5.

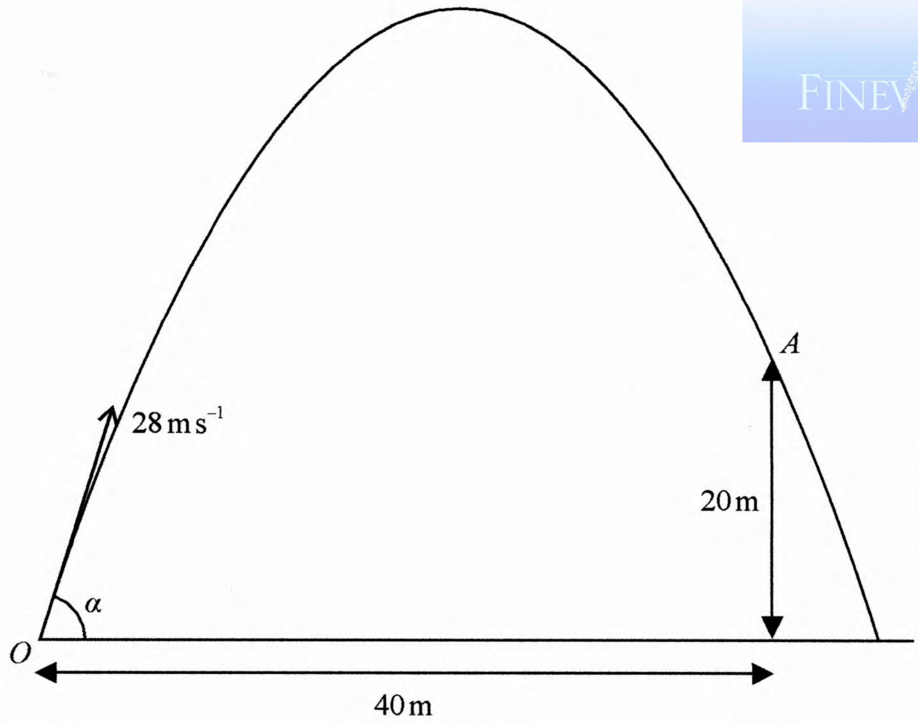

Figure 2

A small ball is projected with speed $28 \mathrm{~m} \mathrm{~s}^{-1}$ from a point O on horizontal ground.

After moving for T seconds, the ball passes through the point A.

The point A is 40 m horizontally and 20 m vertically from the point O, as shown in Figure 2.

The motion of the ball from O to A is modelled as that of a particle moving freely under gravity.

Given that the ball is projected at an angle α to the ground, use the model to

(a) show that $T=\dfrac{10}{7 \cos \alpha}$ **(2)**

(b) show that $\tan^2 \alpha-4 \tan \alpha+3=0$ **(5)**

(c) find the greatest possible height, in metres, of the ball above the ground as the ball moves from O to A. **(3)**

The model does not include air resistance.

(d) State one other limitation of the model. **(1)**