Section 2: General equations

Exercise level 2

1. A man throws a ball horizontally from the top of a hill 4.9 m high. He wants the ball to clear a fence 2.4 m high standing on horizontal ground and 8 m horizontally away from the point of projection. Find the minimum speed at which the ball must be thrown. If the ball is thrown with this minimum speed find how far beyond the fence that it lands.

2. Shells are fired from a gun at 210 ms^{-1}. What is the maximum range of the shells on horizontal ground? At what angle should the shells be fired if they are to hit a target 3600 m away?

3. A free kick in football is taken from point O on horizontal ground. 2 seconds later it is at a height of 2.4 m and 22 m away from where it was kicked. Find
   (i) The velocity at which it was kicked
   (ii) The maximum height that it achieved
   (iii) The distance from O at which the ball lands

4. (i) Freddie hits a cricket ball at an initial speed of 25 ms^{-1} and an angle of 50° to the horizontal. Find the greatest height reached by the ball.
   (ii) The pavilion is 50 m away from Freddie and is 10 m high. Will the ball clear the pavilion?

5. Take g to be 10 ms^{-2} for this question.
   A particle is projected at 60 ms^{-1} at an angle α such that $\tan \alpha = \frac{4}{3}$ from a point O on a horizontal plane. Find
   (i) The time at which the particle is at a height of 99 m above the plane
   (ii) The horizontal distances from O when it is at a height of 99 m.