PRACTICE & PROBLEM SOLVING

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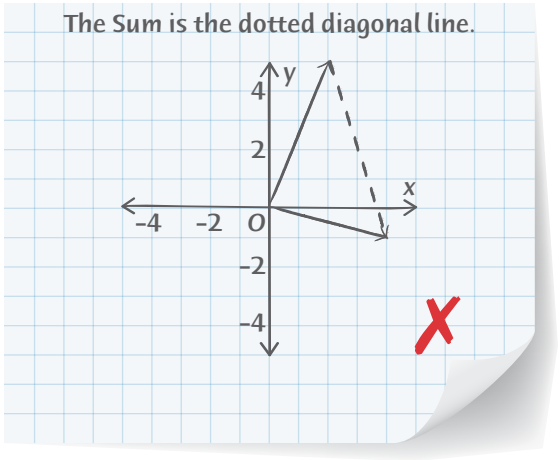
Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

11. Communicate Precisely Explain two ways in which you can find the magnitude of vectors.

12. Error Analysis Describe and correct the error a student made in graphically adding the vectors $\overrightarrow{AB} = \langle 2, 5 \rangle$ and $\overrightarrow{BC}\ \langle 4, -1 \rangle$.

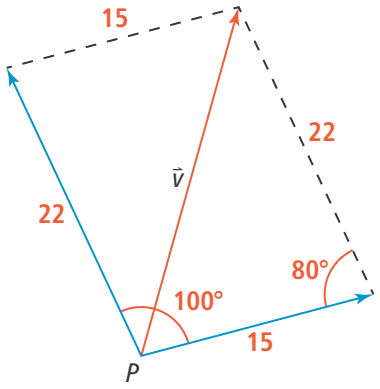


13. Generalize Why is the magnitude of a vector always represented by a positive value?

14. Construct Arguments Is $\overrightarrow{MN}$ the same as $\overrightarrow{NM}$? Justify your answer with an explanation.

15. Make Sense and Persevere If $\overrightarrow{EF} = \langle -2, 6 \rangle$, write the component form of a vector with the same magnitude but in the opposite direction.

16. Higher Order Thinking The sum of two vector forces operating on an object gives the total net force on the object. Use the Law of Cosines to find the magnitude of $\vec{v}$ when two forces of 15 and 22 kg act on a point P in the plane.



PRACTICE

Write each vector in component form. Identify its magnitude and direction. SEE EXAMPLE 1

17. initial point at (9, 5); terminal point at (4, 3)

18. initial point at (0, 6); terminal point at (−1, 2)

19. initial point at (0, 0); terminal point at (7, 3)

20. initial point at (2, −2); terminal point at (1, 8)

Add each vector pair. SEE EXAMPLE 2

21. $\overrightarrow{MN} = \langle 12, 4 \rangle$ and $\overrightarrow{NO} = \langle -5, 0 \rangle$

22. $\overrightarrow{MN} = \langle 2, 13 \rangle$ and $\overrightarrow{NO} = \langle -10, 6 \rangle$

23. $\overrightarrow{MN} = \langle -7, 10 \rangle$ and $\overrightarrow{NO} = \langle 14, -9 \rangle$

24. Yumiko is operating a boat across a river with engine speed set at 15 mph headed 45° south of west. The current of the river is 3 mph at a direction that is 45° east of south. What are the magnitude and direction of the path of her boat as she operates it across the river? SEE EXAMPLE 3

Find the components, magnitude, and direction of $\vec{s} - \vec{t}$ for each given vector pair. SEE EXAMPLE 4

25. $\vec{s} = \langle 6, 5 \rangle$ and $\vec{t} = \langle -8, 1 \rangle$

26. $\vec{s} = \langle -1, 10 \rangle$ and $\vec{t} = \langle 1, 1 \rangle$

27. $\vec{s} = \langle -3, 7 \rangle$ and $\vec{t} = \langle 0, 0 \rangle$

Multiply each vector by the given scalar. SEE EXAMPLE 5

28. $\vec{t} = \langle -7, -9 \rangle$; scalar = 4

29. $\vec{t} = \langle 4, 12 \rangle$; scalar = −6

30. $\vec{t} = \langle 6, -1 \rangle$; scalar = 2

31. $\overrightarrow{EF} = \langle 8, 4 \rangle$. How can you reflect $\overrightarrow{EF}$ across the y-axis using matrices? SEE EXAMPLE 6

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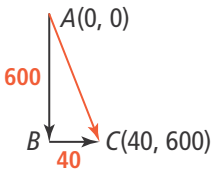
Mixed Review Available Online

APPLY

32. Reason A ball is thrown with an initial speed of 20 mph in a direction that makes an angle of 30° with the positive x-axis. Express the velocity vector $\vec{v}$ in terms of the horizontal movement along the x-axis $\overrightarrow{AP}$ and the vertical movement along the y-axis $\overrightarrow{AQ}$.

33. Model With Mathematics A plane is flying due south, but it is pushed off course by a crosswind blowing east. At 7 A.M. the plane is located at point A, and at 8 A.M. the plane is located at point C. The diagram below shows the movement of the plane and the coordinates of the locations.



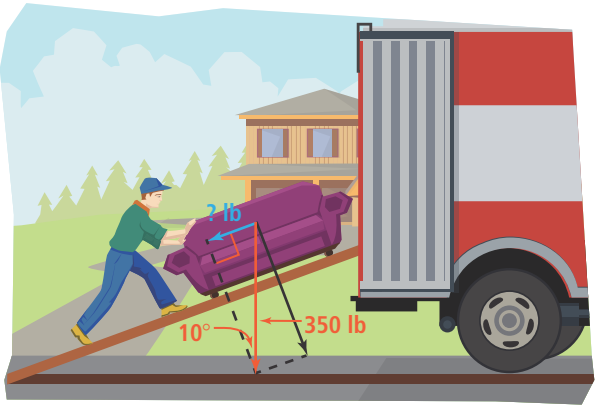
a. What is the component form of vector $\overrightarrow{AC}$?

b. What does each of the components of vector $\overrightarrow{AC}$ represent?

c. Find and interpret the magnitude of $\overrightarrow{AC}$.

d. To what degree did the crosswind change the plane's original course?

34. Make Sense and Persevere You are pushing a 350 lb sofa on wheels onto a ramp that inclines 10°. Find the component form and magnitude of the blue vector in the diagram to determine how much force you need to apply to keep the sofa from rolling down the ramp.



ASSESSMENT PRACTICE

35. Which of the following vectors have the same magnitude? Select all that apply.

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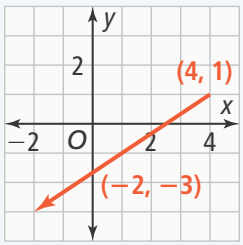

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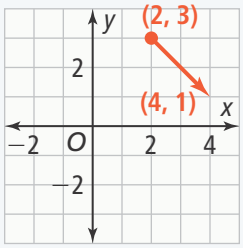

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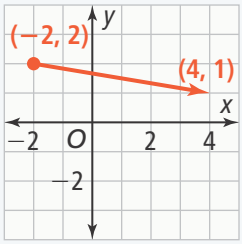

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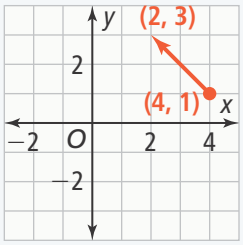
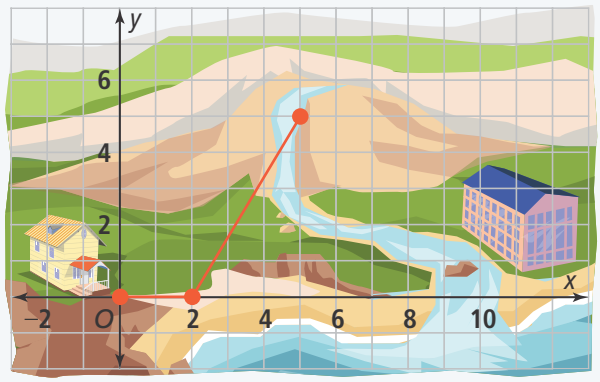


36. SAT/ACT If $\vec{s} = \langle -2, 8 \rangle$ and $\vec{t} = \langle 7, 11 \rangle$, find $\vec{s} + \vec{t}$.

Ⓐ $\langle -5, 3 \rangle$ Ⓑ $\langle 9, 19 \rangle$ Ⓒ $\langle 9, 3 \rangle$ Ⓓ $\langle 5, 19 \rangle$

37. Performance Task Starting from her cabin, Marta hikes 2 mi east to a cove and then turns 60° toward the north to hike 6 mi to a waterfall. The component form, $\vec{v}$, of Marta's hike to the cove is $\langle 2, 0 \rangle$. Let $\vec{u}$ represent Marta's hike from the cove to the waterfall.



Part A Find the component form of $\vec{u}$.

Part B Use vector addition to find the component form of the vector that represents the straight distance from Marta's current location back to her cabin.

Part C Find Marta's actual straight distance from her cabin by finding the magnitude of the vector in part (b).