Please submit your homework on this sheet. If you need more space than is available, please attach additional sheets of paper. Assume $g=10 \text{ m/s}^2$.

1. A ball is tossed from an upper-story window of a building. The ball is given an initial velocity of 8 m/s at an angle of 20^0 below the horizontal. It strikes the ground 3s later. (a) How far horizontally from the base of the building does the ball strike the ground?

   (b) Find the height from which the ball was thrown.

   (c) Determine the vertical component of the velocity of the ball as it strikes the ground.

2. A placekicker must kick a football from a point 36 m from the goal, and half the crowd hopes the ball will clear the crossbar, which is 2 m high. When kicked, the ball leaves the ground with a speed of 20 m/s at an angle of 53^0 to the horizontal. (a) By how much does the ball clear or fall short of clearing the crossbar? (b) Does the approach the crossbar while still rising or while falling?
   First try to solve this problem on a blank sheet of paper without extra hints. Only later fill in the answers in the space provided on the other side of this sheet. If you have no clue what to do, you will find hints on the other side.

3. The athlete rotates a 1 kg discus along a circular path of radius 1.06m. The maximum speed of the discus is 20 m/s. Determine the magnitude of the maximal radial acceleration of the discus.

2. Space for answers and hints to the 2ⁿᵈ assignment (see the front page)

   (a) *Possible outline of how to proceed:* calculate horizontal (x) component of the
       initial velocity. From its value and horizontal distance to the goal determine time
       it will take to reach the goal (Δt). Calculate vertical (y) component of the initial
       velocity. From its value, Δt and g determine vertical displacement of the ball (Δy)
       until it reaches the goal. How does it compare with the height of the crossbar?

   (b) *Hint:* calculate vertical component of velocity when reaching the goal. The sign of
       it will tell you if the ball is rising or falling.