

(3)

(3)

[illegible]

- (a) the value of u ,

(3)

- (4)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

3. A particle P of mass 0.4 kg moves under the action of a single constant force $\mathbf{F}$ newtons. The acceleration of P is $(6\mathbf{i} + 8\mathbf{j}) \text{ m s}^{-2}$. Find

(a) the angle between the acceleration and $\mathbf{i}$,

(b) the magnitude of $\mathbf{F}$. (3)

At time t seconds the velocity of P is $\mathbf{v} \text{ m s}^{-1}$. Given that when $t = 0$, $\mathbf{v} = 9\mathbf{i} - 10\mathbf{j}$,

(c) find the velocity of P when $t = 5$. (3)

[illegible]

- [illegible]

(Total 9 marks)



5.

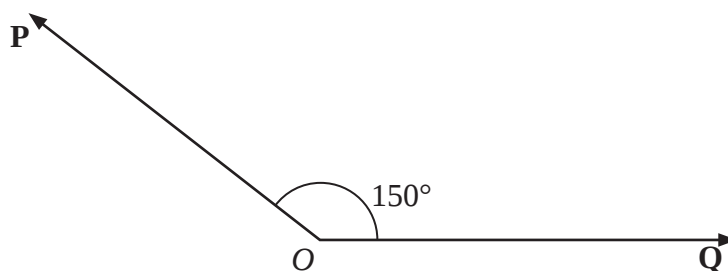


Figure 1

Two forces **P** and **Q** act on a particle at a point **O**. The force **P** has magnitude 15 N and the force **Q** has magnitude X newtons. The angle between **P** and **Q** is 150° , as shown in Figure 1. The resultant of **P** and **Q** is **R**.

Given that the angle between **R** and **Q** is 50° , find

- (a) the magnitude of $\mathbf{R}$, (4)
- (b) the value of X . (5)



6.

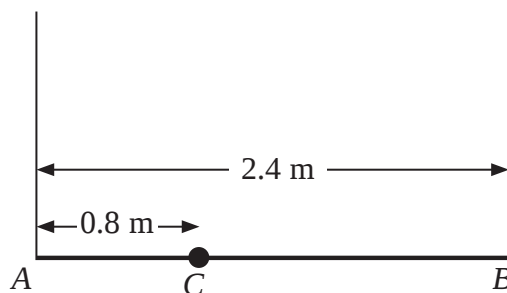


Figure 2

A plank AB has mass 12 kg and length 2.4 m . A load of mass 8 kg is attached to the plank at the point C , where $AC = 0.8\text{ m}$. The loaded plank is held in equilibrium, with AB horizontal, by two vertical ropes, one attached at A and the other attached at B , as shown in Figure 2. The plank is modelled as a uniform rod, the load as a particle and the ropes as light inextensible strings.

- (a) Find the tension in the rope attached at B .

(4)

The plank is now modelled as a non-uniform rod. With the new model, the tension in the rope attached at A is 10 N greater than the tension in the rope attached at B .

- (b) Find the distance of the centre of mass of the plank from A.

(6)

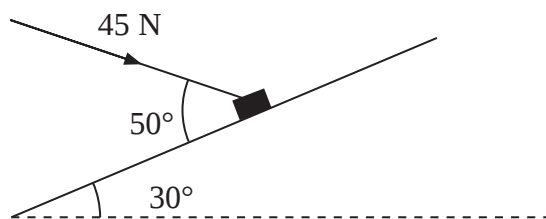
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Question 6 continued

13

Turn over





A package of mass 4 kg lies on a rough plane inclined at 30° to the horizontal. The package is held in equilibrium by a force of magnitude 45 N acting at an angle of 50° to the plane, as shown in Figure 3. The force is acting in a vertical plane through a line of greatest slope of the plane. The package is in equilibrium on the point of moving up the plane. The package is modelled as a particle. Find

- (a) the magnitude of the normal reaction of the plane on the package, (5)
- (b) the coefficient of friction between the plane and the package. (6)



8.



Figure 4

Two particles P and Q , of mass 2 kg and 3 kg respectively, are joined by a light inextensible string. Initially the particles are at rest on a rough horizontal plane with the string taut. A constant force $\mathbf{F}$ of magnitude 30 N is applied to Q in the direction PQ , as shown in Figure 4. The force is applied for 3 s and during this time Q travels a distance of 6 m. The coefficient of friction between each particle and the plane is μ . Find

- (a) the acceleration of Q , (2)
- (b) the value of μ , (4)
- (c) the tension in the string. (4)
- (d) State how in your calculation you have used the information that the string is inextensible. (1)

When the particles have moved for 3 s, the force $\mathbf{F}$ is removed.

- (e) Find the time between the instant that the force is removed and the instant that Q comes to rest.
- (4)**

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

Question 8 continued

Handwriting practice lines for Question 8 continued.

Q8

(Total 15 marks)

TOTAL FOR PAPER: 75 MARKS

END

