AP Physics **Projectiles** **Mr. McMullen**

Name_____ Date _____ Period _____

Projectiles – Problem Set 2

Answer the following questions a separate sheet of paper. Show all work and circle your answer.

1. If a football is kicked with a velocity of 20.0 m/s at an angle of 16.0˚,
   a) What is the hang time of the football?
   b) How high does the football rise?
   c) How far away does the football land?
   d) What is the final velocity of the football just before it hits the ground?

2. You have just gotten a job as the new stunt coordinator of a movie set. The stunt calls for a car to make it across an open drawbridge. The gap is 200. meters wide, and the bridge is open so that it makes an angle of 35.0˚ from the horizontal. With what velocity does the car need to be going to make it across the bridge?

3. A small child kicks a football from ground level with a velocity of 13.0 m/s at an angle of 30.0 º above the horizontal.
   a) What is the initial horizontal velocity of the ball?
   b) What is the initial vertical velocity of the ball?
   c) What is the "hang time" of the ball?
   d) What is the maximum height the ball reaches?
   e) How far away does the ball land on the ground?

4. A golfer hits a ball with a velocity of 20.0 m/s at an angle of 40.0º from the horizontal.
   a) What was the hang time of the ball?
   b) How high did the ball go?
   c) How far did the ball go?
   d) What is the **final** velocity of the ball just before it hits the ground?

5. A monster climbs to the top of a building 40.0 m above the ground and hurls a boulder downward with a velocity of 20.0 m/s at an angle of 30.0˚ below the horizontal. How far from the building does the boulder land? Assume 40.0 m is the height of hand at release.

6. A football resting on the ground is kicked at an angle of 40.0˚ with an initial speed of 23.0 m/s. (a) What is the maximum height reached by the ball? (b) What is its range?

7. The shells fired from an artillery piece have a muzzle velocity of 1.80×10^2 m/s, and the target is 3.00 km away. (a) At what angle relative to the horizontal should the gun be aimed? (b) Could the gun hit a target 3.50 km away?

8. An artillery shell with a muzzle velocity of 125 m/s is fired at an angle of 35.0˚ to the horizontal. If the shell explodes 10.0 s after being projected, where does the blast occur? Write your answer in unit vector component notation.

9. A javelin is thrown at angles of 35.0˚ and 60.0˚ to the horizontal from the same height with the same speed in each case. For which throw does the javelin go farther and how many times farther? (Assume that the landing place is at the same height as the launching.)

10. An astronaut on Moon fires a projectile from a launcher sitting on a level surface so as to get the maximum range. If the launcher gives the projectile a muzzle velocity of 36.0 m/s, what is the range of the projectile? (Hint: don't forget where the launcher is and the gravitational effects.)