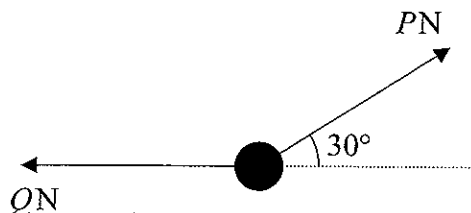


1.

Figure 1



A particle of weight 24 N is held in equilibrium by two light inextensible strings. One string is horizontal. The other string is inclined at an angle of 30° to the horizontal, as shown in Figure 1. The tension in the horizontal string is Q newtons and the tension in the other string is P newtons. Find

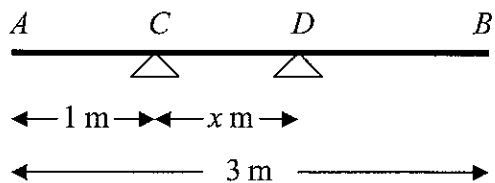
(a) the value of P , (3)

(b) the value of Q . (3)



2.

Figure 2



A uniform plank AB has weight 120 N and length 3 m . The plank rests horizontally in equilibrium on two smooth supports C and D , where $AC = 1\text{ m}$ and $CD = x\text{ m}$, as shown in Figure 2. The reaction of the support on the plank at D has magnitude 80 N . Modelling the plank as a rod,

(a) show that $x = 0.75$ (3)

A rock is now placed at B and the plank is on the point of tilting about D . Modelling the rock as a particle, find

(b) the weight of the rock, (4)

(c) the magnitude of the reaction of the support on the plank at D . (2)

(d) State how you have used the model of the rock as a particle. (1)



Question 2 continued

(Total 10 marks)

Q2

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Leave blank

Question 3 continued

Lined writing area with 20 horizontal lines for student response.

(Total 9 marks)

Q3



4. A particle P of mass 0.3 kg is moving with speed $u \text{ m s}^{-1}$ in a straight line on a smooth horizontal table. The particle P collides directly with a particle Q of mass 0.6 kg , which is at rest on the table. Immediately after the particles collide, P has speed 2 m s^{-1} and Q has speed 5 m s^{-1} . The direction of motion of P is reversed by the collision. Find

(a) the value of u , (4)

(b) the magnitude of the impulse exerted by P on Q . (2)

Immediately after the collision, a constant force of magnitude R newtons is applied to Q in the direction directly opposite to the direction of motion of Q . As a result Q is brought to rest in 1.5 s .

(c) Find the value of R . (4)

Lined area for student answers.



Question 4 continued

Handwriting practice lines for the question.

Q4

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(Total 10 marks)



Question 5 continued

Lined writing area for the answer to Question 5.

(Total 10 marks)

Q5

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Question 6 continued

Lined writing area for the answer.

(Total 14 marks)

Q6



7.

Figure 4

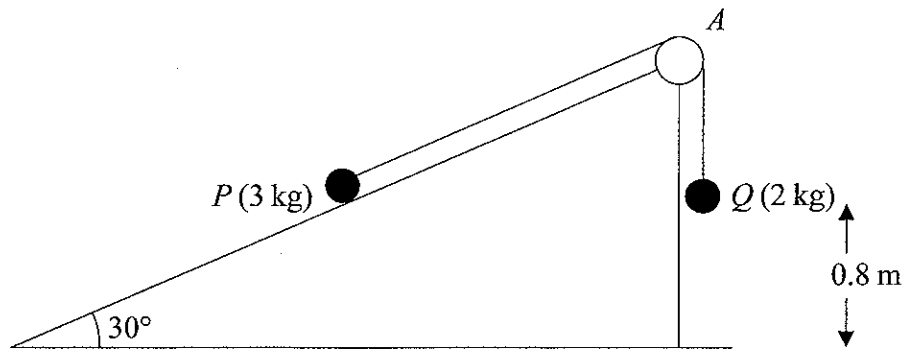


Figure 4 shows two particles P and Q , of mass 3 kg and 2 kg respectively, connected by a light inextensible string. Initially P is held at rest on a fixed smooth plane inclined at 30° to the horizontal. The string passes over a small smooth light pulley A fixed at the top of the plane. The part of the string from P to A is parallel to a line of greatest slope of the plane. The particle Q hangs freely below A . The system is released from rest with the string taut.

- (a) Write down an equation of motion for P and an equation of motion for Q . (4)
- (b) Hence show that the acceleration of Q is 0.98 m s^{-2} . (2)
- (c) Find the tension in the string. (2)
- (d) State where in your calculations you have used the information that the string is inextensible. (1)

On release, Q is at a height of 0.8 m above the ground. When Q reaches the ground, it is brought to rest immediately by the impact with the ground and does not rebound. The initial distance of P from A is such that in the subsequent motion P does not reach A . Find

- (e) the speed of Q as it reaches the ground, (2)
- (f) the time between the instant when Q reaches the ground and the instant when the string becomes taut again. (5)



Question 7 continued

Handwriting practice lines consisting of a solid top line, a dashed middle line, and a solid bottom line. There are 25 such lines available for writing.

Q7

(Total 16 marks)

TOTAL FOR PAPER: 75 MARKS

END

