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 skier leaves the horizontal end of a ramp with a velocity of 25.0 m/s 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]

3. 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 $1/6^{th}$ that of the Earth). [55.3 m]

4. A ball rolls off a desk at a speed of 3.0 m/s and lands 0.40 seconds later.
   a) How far from the base of the desk does the ball land?
   b) How high is the desk?
   c) What is the speed and angle of impact?

5. A slingshot is used to launch a stone horizontally from the top of a 20.0 meter cliff. The stone lands 36.0 meters away.
   a) At what speed was the stone launched?
   b) What is the speed and angle of impact?

6. A canon ball fired horizontally from a cliff has a velocity directed at 60^{o} below horizontal when it hits the ground 3.0 seconds later.
   a) How high is the cliff?
   b) How far from the base of the cliff does the canon ball land?

7. 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 resistance is disregarded, how far in advance of the starving explorer's drop zone should she release the package? [2020 m]

8. 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] How fast (in km/h) is she moving when she lands?

9. 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]

10. A football is kicked from the ground 20.0 m/s at 37.0^{o} above horizontal.
    a) Find the maximum height. [7.38 m]
    b) Find the time of travel. [2.45 s]
    c) How far away does it hit the ground? [39.2 m]
    d) Find the velocity vector at maximum height. [16.0 m/s which is horizontal]
    e) Find the acceleration vector at maximum height. [9.81 m/s^2 down]

11. 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^{o} 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]

12. A punter in a football game kicks a ball from the goal line at 60.0^{o} 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]

13. An elastic loaded balloon launcher fires balloons at an angle of [38.0^{o} 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 cannon fires a cannonball 500.0 m downrange when set at a 45.0^{o} angle. At what velocity does the cannonball leave the cannon? [70.0 m/s at 45.0^{o}]

15. An object is punted at 25.0 m/s [40.0^{o} N of E] on G's home planet. What is the range of the object on level ground? (Use g = 18.0 m/s^2) [34.2 m]