# Projectile Motion Test 2

1. A soccer ball is kicked from ground level with a speed of 12.3 ms^{-1} at an angle of 26.0° above the horizontal.
   (a) Calculate the horizontal and vertical components of the initial velocity of the soccer ball.   /2
   (b) Show that the time of flight of the soccer ball is 1.10 s, assuming it lands at ground level.   /3
   (c) Hence calculate the range of the soccer ball.   /2
   (d) Calculate the maximum height of the soccer ball.   /2
   (e) Calculate the velocity of the soccer ball 0.87 seconds after it was kicked.   /4
   (f) Explain the effect decreasing the launch angle will have on the range of the soccer ball.   /2

2. In a game of badminton, a projectile called a shuttlecock is used. The shuttlecock has feathers attached in such a way that it experiences significant air resistance.
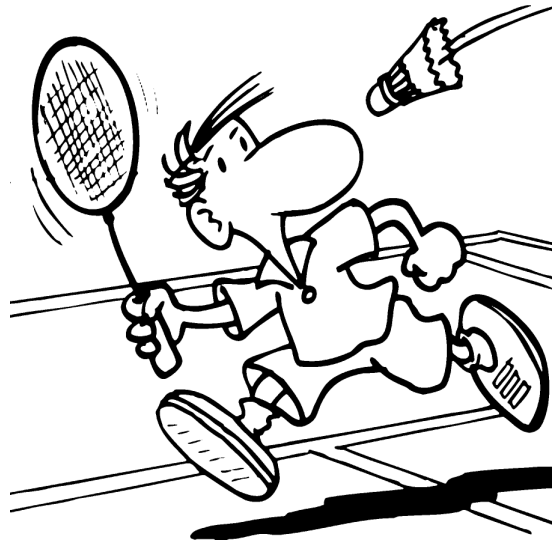
   Explain why the time of flight of a shuttlecock hit horizontally from a height is greater when air resistance is present.   /3

3. A GoPro is dropped from an aircraft moving horizontally at 68 ms^{-1} at an altitude of 2.2×10^3 m.
   (a) Show that the time taken t for a object dropped from an aircraft moving at speed v_H to reach
   speed v_t is $t = \sqrt{\dfrac{v_t^{\,2} - v_H^{\,2}}{g^2}}$ /3

   (b) Determine whether the GoPro is able to reach a speed of 200 ms^{-1}.   /4

                                                      TOTAL   /25