Projectiles 3

1. Michael Hout of Ohio can run 110.0 m hurdles in 18.9 s at an average speed of 5.82 m/s. What makes this interesting is that he juggles three balls as he runs the distance. Suppose Hout throws a ball up and forward at twice his running speed and just catches it at the same level. At what angle, q, must the ball be thrown? (Hint: Consider horizontal displacements for Hout and for the ball.)

2. In 1993, Wayne Brian threw a spear a record distance of 201.24 m. (This is not an official sport record because a special device was used to "elongate" Brian's hand.) Suppose Brian threw the spear at a 35.0° angle with respect to the horizontal. What is the initial speed of the spear?

3. April Moon set a record in flight shooting (a variety of long-distance archery). In 1981 in Utah, she sent an arrow a horizontal distance of 9.50×10^2 m. What is the velocity of the arrow at the top of the flight if the arrow is launched at an angle of 45.0° with respect to the horizontal?

4. In 1989 during overtime in a high school basketball game in Erie, Pennsylvania, Chris Eddy threw a basketball a distance 27.5 m to score and win the game. If the shot was made at an 50.0° angle above the horizontal, what was the initial velocity of the ball?

5. In 1978, Geoff Capes of the United Kingdom won a competition for throwing 5 kg bricks: he threw a brick a distance of 44.0 m. Suppose the brick left Geoff 's hand at an angle of 45.0° with respect to the horizontal.
   a. Find the initial velocity of the brick.
   b. If Geoff threw the brick straight up with the speed found in (a), what is the maximum height the brick could have achieved?

6. A scared kangaroo once cleared a fence that was 2.44 m high. If the horizontal component of the kangaroo's velocity was 4.80 m/s, find the angle with respect to the ground at which the kangaroo leaped.

7. According to measurements made in 1910, a common flea can jump 0.330 m. Assuming that the flea's initial speed is 2.20 m/s, find the angle with respect to the ground at which the flea leaps (Hint: The angle is less than 45°).

8. In 1991, Doug Danger jumped 76.5 m on his Honda CR500 motorcycle. Find the maximum height of the jump if his angle with respect to the ground at the beginning of the jump is 12.0°.