8.

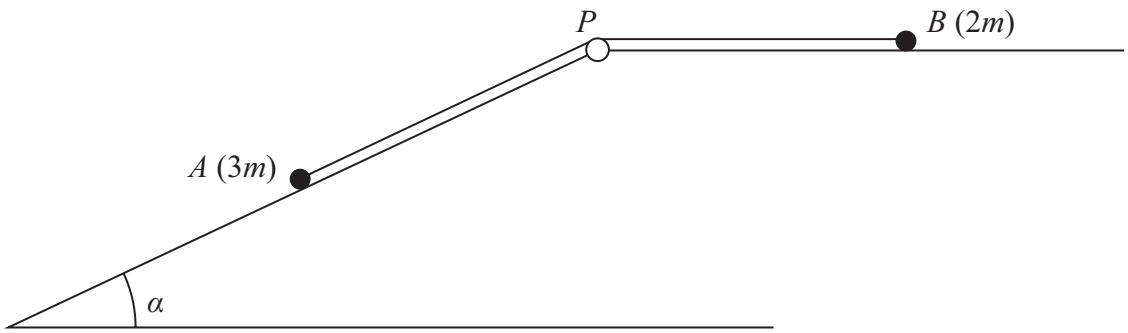


Figure 4

One end of a light inextensible string is attached to a particle A of mass $3m$. The other end of the string is attached to a particle B of mass $2m$. Particle A lies on a **rough** plane which is inclined to the horizontal at an angle α, where $\tan\alpha = \frac{3}{4}$. Particle B lies on a **smooth** horizontal plane. The string passes over a small smooth pulley P which is fixed at the top of the inclined plane, as shown in Figure 4.

The two particles, the string and the pulley all lie in the same vertical plane. The portion of the string between A and P lies along a line of greatest slope of the inclined plane.

The coefficient of friction between A and the inclined plane is $\frac{1}{4}$

The system is released from rest with the string taut and A begins to move down the inclined plane.

(a) Find, in terms of m and g, the magnitude of the frictional force acting on A.

(3)

(b) Write down an equation of motion for B.

(1)

(c) Show that the tension in the string is $\frac{12mg}{25}$

(4)

(d) State how you have used the fact that the string is inextensible.

(1)

The force exerted on the pulley by the string is **S**.

(e) State clearly, giving your answer in terms of α, the direction of **S**.

(1)

(f) Find, in terms of m and g, the magnitude of **S**.

(4)

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TOTAL FOR PAPER IS 75 MARKS

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