6C Angled Projections

1. A particle P is projected from a point O on a horizontal plane with speed $28ms^{-1}$, and with angle of elevation 30°. After projection, the particle moves freely under gravity until it strikes the plane at a point A.

   Find:

a) The greatest height above the plane reached by P

b) The time of flight of P

c) The distance OA

2. A particle is projected from a point O with speed Vms^{-1} at an angle of elevation θ, where $\tan\theta = {}^{4}/_{3}$. The point O is 42.5m above the horizontal plane. The particle strikes the plane 5 seconds after it is projected.

a) Show that $V = 20ms^{-1}$

b) Find the distance between O and A

3. A particle is projected from a point O with speed $35ms^{-1}$ at an angle of elevation of 30°. The particle moves freely under gravity.

   Find the length of time for which the particle is 15m or more above O

4. A ball is struck by a racket at a point A which is 2m above horizontal ground. Immediately after being struck, the ball has velocity $(5\mathbf{i} + 8\mathbf{j})$ ms^{-1}, where **i** and **j** are unit vectors horizontally and vertically respectively.

   After being struck, the ball travels freely under gravity until is strikes the ground at a point B, as shown. Find:

a) The greatest height above ground reached by the ball

b) The speed of the ball as it reaches B

c) The angle the velocity of the ball makes with the ground as the ball reaches B