

* 3–8 Relative Velocity

- * 36. (I) A person going for a morning jog on the deck of a cruise ship is running toward the bow (front) of the ship at 2.2 m/s while the ship is moving ahead at 7.5 m/s . What is the velocity of the jogger relative to the water? Later, the jogger is moving toward the stern (rear) of the ship. What is the jogger's velocity relative to the water now?
- * 37. (II) Huck Finn walks at a speed of 0.60 m/s across his raft (that is, he walks perpendicular to the raft's motion relative to the shore). The raft is traveling down the Mississippi River at a speed of 1.70 m/s relative to the river bank (Fig. 3–38). What is Huck's velocity (speed and direction) relative to the river bank?

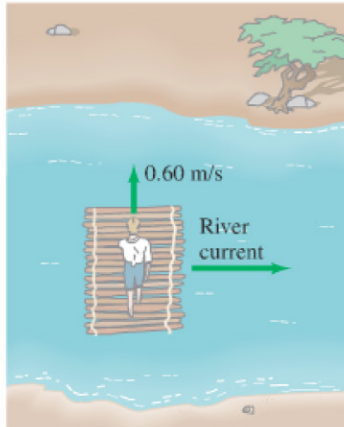


FIGURE 3–38 Problem 37.

- * 38. (II) You are driving south on a highway at 25 m/s (approximately 55 mi/h) in a snowstorm. When you last stopped, you noticed that the snow was coming down vertically, but it is passing the windows of the moving car at an angle of 30° to the horizontal. Estimate the speed of the snowflakes relative to the car and relative to the ground.
- * 39. (II) A boat can travel 2.30 m/s in still water. (a) If the boat points its prow directly across a stream whose current is 1.20 m/s , what is the velocity (magnitude and direction) of the boat relative to the shore? (b) What will be the position of the boat, relative to its point of origin, after 3.00 s ? (See Fig. 3–30.)
- * 40. (II) Two planes approach each other head-on. Each has a speed of 785 km/h , and they spot each other when they are initially 11.0 km apart. How much time do the pilots have to take evasive action?
- * 41. (II) An airplane is heading due south at a speed of 600 km/h . If a wind begins blowing from the southwest at a speed of 100 km/h (average), calculate: (a) the velocity (magnitude and direction) of the plane relative to the ground, and (b) how far from its intended position will it be after 10 min if the pilot takes no corrective action. [Hint: First draw a diagram.]
- * 42. (II) In what direction should the pilot aim the plane in Problem 41 so that it will fly due south?

- * 43. (II) Determine the speed of the boat with respect to the shore in Example 3–11.
- * 44. (II) A passenger on a boat moving at 1.50 m/s on a still lake walks up a flight of stairs at a speed of 0.50 m/s (Fig. 3–39). The stairs are angled at 45° pointing in the direction of motion as shown. What is the velocity of the passenger relative to the water?

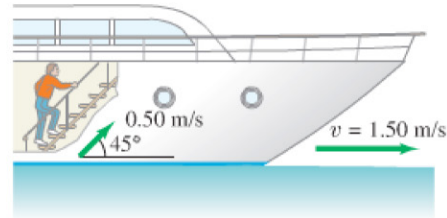


FIGURE 3–39 Problem 44.

- * 45. (II) A motorboat whose speed in still water is 2.60 m/s must aim upstream at an angle of 28.5° (with respect to a line perpendicular to the shore) in order to travel directly across the stream. (a) What is the speed of the current? (b) What is the resultant speed of the boat with respect to the shore? (See Fig. 3–28.)
- * 46. (II) A boat, whose speed in still water is 1.70 m/s , must cross a 260-m -wide river and arrive at a point 110 m upstream from where it starts (Fig. 3–40). To do so, the pilot must head the boat at a 45° upstream angle. What is the speed of the river's current?

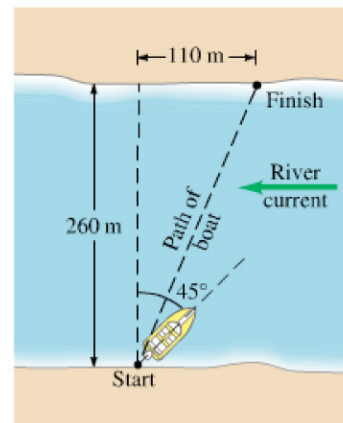


FIGURE 3–40 Problem 46.

- * 47. (II) A swimmer is capable of swimming 0.45 m/s in still water. (a) If she aims her body directly across a 75-m -wide river whose current is 0.40 m/s , how far downstream (from a point opposite her starting point) will she land? (b) How long will it take her to reach the other side?
- * 48. (II) (a) At what upstream angle must the swimmer in Problem 47 aim, if she is to arrive at a point directly across the stream? (b) How long would it take her?