



A particle of mass m is attached to one end of a light inextensible string of length a . The other end of the string is attached to a fixed point O . The point A is such that $OA = a$ and OA makes an angle α with the upward vertical, where $\tan \alpha = \frac{12}{5}$. The particle is projected downwards from A with speed u perpendicular to the string and moves in a vertical plane (see diagram). The string becomes slack after the string has rotated through 270° from its initial position, with the particle now at the point B .

(i) Show that $u^2 = 2ag$. [5]

(ii) Find the maximum tension in the string as the particle moves from A to B . [4]