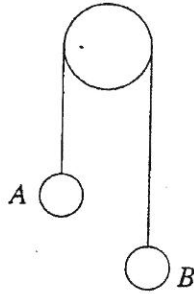


## M1 - Pulley Systems (Tension/Acceleration) (1)

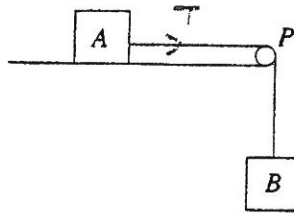
- ① 4. The diagram shows two particles  $A$  and  $B$ , of mass  $3.1$  kg and  $1.8$  kg respectively, connected by a light inextensible string passing over a fixed smooth pulley. Initially,  $B$  is held at rest with the string taut. It is then released.



Calculate the magnitude of the acceleration of  $A$  and the tension in the string.

[6]

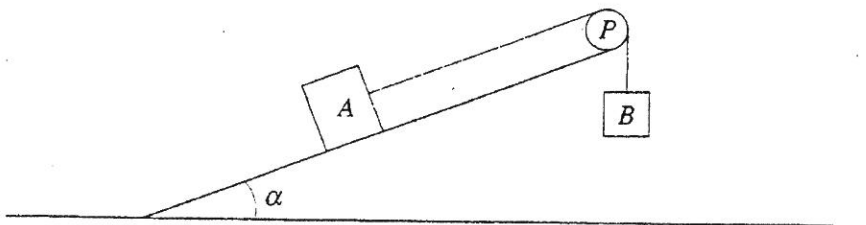
- ② 4. The diagram shows a block  $A$ , of mass  $3$  kg, lying on a smooth horizontal table. It is connected to an object  $B$ , of mass  $5$  kg, by a light inextensible string, which passes over a smooth light pulley  $P$  fixed at the edge of the table so that  $B$  hangs freely.



Initially the system is held at rest with the string taut. A horizontal force of magnitude  $75$  N is then applied to  $A$  in the direction  $PA$  so that  $B$  is raised. Find the magnitude of the acceleration of  $A$  and the tension in the string.

[7]

- ③ 4. The diagram shows a particle  $A$ , on a fixed smooth inclined plane, joined by a light inextensible string passing over a smooth fixed pulley  $P$  to a particle  $B$ , which hangs freely. The plane is inclined at an angle  $\alpha$  to the horizontal, where  $\sin \alpha = 0.21$ . The masses of  $A$  and  $B$  are  $5$  kg and  $9$  kg respectively. The string is in the same vertical plane as a line of greatest slope of the plane. Initially, the particles are held at rest with the string taut.

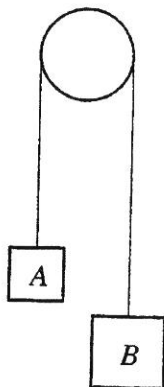


The system is released. Calculate the magnitude of the acceleration of the particle  $A$  and the tension in the string.

[7]

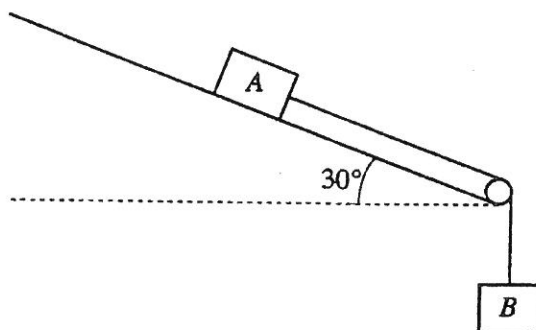
## M1 - Pulley Systems (Tension/Acceleration) (2)

4. Two particles  $A$  and  $B$ , of mass  $5\text{ kg}$  and  $9\text{ kg}$  respectively, are connected by a light inextensible string passing over a smooth light pulley, as shown in the diagram.



Initially, the particles are held at rest with the string taut. The system is then released. Calculate the magnitude of the acceleration of the particle  $A$  and the tension in the string. [6]

5. A light inextensible string connects object  $A$ , of mass  $2\text{ kg}$ , to object  $B$ , of mass  $3\text{ kg}$ . The diagram shows  $A$  on a smooth plane, inclined at an angle of  $30^\circ$  to the horizontal with the string passing over a smooth light pulley at the edge of the plane so that  $B$  hangs freely. Initially,  $A$  is held at rest with the string taut.



The system is released from rest. Find the magnitude of the acceleration of object  $A$  and the tension in the string. [7]

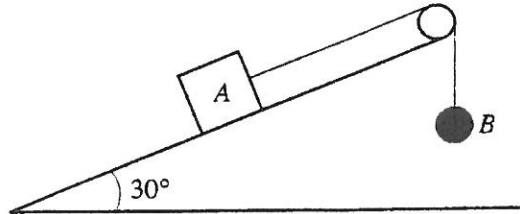
6. A particle  $A$  of mass  $12\text{ kg}$  and a particle  $B$  of mass  $4\text{ kg}$  are attached one to each end of a light, inextensible string. The string passes over a smooth light pulley. Initially, the particles are held at rest with the hanging parts of the string vertical and taut. The system is released.

(a) Find the magnitude of the acceleration of the particle  $A$  and the tension in the string. [7]

(b) What assumption did the phrase "inextensible string" enable you to make in your solution? [1]

## M1 - Pulley Systems (Tension/Acceleration) (3)

- 7 4. The diagram shows a block  $A$  of mass  $8\text{ kg}$  on a smooth plane inclined at an angle of  $30^\circ$  to the horizontal. The block is connected to a body  $B$ , of mass  $6\text{ kg}$ , by means of a light inextensible string passing over a light smooth pulley fixed at the top of the plane.



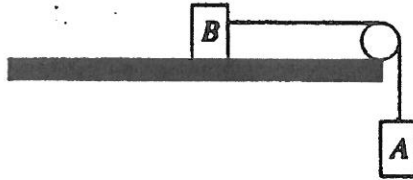
Initially, the system is held at rest with the string taut. The system is then released.

- (a) Calculate the magnitude of the acceleration of  $A$  and the tension in the string. [7]
- (b) What assumption did the word 'inextensible', underlined above, enable you to make in your solution? [1]

## M1 - Pulley Systems (Tension/Acceleration) (4)

8

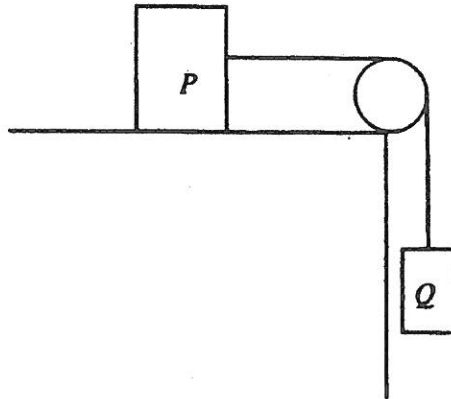
The diagram shows two bodies  $A$  and  $B$ , of mass  $6\text{ kg}$  and  $2\text{ kg}$  respectively, connected by a light inextensible string passing over a smooth light pulley fixed at the edge of a rough horizontal table. Body  $A$  hangs freely below the pulley, and body  $B$  is on the table.



Initially,  $A$  is supported so that the system is at rest with the string taut. When  $A$  is released, it descends with uniform acceleration  $a\text{ ms}^{-2}$ , and a frictional force of magnitude  $13.2\text{ N}$  acts upon  $B$ . Calculate the value of  $a$  and the tension in the string. [7]

9

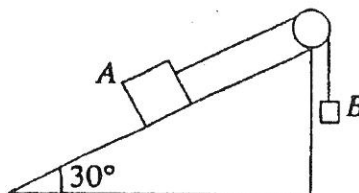
The diagram below shows two particles  $P$  and  $Q$ , of mass  $3\text{ kg}$  and  $4\text{ kg}$  respectively, connected by a light inextensible string passing over a light smooth pulley fixed at the edge of a smooth horizontal table. Particle  $P$  lies on the table and particle  $Q$  hangs freely below the pulley as shown in the diagram.



The system is released from rest with the string taut. Find the magnitude of the acceleration of  $P$  and the tension in the string. [6]

10

The diagram below shows two objects connected by means of a light inextensible string passing over a smooth light pulley fixed at the top of a smooth fixed plane inclined at an angle of  $30^\circ$  to the horizontal. Object  $A$ , of mass  $3\text{ kg}$ , is on the inclined plane and object  $B$ , of mass  $4\text{ kg}$ , is hanging freely.



Find the magnitude of the acceleration of  $A$  and the tension in the string.

[8]

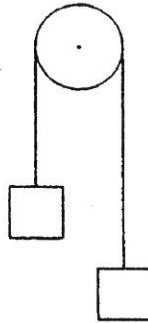
## M1 - Pulley Systems (Tension/Acceleration) (5)

11 On a building site, a load, of mass 150 kg, is hoisted vertically upwards by means of a vertical rope. Neglecting the weight of the rope, calculate the tension in the rope when the load is

(a) accelerating at  $0.3 \text{ ms}^{-2}$ , [3]

(b) moving with constant speed. [1]

12 Two particles of masses 7 kg and 9 kg are connected by a light inextensible string passing over a smooth pulley as shown in the diagram.

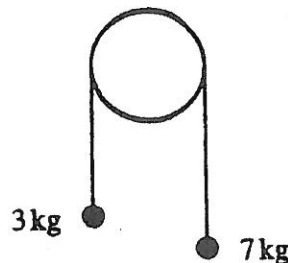


Initially the particles are held at rest with the string taut. The system is then released. Calculate

(a) the magnitude of the acceleration of each particle, [5]

(b) the tension in the string. [1]

13 Two particles of masses 3 kg and 7 kg are connected by a light inextensible string passing over a fixed smooth light pulley as shown in the diagram.



Initially the particles are held at rest with the string taut. The system is then released.

(a) Calculate the magnitude of the acceleration of each particle. [5]

(b) Find the tension in the string. [1]

(c) What assumption did the phrase 'inextensible string' enable you to make in your solution? [1]