Quick Quiz

1. The magnitudes of two vectors $\vec{A}$ and $\vec{B}$ are 12 units and 8 units, respectively. What are the largest and smallest possible values for the magnitude of the resultant vector $\vec{R} = \vec{A} + \vec{B}$ ? (a) 14.4 and 4; (b) 12 and 8; (c) 20 and 4; (d) none of these.

2. If vector $\vec{B}$ is added to vector $\vec{A}$, the resultant vector $\vec{A} + \vec{B}$ has magnitude $A + B$ when $\vec{A}$ and $\vec{B}$ are (a) perpendicular to each other; (b) oriented in the same direction; (c) oriented in opposite directions; (d) none of these answers.

3. Figure 3.9 shows two vectors lying in the $xy$-plane. Determine the signs of the $x$- and $y$-components of $\vec{A}$, $\vec{B}$, and $\vec{A} + \vec{B}$, and place your answers in the following table:

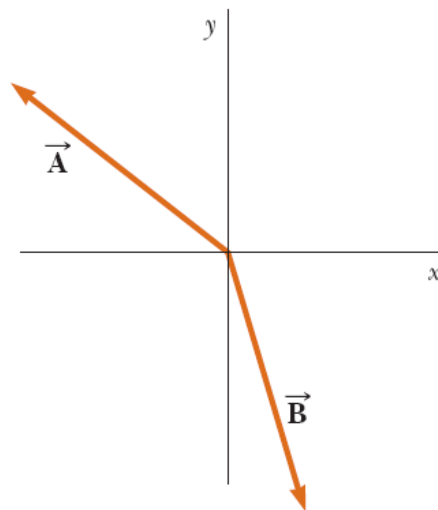| Vector | x-component | y-component |
|--------|-------------|-------------|
| $\vec{A}$ | | |
| $\vec{B}$ | | |
| $\vec{A} + \vec{B}$ | | |



**Figure 3.9**

Chapter 3 Problems

Section 3.1    Vectors and Their Properties

2.       An airplane flies 200 km due west from city A to city B and then 300 km in the direction of 30.0° north of west from city B to city C. (a) In straight-line distance, how far is city C from city A? (b) Relative to city A, in what direction is city C?

5.       A plane flies from base camp to lake A, a distance of 280 km at a direction of 20.0° north of east. After dropping off supplies, the plane flies to lake B, which is 190 km and 30.0° west of north from lake A. Graphically determine the distance and direction from lake B to the base camp.

Section 3.2    Components of a Vector

13.      A commuter airplane starts from an airport and takes the route shown in Figure P3.13. The plane first flies to city A, located 175 km away in a direction 30.0° north of east. Next, it flies for 150 km 20.0° west of north, to city B. Finally, the plane flies 190 km due west, to city C. Find the location of city C relative to the location of the starting point.

15.      A man pushing a mop across a floor causes the mop to undergo two displacements. The first has a magnitude of 150 cm and makes an angle of 120° with the positive x-axis. The resultant displacement has a magnitude of 140 cm and is directed at an angle of 35.0° to the positive x-axis.

Find the magnitude and direction of the second displacement.

Additional Problems

33.      A particle undergoes two displacements. The first has a magnitude of 150 cm and makes an angle of 120.0° with the positive x-axis. The resultant of the two displacements is 140 cm, directed at an angle of 35.0° to the positive x-axis. Find the magnitude and direction of the second displacement.

34.      Find the sum of these four vector forces: 12.0 N to the right at 35.0° above the horizontal, 31.0 N to the left at 55.0° above the horizontal, 8.40 N to the left at 35.0° below the horizontal, and 24.0 N to the right at 55.0° below the horizontal. (Hint: N stands for newton, the SI unit of force. The component method allows the addition of any vectors—forces as well as displacements and velocities. Make a drawing of this situation, and select the best axes for x and y so that you have the least number of components.)