

5. A small ball is projected with speed u from a point O on horizontal ground. The angle of projection is θ to the horizontal, where $0 < \theta < 90^\circ$. The ball hits the ground at the point A .

The ball is modelled as a particle moving freely under gravity.

(a) Show that, according to the model, $OA = \frac{u^2 \sin 2\theta}{g}$ (5)

A golfer hits a golf ball with speed 25 ms^{-1} from a point X on horizontal ground.

The golf ball hits the ground at the point Y .

The angle of projection is θ to the horizontal, where $0 < \theta < 90^\circ$.

The golfer requires the distance XY to be at least 40 m.

The golf ball is modelled as a particle moving freely under gravity.

(b) Find, according to the model, the size of the largest possible angle θ (2)

Given that $\theta = 30^\circ$ and that the golf ball is more than 3 m above the ground for T seconds,

(c) find the value of T . (4)