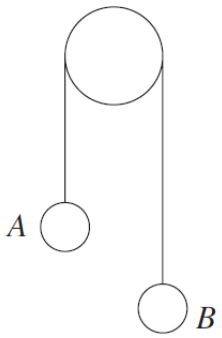
Old Exam Questions – Old Course

Strings Over Pulleys

(M1 Summer 2006)

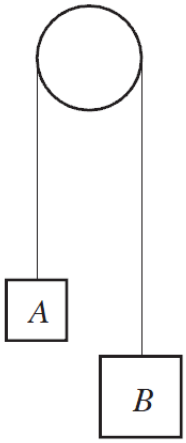
4. The diagram shows two particles A and B, of mass 3·1 kg and 1·8 kg respectively, connected by a light inextensible string passing over a fixed smooth pulley. Initially, B is held at rest with the string taut. It is then released.



Calculate the magnitude of the acceleration of A and the tension in the string. [6]

(M1 Summer 2008)

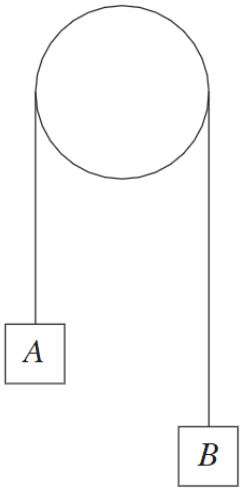
4. Two particles A and B, of mass 5 kg and 9 kg respectively, are connected by a light inextensible string passing over a smooth light pulley, as shown in the diagram.



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]

(M1 Summer 2009)

2. Two objects A, of mass 2 kg, and B, of mass 5 kg, are attached one to each end of a light inextensible string. The string passes over a smooth peg. Initially, the objects are held at rest. The system is released from rest.

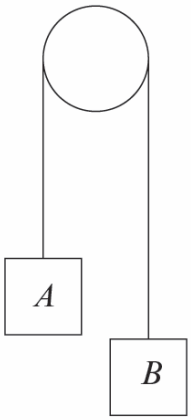


(a) Find the magnitude of the acceleration of A and the tension in the string. [7]

(b) What assumption did the word "inextensible" underlined in the first sentence enable you to make in your solution? [1]

(M1 Winter 2012)

5. The diagram shows two objects A and B, of mass 5 kg and 9 kg respectively, connected by a light inextensible string passing over a smooth peg. Initially, the objects are held at rest. The system is then released.

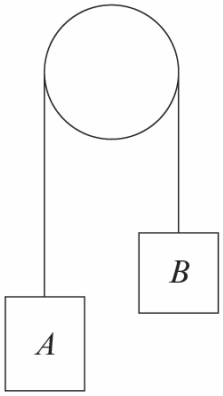


(a) Find the magnitude of the acceleration of A and the tension in the string. [7]

(b) What assumption did the word "light", underlined in the first sentence, enable you to make in your solution? [1]

(M1 Summer 2012)

4. Two particles A and B are connected by a light inextensible string which passes over a smooth fixed pulley. Particle A has mass 3 kg and particle B has mass M kg. Initially, the particles are held at rest with the string just taut and the hanging parts of the string vertical, as shown in the diagram.



The system is then released from rest and particle B moves downwards with acceleration $0{\cdot}4\,g\,\text{ms}^{-2}$, where g is the acceleration due to gravity.
Calculate the tension in the string and the value of M. [7]

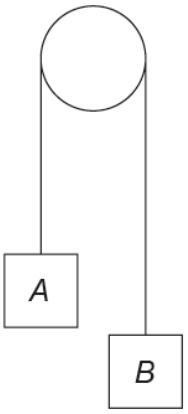
(M1 Winter 2013)

8. The diagram shows a body A, of mass 5 kg, lying on a smooth horizontal table. It is connected to another body B, of mass 9 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 126 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]

(M1 Summer 2016)

2. The diagram shows two objects, *A* and *B*, of mass 2 kg and 5 kg respectively, connected by a light inextensible string passing over a smooth fixed pulley. Initially, the objects are held at rest with the string taut. The system is then released.



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

(b) Before the object *A* reaches the pulley and 2 seconds after the system is released, the string breaks.

(i) Find the speed of *A* when the string breaks.
(ii) Given that *A* does not reach the pulley in the subsequent motion and that *A* is 18·9 m above the ground when the string breaks, determine the time taken for *A* to reach the ground. [6]

(M1 Summer 2018)

4. Two particles *P* and *Q*, of masses 3 kg and 5 kg respectively, are attached one to each end of a light inextensible string which passes over a smooth peg. Initially, the particles are held at rest with the string just taut and with both hanging parts of the string vertical. The particles are then released from rest.

(a) Find the magnitude of the acceleration of *P* and the tension in the string. [7]

(b) What assumption does the word 'light', in the description of the string, enable you to make in your solution? [1]

(c) What assumption does the word 'smooth', in the description of the peg, enable you to make in your solution? [1]