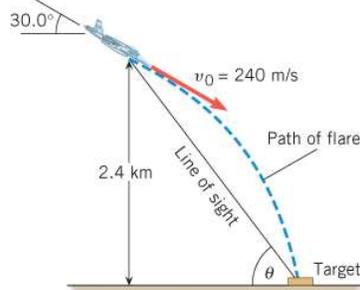
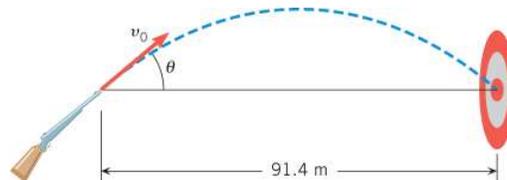


### 304 Problems set 3 (7 problems)

**\*43. ssm** An airplane is flying with a velocity of 240 m/s at an angle of  $30.0^\circ$  with the horizontal, as the drawing shows. When the altitude of the plane is 2.4 km, a flare is released from the plane. The flare hits the target on the ground. What is the angle  $\theta$ ?

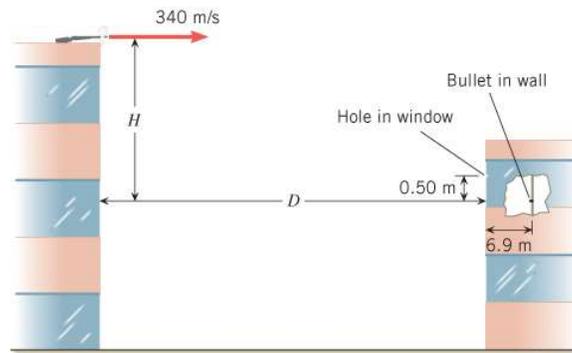


**\*\*47. ssm** The drawing shows an exaggerated view of a rifle that has been “sighted in” for a 91.4-meter target. If the muzzle speed of the bullet is  $v_0 = 427$  m/s, what are the two possible angles  $\theta_1$  and  $\theta_2$  between the rifle barrel and the horizontal such that the bullet will hit the target? One of these angles is so large that it is never used in target shooting. (Hint: The following trigonometric identity may be useful:  $2 \sin \theta \cos \theta = \sin 2\theta$ .)

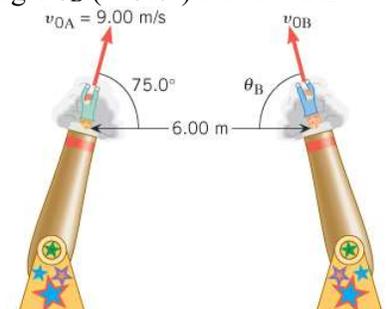


Problem 47

**\*\*49. ssm** From the top of a tall building, a gun is fired. The bullet leaves the gun at a speed of 340 m/s, parallel to the ground. As the drawing shows, the bullet puts a hole in a window of another building and hits the wall that faces the window. Using the data in the drawing, determine the distances  $D$  and  $H$ , which locate the point where the gun was fired. Assume that the bullet does not slow down as it passes through the window.



**\*\*51.** Two cannons are mounted as shown in the drawing and rigged to fire simultaneously. They are used in a circus act in which two clowns serve as human cannonballs. The clowns are fired toward each other and collide at a height of 1.00 m above the muzzles of the cannons. Clown A is launched at a  $75.0^\circ$  angle, with a speed of 9.00 m/s. The horizontal separation between the clowns as they leave the cannons is 6.00 m. Find the launch speed  $v_{0B}$  and the launch angle  $\theta_B$  ( $>45.0^\circ$ ) for clown B.



**52.** In a marathon race Chad is out in front, running due north at a speed of 4.00 m/s. John is 95 m behind him, running due north at a speed of 4.50 m/s. How long does it take for John to pass Chad?

**53. ssm** A swimmer, capable of swimming at a speed of 1.4 m/s in still water (i.e., the swimmer can swim with a speed of 1.4 m/s relative to the water), starts to swim directly across a 2.8-km-wide river. However, the current is 0.91 m/s, and it carries the swimmer downstream. **(a)** How long does it take the swimmer to cross the river? **(b)** How far downstream will the swimmer be upon reaching the other side of the river?

**56.** At some airports there are speed ramps to help passengers get from one place to another. A speed ramp is a moving conveyor belt on which you can either stand or walk. Suppose a speed ramp has a length of 105 m and is moving at a speed of 2.0 m/s relative to the ground. In addition, suppose you can cover this distance in 75 s when walking on the ground. If you walk at the same rate with respect to the speed ramp that you walk on the ground, how long does it take for you to travel the 105 m using the speed ramp?