

Projectile Motion Worksheet

- 1) A ball rolls with a speed of 2.0 m/s across a level table that is 1.0 m above the floor. Upon reaching the edge of the table, it follows a parabolic path to the floor. How far along the floor is the landing spot from the table?
- 2) A rescue pilot drops a survival kit while her plane is flying at an altitude of 2000.0 m with a forward velocity of 100.0 m/s. If air friction is disregarded, how far in advance of the starving explorer's drop zone should she release the package?
- 3) A rifle is fired horizontally and travels 200.0 m. The rifle barrel is 1.90 m from the ground. What speed must the bullet have been travelling at? Ignore friction.
- 4) A skier leaves the horizontal end of a ramp with a velocity of 25.0 m/s [E] and lands 70.0 m from the base of the ramp. How high is the end of the ramp from the ground?
- 5) An astronaut stands on the edge of a lunar crater and throws a half-eaten Twinkie™ horizontally with a velocity of 5.00 m/s. The floor of the crater is 100.0 m below the astronaut. What horizontal distance will the Twinkie™ travel before hitting the floor of the crater? (The acceleration of gravity on the moon is $1/6^{\text{th}}$ that of the Earth).
- 6) A baseball player leads off the game and hits a long home run. The ball leaves the bat at an angle of 30.0° from the horizontal with a velocity of 40.0 m/s. How far will it travel in the air?

- 7) A golfer is teeing off on a 170.0 m long par 3 hole. The ball leaves with a velocity of 40.0 m/s at 50.0° to the horizontal. Assuming that she hits the ball on a direct path to the hole, how far from the hole will the ball land (no bounces or rolls)?
- 8) A punter in a football game kicks a ball from the goal line at 60.0° from the horizontal at 25.0 m/s.
- a) What is the hang time of the punt?
- b) How far down field does the ball land?
- 9) A cannon fires a cannonball 500.0 m downrange when set at a 45.0° angle. At what velocity does the cannonball leave the cannon?
- 10) You are piloting a helicopter which is rising vertically at a uniform velocity of 14.70 m/s. When you reach 196.00 m, you see Barney (Uh-oh). A large object is projected with a horizontal velocity of 8.50 m/s from the rising helicopter.
- a) When does the ball reach Barney's head if he is standing in a hole with his head at ground level?
- b) Where does Barney have to be horizontally relative to the helicopter's position?
- c) What is the vertical velocity when it hits the ground?

- 11) An object is punted at 25.0 m/s at 40.0° on G's home planet. What is the range of the object on level ground? (Use $g = 18.0 \text{ m/s}^2$)
- 12) An elastic loaded balloon launcher fires balloons at an angle of 38.0° from the surface of the ground. If the initial velocity is 25.0 m/s, find how far away the balloons are from the launcher when they hit the level ground again.
- 13) A movie stunt driver on a motorcycle speeds horizontally off a 50.0 m high cliff. How fast (in km/h) must the motorcycle leave the cliff-top if it's to land on the level ground below at a distance of 90.0 m from the base of the cliff?
- 14) A football is kicked at 37.0° to the horizontal at 20.0 m/s from the player's hand at 1.00 m from the ground. How far did the football travel before hitting the ground?

15) The same football in #14 is kicked from the ground instead.

a) Find the maximum height.

b) Find the time of travel.

c) How far away does it hit the ground?

d) Find the velocity vector at maximum height.

e) Find the acceleration vector at maximum height.

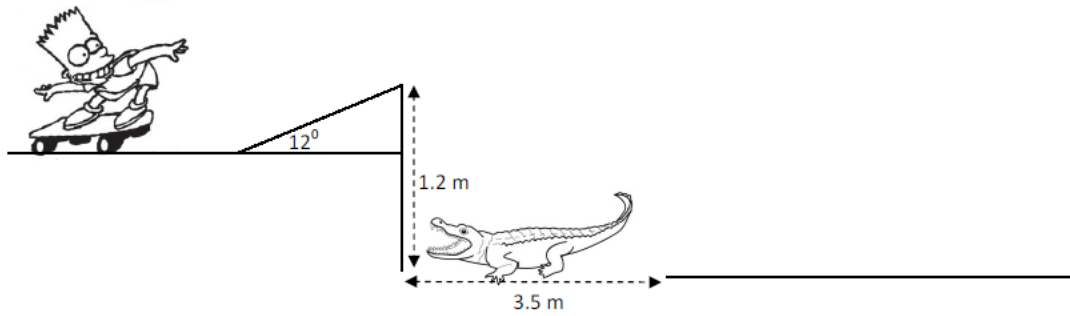
16) The stone is thrown off the top of a building from a height of 45.0 m. The stone has a launch angle of 62.5° and a speed of 31.5 m/s.

a) How long is the stone in flight?

b) How far from the base of the building does it travel?

c) What is its speed just before it hits the ground?]

17) Student is attempting to jump an alligator on his skateboard as in figure below.



What is the minimum speed student must leave the ramp in order to make the jump?

18) Student is playing golf. He is hitting golf balls from the top of a cliff into the water below. One ball is hit with an initial speed of 65 m/s at an angle of 45° to the horizontal. The ball takes 12.5 s from the time it is hit until it lands in the water. What is the height of the cliff? How high above the top of the cliff does the ball rise?

19) Which of the following graphs below best represents student's speed as a function of time whilst airborne?

