HW#2: Trajectories

1. An archer shoots an arrow horizontally with a velocity of 48.0 m/s at a height of 1.5m above the ground. How far from the archer will the arrow hit the ground? [26.6m]

2. A canon shoots an artillery shell towards a target 4.54 km distant, where it lands at the same level it was shot. It was noted that the elapsed time of the projectile was 27.5s. What was the muzzle velocity of the shell? [213.2 m/s] What is the maximum height of the mountain. [926m]
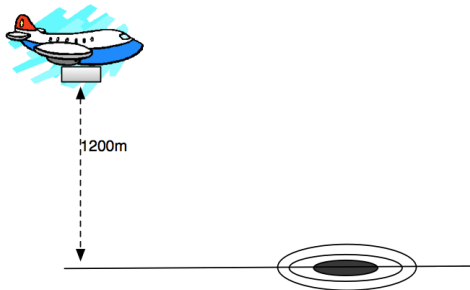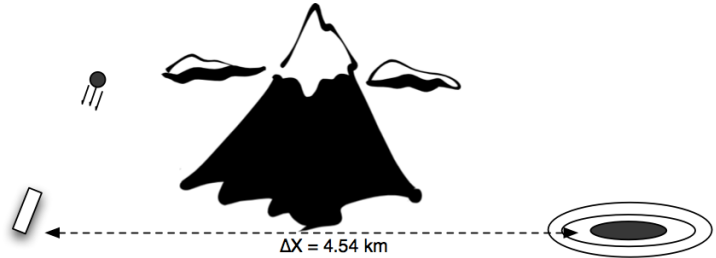
3. An airplane crew is competing to determine which crew can drop a container closest to a target. The plane is flying at 180 km/h at an altitude of 1,200m. How man kilometers before the target should the crew drop the cargo? [0.78km]

4. A ball is thrown in the air. When it is 12.0m above the point of departure its velocity components in the horizontal and vertical directions are 4.5 m/s and 3.36 m/s respectively. Determine:
   a. the initial velocity of the ball [16.3m/s; θ=74.0°]
   b. the maximum height of the ball [12.6m]
   c. The time it takes to finish the trajectory from the 12.0m position [1.95s]
   d. the horizontal distance the ball travels from the 12.0m position [8.75m]
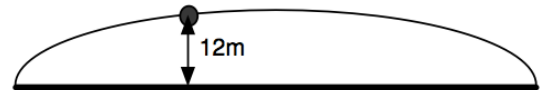
5. A stone is thrown from a bridge 30.0m above the water with an initial speed of 20.0 m/s. Determine the horizontal distance travelled and the final velocity when the stone hits the water if the initial angle is:
   a. 37°   b. 45° [4.31s; Δx=58.9m]

6. A Frisbee is lodged in a tree 14.0m above shoulder level. To dislodge the Frisbee you must hit it with a ball that is traveling horizontally at the point of collision. If you throw the ball from a horizontal distance of10.0m, determine:
   a. the initial velocity of the ball [17.6m/s; θ=70.3°]
   b. the speed of the ball when it hits the Frisbee
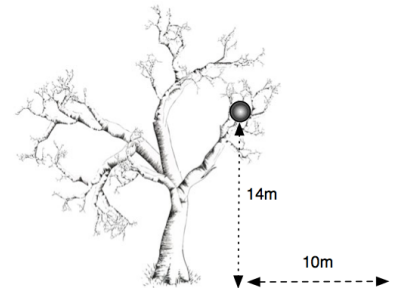
7. A place-kicker must kick a football from a point 36.0 m from the goal. Half the crowd hopes the ball will clear the crossbar, which is 3.05 m high. When kicked, the ball leav figure 4 ound with a speed of 20.0 m/s at an angle of 53° to the horizontal.

    a. By how much does the ball clear or fall short of clearing the crossbar?

    b. Does the ball approach the crossbar while still rising or while falling?