**5.**
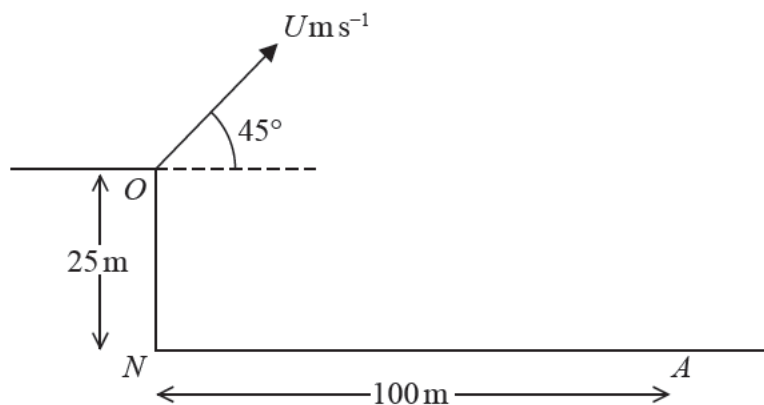


**Figure 2**

A small ball is projected with speed $U\,\mathrm{m\,s^{-1}}$ from a point $O$ at the top of a vertical cliff.

The point $O$ is $25\,\mathrm{m}$ vertically above the point $N$ which is on horizontal ground.

The ball is projected at an angle of $45°$ above the horizontal.

The ball hits the ground at a point $A$, where $AN = 100\,\mathrm{m}$, as shown in Figure 2.

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

Using this initial model,

(a) show that $U = 28$

**(6)**

(b) find the greatest height of the ball above the horizontal ground $NA$.

**(3)**

In a refinement to the model of the motion of the ball from $O$ to $A$, the effect of air resistance is included.

This refined model is used to find a new value of $U$.

(c) How would this new value of $U$ compare with 28, the value given in part (a)?

**(1)**

(d) State one further refinement to the model that would make the model more realistic.

**(1)**