68. (*a*) A skier is accelerating down a 30.0° hill at 1.80 m/s^2 (Fig. 3–48). What is the vertical component of her acceleration? (*b*) How long will it take her to reach the bottom of the hill, assuming she starts from rest and accelerates uniformly, if the elevation change is 335 m?

FIGURE 3–48 Problem 68.

69. A basketball leaves a player's hands at a height of 2.10 m above the floor. The basket is 2.60 m above the floor. The player likes to shoot the ball at a 38.0° angle. If the shot is made from a horizontal distance of 11.00 m and must be accurate to ± 0.22 m (horizontally), what is the range of initial speeds allowed to make the basket?

70. A high diver leaves the end of a 5.0-m-high diving board and strikes the water 1.3 s later, 3.0 m beyond the end of the board. Considering the diver as a particle, determine (*a*) her initial velocity, $\vec{\mathbf{v}}_0$, (*b*) the maximum height reached, and (*c*) the velocity $\vec{\mathbf{v}}_f$ with which she enters the water.

71. A stunt driver wants to make his car jump over eight cars parked side by side below a horizontal ramp (Fig. 3–49). (*a*) With what minimum speed must he drive off the horizontal ramp? The vertical height of the ramp is 1.5 m above the cars, and the horizontal distance he must clear is 20 m. (*b*) If the ramp is now tilted upward, so that "takeoff angle" is 10° above the horizontal, what is the new minimum speed?

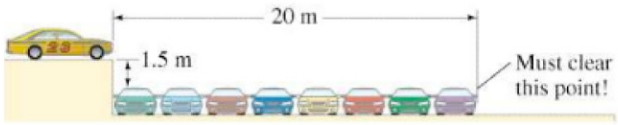

FIGURE 3–49 Problem 71.

72. A batter hits a fly ball which leaves the bat 0.90 m above the ground at an angle of 61° with an initial speed of 28 m/s heading toward centerfield. Ignore air resistance. (*a*) How far from home plate would the ball land if not caught? (*b*) The ball is caught by the centerfielder who, starting at a distance of 105 m from home plate, runs straight toward home plate at a constant speed and makes the catch at ground level. Find his speed.

73. At $t = 0$ a batter hits a baseball with an initial speed of 32 m/s at a 55° angle to the horizontal. An outfielder is 85 m from the batter at $t = 0$, and, as seen from home plate, the line of sight to the outfielder makes a horizontal angle of 22° with the plane in which the ball moves (see Fig. 3–50). What speed and direction must the fielder take in order to catch the ball at the same height from which it was struck? Give angle with respect to the outfielder's line of sight to home plate.

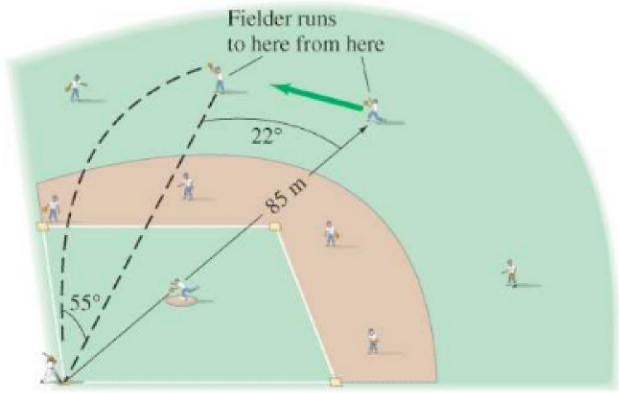

FIGURE 3–50 Problem 73.

74. A ball is shot from the top of a building with an initial velocity of 18 m/s at an angle $\theta = 42°$ above the horizontal. (*a*) What are the x and y components of the initial velocity? (*b*) If a nearby building is the same height and 55 m away, how far below the top of the building will the ball strike the nearby building?

75. You buy a plastic dart gun, and being a clever physics student you decide to do a quick calculation to find its maximum horizontal range. You shoot the gun straight up, and it takes 4.0 s for the dart to land back at the barrel. What is the maximum horizontal range of your gun?

Answers to Exercises

A: When the two vectors D_1 and D_2 point in the same direction.
B: $3\sqrt{2} = 4.24$.
C: They hit at the same time.
D: Both balls reach the same height; therefore they are in the air for the same length of time.
E: (*b*).