VECTOR ADDITION

☞ Sketch a diagram for each problem, then solve it.

1. Two people are pushing a disabled car. One exerts a force of 200 N east, the other a force of 150 N east. What is the net force exerted on the car? (Assume friction to be negligible.)
2. Two soccer players kick a ball simultaneously from opposite sides. Red #3 kicks with 50 N of force while Blue #5 kicks with 63 N of force. What is the net force on the ball?
3. An airplane flies due north at 100 m/s through a 30 m/s cross wind blowing from the east to the west. Determine the resultant velocity of the airplane.
4. A mountain climbing expedition establishes a base camp and two intermediate camps, A and B. Camp A is 11,200 m east of and 3200 m above base camp. Camp B is 8400 m east of and 1700 m higher than Camp A. Determine the displacement between base camp and Camp B.
5. A plane flies with a velocity of 52 m/s east through a 12 m/s cross wind blowing the plane south. Find the magnitude and direction (relative to due east) of the resultant velocity at which it travels.
6. An ambitious hiker walks 25 km west and then 35 km south in a day. Find the magnitude and direction (relative to due west) of her resultant displacement.
7. A boat heads directly across a river with a velocity of 12 m/s. If the river flows at 6.0 m/s find the magnitude and direction (with respect to the shore) of the boat's resultant velocity.
8. I went for a walk the other day. I went four avenues east (0.80 miles), then twenty-four streets south (1.20 miles), then one avenue west (0.20 miles), and finally eight streets north (0.40 miles).
   a. What distance did I travel?
   b. What's my resultant displacement?
9. A plane intends to fly north with a speed of 250 m/s relative to the ground through a high altitude cross wind of 50 m/s coming from the east. Determine ...
   a. the bearing that the plane should take (relative to due north) and
   b. the plane's speed with respect to the air.
10. At a particular instant, a stationary observer on the ground sees a package falling from a moving airplane with a speed v_{observer} at an angle θ to the vertical. To the pilot flying horizontally at a constant speed relative to the ground the package appears to be falling vertically with a speed v_{pilot} at that same instant. What is the speed of the pilot relative to the ground in terms of the given quantities?