5.

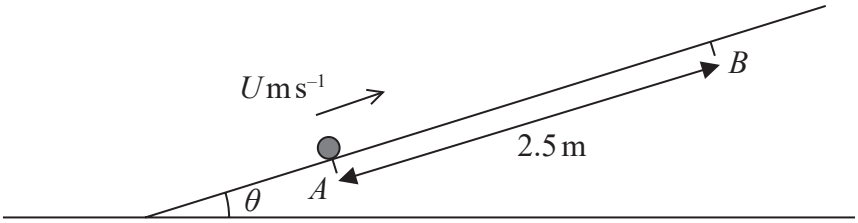


Figure 2

A rough straight ramp is fixed to horizontal ground. The ramp is inclined at an angle θ to the horizontal, where $\tan\theta = \frac{5}{12}$

The points A and B are on a line of greatest slope of the ramp, with $AB = 2.5\,\text{m}$ and B above A, as shown in Figure 2.

A package of mass 1.5 kg is projected up the ramp from A with speed $U\,\text{m s}^{-1}$ and first comes to instantaneous rest at B.

The coefficient of friction between the package and the ramp is $\frac{2}{7}$

The package is modelled as a particle.

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

(3)

(b) Use the work–energy principle to find the value of U.

(4)

After coming to instantaneous rest at B, the package slides back down the slope.

(c) Use the work–energy principle to find the speed of the package at the instant it returns to A.

(3)

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Question 5 continued

(Total for Question 5 is 10 marks)