

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? [0.90 m]
- 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? [2020 m]
- 3) A rifle is fired horizontally and travels 200.0 m [E]. The rifle barrel is 1.90 m from the ground. What speed must the bullet have been travelling at? Ignore friction. [321 m/s]
- 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? [38.5 m]
- 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). [55.3 m]
- 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? [141 m]
- 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)? [9.38 m]
- 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? [4.41 s]
 - b) How far down field does the ball land? [55.2 m]
- 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? [70.0 m/s at 45.0°]
- 10) A lovesick lad wants to throw a bag of candy and love notes into the open window of his girlfriend's bedroom 10.0 m above. Assuming it just reaches the window, he throws the love gifts at 60.0° to the ground:
 - a) At what velocity should she throw the bag? [16.2 m/s at 60.0° to the ground]
 - b) How far from the house is he standing when he throws the bag? [11.5 m]

- 11) 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.
- When does the ball reach Barney's head if he is standing in a hole with his head at ground level? [7.99 s]
 - Where does Barney have to be horizontally relative to the helicopter's position? [68.0 m]
 - What is the vertical velocity when it hits the ground? [- 63.7 m/s]
- 12) An object is punted at 25.0 m/s [40.0° N of E] on G's home planet. What is the range of the object on level ground? (Use $g = 18.0 \text{ m/s}^2$) [34.2 m]
- 13) An elastic loaded balloon launcher fires balloons at an angle of [38.0° N of E] 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. [61.8 m]
- 14) 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? [101 km/h]
- 15) 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? [40.5 m]
- 16) The same football in #15 is kicked from the ground instead.
- Find the maximum height. [7.38 m]
 - Find the time of travel. [2.45 s]
 - How far away does it hit the ground? [39.2 m]
 - Find the velocity vector at maximum height. [16.0 m/s which is horizontal]
 - Find the acceleration vector at maximum height. [9.81 m/s^2 down]