Do the highlighted problems.

Exercises

= Step-by-Step Solutions begin on page R29.

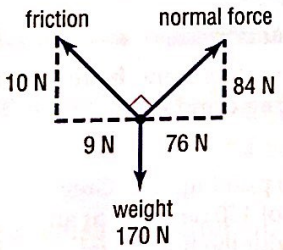
Find the component form and magnitude of $\overrightarrow{AB}$ with the given initial and terminal points. (Examples 1 and 2)

1. $A(-3, 1), B(4, 5)$
2. $A(2, -7), B(-6, 9)$
3. $A(10, -2), B(3, -5)$
4. $A(-2, 7), B(-9, -1)$
5. $A(-5, -4), B(8, -2)$
6. $A(-2, 6), B(1, 10)$
7. $A(2.5, -3), B(-4, 1.5)$
8. $A(-4.3, 1.8), B(9.4, -6.2)$
9. $A\left(\frac{1}{2}, -9\right), B\left(6, \frac{5}{2}\right)$
10. $A\left(\frac{3}{5}, -\frac{2}{5}\right), B(-1, 7)$

Find each of the following for $\mathbf{f} = \langle 8, 0\rangle$, $\mathbf{g} = \langle -3, -5\rangle$, and $\mathbf{h} = \langle -6, 2\rangle$. (Example 3)

11. $4\mathbf{h} - \mathbf{g}$
12. $\mathbf{f} + 2\mathbf{h}$
13. $3\mathbf{g} - 5\mathbf{f} + \mathbf{h}$
14. $2\mathbf{f} + \mathbf{g} - 3\mathbf{h}$
15. $\mathbf{f} - 2\mathbf{g} - 2\mathbf{h}$
16. $\mathbf{h} - 4\mathbf{f} + 5\mathbf{g}$
17. $4\mathbf{g} - 3\mathbf{f} + \mathbf{h}$
18. $6\mathbf{h} + 5\mathbf{f} - 10\mathbf{g}$

19. **PHYSICS** In physics, force diagrams are used to show the effects of all the different forces acting upon an object. The following force diagram could represent the forces acting upon a child sliding down a slide. (Example 3)



   a. Using the blue dot representing the child as the origin, express each force as a vector in component form.
   b. Find the component form of the resultant vector representing the force that causes the child to move down the slide.

Find a unit vector $\mathbf{u}$ with the same direction as $\mathbf{v}$. (Example 4)

20. $\mathbf{v} = \langle -2, 7\rangle$
21. $\mathbf{v} = \langle 9, -3\rangle$
22. $\mathbf{v} = \langle -8, -5\rangle$
23. $\mathbf{v} = \langle 6, 3\rangle$
24. $\mathbf{v} = \langle -2, 9\rangle$
25. $\mathbf{v} = \langle -1, -5\rangle$
26. $\mathbf{v} = \langle 1, 7\rangle$
27. $\mathbf{v} = \langle 3, -4\rangle$

Let $\overrightarrow{DE}$ be the vector with the given initial and terminal points. Write $\overrightarrow{DE}$ as a linear combination of the vectors $\mathbf{i}$ and $\mathbf{j}$. (Example 5)

28. $D(4, -1), E(5, -7)$
29. $D(9, -6), E(-7, 2)$
30. $D(3, 11), E(-2, -8)$
31. $D(9.5, 1), E(0, -7.3)$
32. $D(-3, -5.7), E(6, -8.1)$
33. $D(-4, -6), E(9, 5)$
34. $D\left(\frac{1}{8}, 3\right), E\left(-4, \frac{2}{7}\right)$
35. $D(-3, 1.5), E(-3, 1.5)$
36. **COMMUTE** To commute to school, Larisa leaves her house and drives north on Pepper Lane for 2.4 miles. She turns left on Cinnamon Drive for 3.1 miles and then turns right on Maple Street for 5.8 miles. Express Larisa's commute as a linear combination of unit vectors $\mathbf{i}$ and $\mathbf{j}$. (Example 5)
37. **ROWING** Nadia is rowing across a river at a speed of 5 miles per hour perpendicular to the shore. The river has a current of 3 miles per hour heading downstream. (Example 5)
   a. At what speed is she traveling?
   b. At what angle is she traveling with respect to the shore?

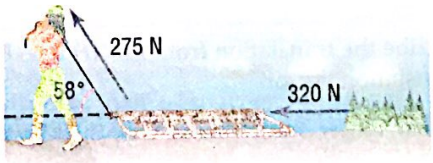
Find the component form of v with the given magnitude and direction angle. (Example 6)

38. $|\mathbf{v}| = 12, \theta = 60°$
39. $|\mathbf{v}| = 4, \theta = 135°$
40. $|\mathbf{v}| = 6, \theta = 240°$
41. $|\mathbf{v}| = 16, \theta = 330°$
42. $|\mathbf{v}| = 28, \theta = 273°$
43. $|\mathbf{v}| = 15, \theta = 125°$

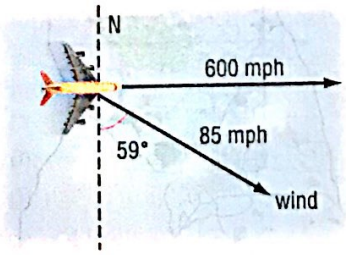
Find the direction angle of each vector to the nearest tenth of a degree. (Example 7)

44. $3\mathbf{i} + 6\mathbf{j}$
45. $-2\mathbf{i} + 5\mathbf{j}$
46. $8\mathbf{i} - 2\mathbf{j}$
47. $-4\mathbf{i} - 3\mathbf{j}$
48. $\langle -5, 9\rangle$
49. $\langle 7, 7\rangle$
50. $\langle -6, -4\rangle$
51. $\langle 3, -8\rangle$

52. **SLEDDING** Maggie is pulling a sled with a force of 275 newtons by holding its rope at a 58° angle. Her brother is pushing the sled with a force of 320 newtons. Determine the magnitude and direction of the resultant force on the sled. (Example 8)



53. **NAVIGATION** An airplane is traveling due east with a speed of 600 miles per hour. The wind blows at 85 miles per hour at an angle of S59°E.



   a. Determine the speed of the airplane's flight.
   b. Determine the angle of the airplane's flight.