b. If the river is 325 m wide, how far downstream is the boat when it reaches the north shore?

44. The pilot of an aircraft wishes to fly due west in a 50.0 km/h wind blowing toward the south. The speed of the aircraft in the absence of a wind is 205 km/h.

a. In what direction should the aircraft head?

b. What should its speed relative to the ground be?

45. A hunter wishes to cross a river that is 1.5 km wide and that flows with a speed of 5.0 km/h. The hunter uses a small powerboat that moves at a maximum speed of 12 km/h with respect to the water. What is the minimum time necessary for crossing?

46. A swimmer can swim in still water at a speed of 9.50 m/s. He intends to swim directly across a river that has a downstream current of 3.75 m/s.

a. What must the swimmer's direction be?

b. What is his velocity relative to the bank?

MIXED REVIEW

47. A ball player hits a home run, and the baseball just clears a wall 21.0 m high located 130.0 m from home plate. The ball is hit at an angle of 35.0° to the horizontal, and air resistance is negligible. Assume the ball is hit at a height of 1.0 m above the ground.

a. What is the initial speed of the ball?

b. How much time does it take for the ball to reach the wall?

c. Find the components of the velocity and the speed of the ball when it reaches the wall.

48. A daredevil jumps a canyon 12 m wide. To do so, he drives a car up a 15° incline.

a. What minimum speed must he achieve to clear the canyon?

b. If the daredevil jumps at this minimum speed, what will his speed be when he reaches the other side?

49. A 2.00 m tall basketball player attempts a goal 10.00 m from the basket (3.05 m high). If he shoots the ball at a 45.0° angle, at what initial speed must he throw the basketball so that it goes through the hoop without striking the backboard?

50. An escalator is 20.0 m long. If a person stands on the escalator, it takes 50.0 s to ride to the top.

a. If a person walks up the moving escalator with a speed of 0.500 m/s relative to the escalator, how long does it take the person to get to the top?

b. If a person walks down the "up" escalator with the same relative speed as in item (a), how long does it take to reach the bottom?

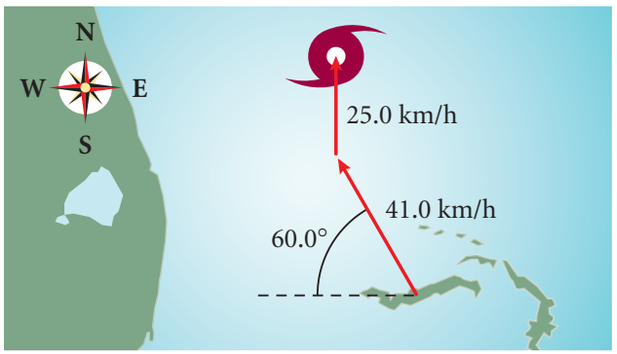
51. A ball is projected horizontally from the edge of a table that is 1.00 m high, and it strikes the floor at a point 1.20 m from the base of the table.

a. What is the initial speed of the ball?

b. How high is the ball above the floor when its velocity vector makes a 45.0° angle with the horizontal?

52. How long does it take an automobile traveling 60.0 km/h to become even with a car that is traveling in another lane at 40.0 km/h if the cars' front bumpers are initially 125 m apart?

53. The eye of a hurricane passes over Grand Bahama Island. It is moving in a direction 60.0° north of west with a speed of 41.0 km/h. Exactly three hours later, the course of the hurricane shifts due north, and its speed slows to 25.0 km/h, as shown below. How far from Grand Bahama is the hurricane 4.50 h after it passes over the island?



54. A boat moves through a river at 7.5 m/s relative to the water, regardless of the boat's direction. If the water in the river is flowing at 1.5 m/s, how long does it take the boat to make a round trip consisting of a 250 m displacement downstream followed by a 250 m displacement upstream?

3 REVIEW

43. **a.** 10.1 m/s at 8.53° east of north
b. 48.8 m

44. **a.** 14.1° north of west
b. 199 km/h

45. 7.5 min

46. **a.** 23.2° upstream from straight across
b. 8.72 m/s across the river

47. **a.** 41.7 m/s
b. 3.81 s
c. $v_{y,f} = -13.5$ m/s, $v_{x,f} = 34.2$ m/s, $v_f = 36.7$ m/s

48. **a.** 15 m/s
b. 15 m/s

49. 10.5 m/s

50. **a.** 22.2 s
b. 2.00×10^2 s

51. **a.** 2.66 m/s
b. 0.64 m

52. 22.5 s

53. 157 km

54. 7.0×10^1 s