

One end of a light inextensible string of length a is attached to a fixed point O . A particle of mass m is attached to the other end of the string. The particle is held at the point A with the string taut. The angle between OA and the downward vertical is equal to α , where $\cos \alpha = \frac{4}{5}$. The particle is projected from A , perpendicular to the string in an upwards direction, with a speed $\sqrt{3ga}$. It then moves along a circular path in a vertical plane. The string first goes slack when it makes an angle θ with the upward vertical through O .

Find the value of $\cos \theta$.

[5]