3.

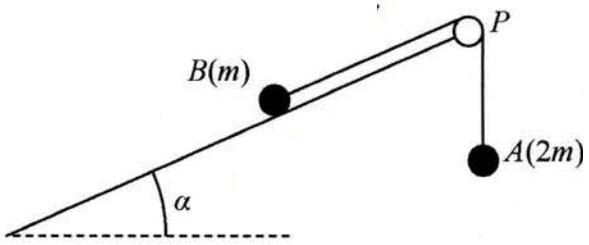

Figure 1

A fixed rough plane is inclined to the horizontal at an angle α, where $\tan\alpha = \frac{4}{3}$

A small smooth light pulley P is fixed at the top of the plane.

A particle A of mass $2m$ and a particle B of mass m are connected by a rope.

The rope passes over the pulley P

The part of the rope from B to P is parallel to a line of greatest slope of the plane.

Particle B is held at rest on the rough plane and A hangs freely with the rope taut, as shown in Figure 1.

Particle B is released from rest and begins to move up the plane.

(a) Find, in terms of mg, the magnitude of the normal reaction that the plane exerts on B.

(2)

The rope is modelled as being light and inextensible.

As B moves up the plane, the tension in the rope has magnitude $\frac{7mg}{5}$

The coefficient of friction between B and the plane is μ.

Using the model,

(b) (i) write down an equation of motion for A,

(ii) hence, find in terms of g, the magnitude of the acceleration of A,

(3)

(c) find the value of μ.

(5)

In reality, the rope would not be light.

(d) State how this would affect the tension in the rope.

(1)