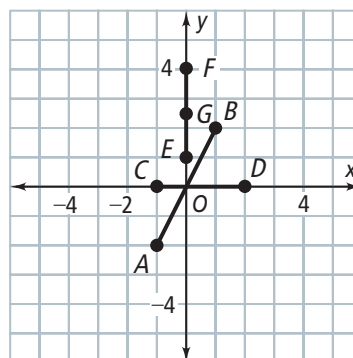
**midpoint** (noun) MID poynt

**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.

- The *midpoint* of  $\overline{EF}$  is  $G$ (  ,  ).
- The *midpoint* of  $\overline{AB}$  is (  ,  ), or the origin.
- The *midpoint* of  $\overline{CD}$  is (  ,  ).



## Key Concept Midpoint Formulas

### On a Number Line

The coordinate of the midpoint  $M$  of  $\overline{AB}$  with endpoints at  $a$  and  $b$  is  $\frac{a+b}{2}$ .

### In the Coordinate Plane

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.

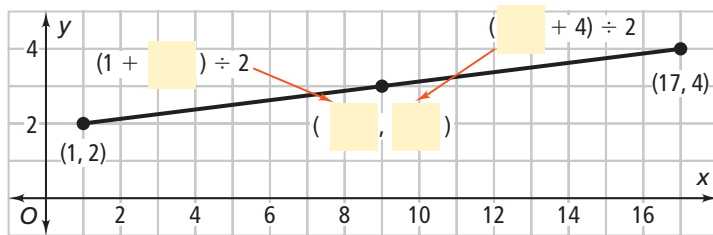
10. endpoints 5 and 9

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.

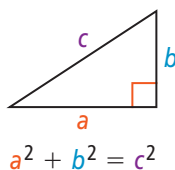
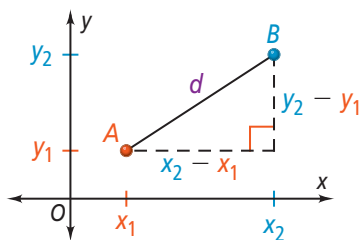
Endpoint A Coordinates	Midpoint Formula	Midpoint Coordinates
( <input type="text"/> , <input type="text"/> )	$\left( \frac{x_1 + \text{$ , $\frac{y_1 + \text{$	( <input type="text"/> , <input type="text"/> )
$\frac{x_1 + \text{$ = <input type="text"/> $\frac{x_1 + \text{$ = <input type="text"/> $x_1 = \text{$		
← Solve two equations. →		
$\frac{y_1 + \text{$ = <input type="text"/> $y_1 + \text{$ = <input type="text"/> $y_1 = \text{$		

16. The coordinates of endpoint  $B$  are (  ).

## 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.



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,  $d$

$c$

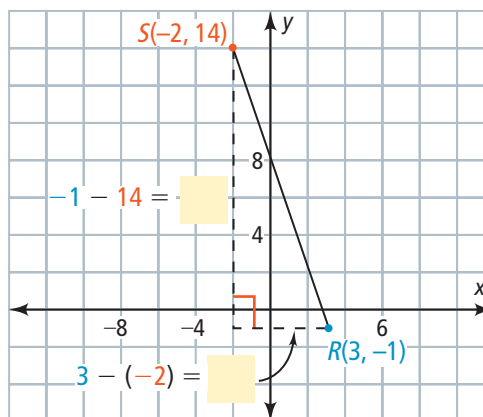


### Problem 3 Finding Distance

**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  $SR$ .



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

$$SR = \sqrt{(\text{ } - (-2))^2 + (\text{ } - 14)^2}$$

$$= \sqrt{(\text{ })^2 + (\text{ })^2}$$

$$= \sqrt{\text{ } + \text{ }}$$

$$= \sqrt{\text{ }}$$

$$\approx \text{ }$$

Use the Distance Formula.

Substitute.

Subtract.

Simplify powers.

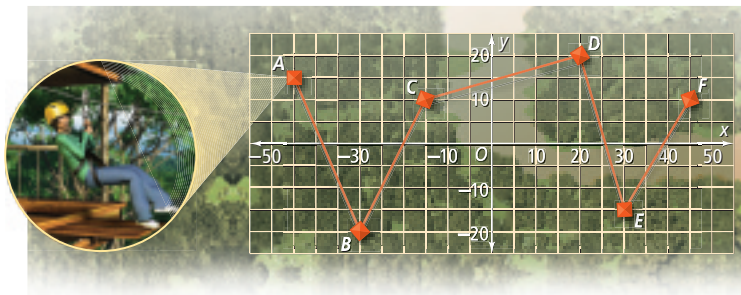
Add.

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*.

