

A particle P is projected with speed $u \text{ m s}^{-1}$ at an angle of θ above the horizontal from a point O on a horizontal plane and moves freely under gravity. The horizontal and vertical displacements of P from O at a subsequent time t s are denoted by x m and y m respectively.

(a) Show that the equation of the trajectory is given by

$$y = x \tan \theta - \frac{gx^2}{2u^2}(1 + \tan^2 \theta). \quad [4]$$

In the subsequent motion P passes through the point with coordinates $(30, 20)$.

(b) Given that one possible value of $\tan \theta$ is $\frac{4}{3}$, find the other possible value of $\tan \theta$. [5]