

4 Projectile Motion

Worksheet C: *Projectile Calculations*

Name _____

AP Physics 1

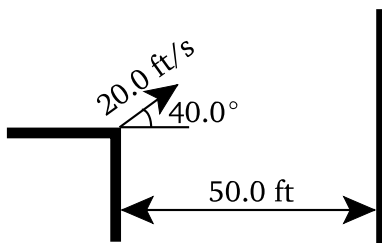
Show your work on this paper; some answers are shown at the right in *italics*.

Assume air resistance is negligible and that $g = -9.80 \text{ m/s}^2$ (or -32.2 ft/s^2).

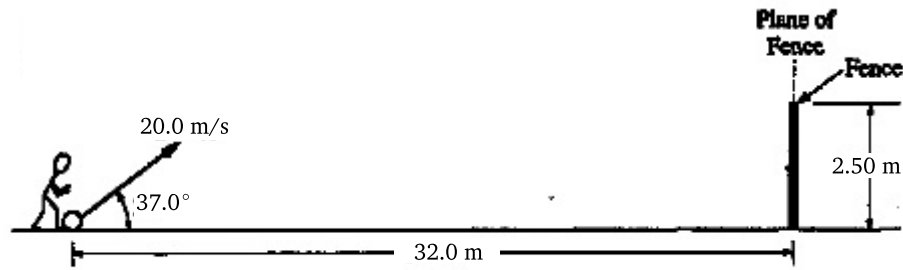
Work metric problems in meters and seconds and U.S. Customary System problems in feet and seconds.

1. An object is projected downward at an angle of 20.0° with the horizontal with an initial speed of 40.0 m/s from the top of a cliff 150 m high.
- a) In what time will it strike the ground? *4.31 s*
- b) How far from the foot of the cliff will it strike the ground? *162 m*
- c) At what angle with the horizontal will it strike? *56.1^\circ below horizon*

2. A ball is thrown from the top of one building toward a tall building 50.0 feet away. The initial velocity of the ball is 20.0 ft/s at 40.0° above the horizontal. How far above or below its original level will the ball strike the opposite wall? *130 feet below*



3. A projectile is fired upward from the top edge of a vertical 200 meter cliff above a valley. Its initial velocity is 60.0 m/s at 60.0° above the horizontal. Calculate the distance from the base of the cliff to the impact point on the valley floor. *408 meters*
4. A plane with a speed of 105 m/s, diving at an angle of 60.0° with the vertical, releases a projectile at an altitude of 875 m. How far does the projectile travel horizontally before striking the ground below?
5. A marble with a speed of 15.0 cm/s rolls off the edge of a table 65.0 cm high. How far, horizontally, from the table edge does the marble strike the floor?



Note: Diagram not drawn to scale.

6. A ball of mass 0.50 kilogram, initially at rest, is kicked directly toward a fence from a point 32.0 meters away, as shown above. The velocity of the ball as it leaves the kicker's foot is 20.0 meters per second at an angle of 37.0° above the horizontal. The top of the fence is 2.50 meters high. The ball hits nothing while in flight and air resistance is negligible.

a. Determine the time it takes for the ball to reach the plane of the fence.

b. Will the ball hit the fence? If so, how far below the top of the fence will it hit? If not, how far above the top of the fence will it pass?

c. On the axes at right, sketch the horizontal and vertical components of the freefall velocity of the ball as functions of time until the ball reaches the plane of the fence.

