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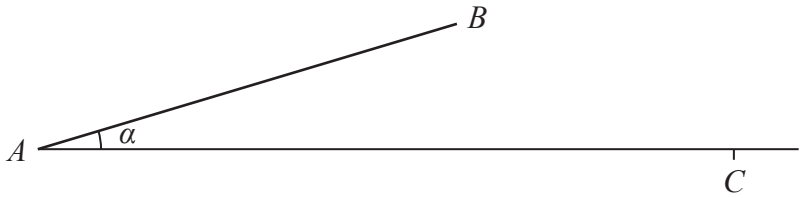


Figure 4

Figure 4 shows a rough ramp fixed to horizontal ground.

The ramp is inclined at angle α to the ground, where $\tan\alpha = \frac{1}{6}$

The point A is on the ground at the bottom of the ramp.
The point B is at the top of the ramp.
The line AB is a line of greatest slope of the ramp and $AB = 4\,\text{m}$.

A particle P of mass $3\,\text{kg}$ is projected with speed $U\,\text{m s}^{-1}$ from A directly towards B.

The coefficient of friction between the particle and the ramp is $\frac{3}{4}$

(a) Find the work done against friction as P moves from A to B.

(4)

Given that at the instant P reaches the point B, the speed of P is $5\,\text{m s}^{-1}$

(b) use the work-energy principle to find the value of U.

(4)

The particle leaves the ramp at B, and moves freely under gravity until it hits the ground at the point C.

(c) Find the horizontal distance from B to C.

(6)

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