

- 1 A car of mass 900 kg is moving along a straight horizontal road against a constant resistance to motion of 350 N. At an instant when the car is moving at 15 m s^{-1} its acceleration is 0.25 m s^{-2} .

(a) Find the driving force of the car's engine at this instant.

[2]

(b) Find the power of the car's engine at this instant.

[2]

- 2 Two particles, P and Q , of masses 3 kg and 5 kg respectively, are at rest on a smooth horizontal plane. P is projected at a speed of 4 m s^{-1} directly towards Q . After P and Q collide, P has speed 1 m s^{-1} .

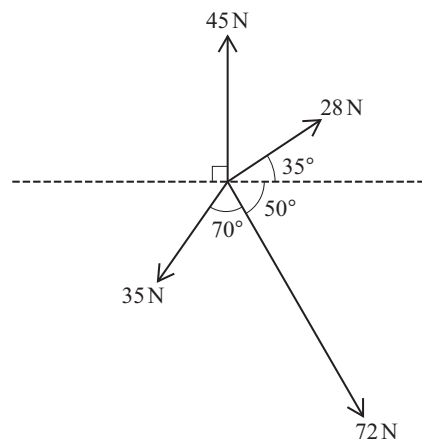
(a) Find the two possible speeds of Q after the collision.

[3]

It is given that λ J of kinetic energy, where $\lambda > 0$, is lost during the collision.

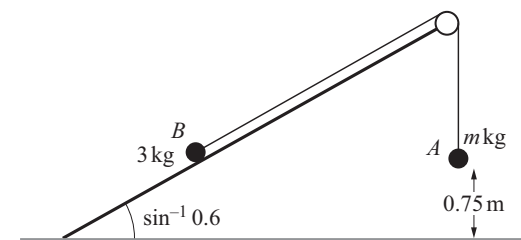
(b) Find the value of λ .

[2]



Find, in either order, the magnitude and direction of the resultant force. [6]

③



The system is released from rest. In the subsequent motion B moves up a line of greatest slope of the plane and does not reach the pulley. As B moves up the plane there is a constant resistance to its motion of magnitude $\frac{10}{3}$ N. The speed of A immediately before it hits the ground is 2 m s^{-1} .

Use an energy method to find the value of m . [6]

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. At the bottom center, there is a small circular icon containing the number 4.

- 7 A particle P starts from a point O and moves in a straight line. The velocity v ms^{-1} of P , at time t s after leaving O , is given by $v = \frac{1}{3}(2t-3)(t-4)$.

- (a) Find the acceleration of P when $t = 2$. [2]

This image shows a full page of white paper with horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

- (b) Find the total distance travelled by P in the first 3 seconds of its motion. [5]

[illegible]This image shows a full page of white paper with ten horizontal dashed lines, typical of primary school handwriting practice paper. The lines are evenly spaced and extend across the entire width of the page. There is no text or other markings on the paper.

- (c) Determine whether P returns to O . [2]

[illegible]

7

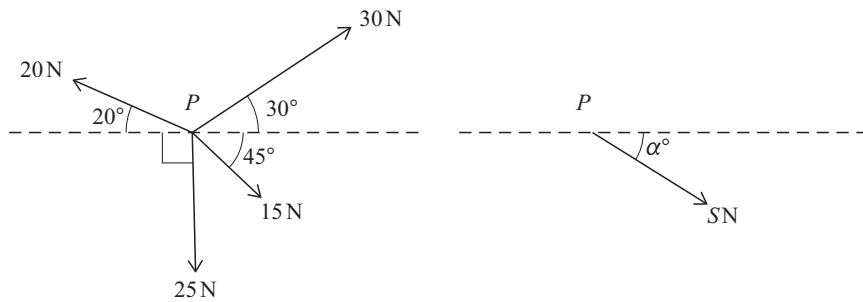


Fig. 7.1

Fig. 7.2

Four coplanar forces of magnitudes 20 N, 30 N, 15 N and 25 N act at a point P in the directions shown in Fig. 7.1. The forces act in a vertical plane. The resultant of these forces has magnitude S N and acts at an angle α° below the horizontal as shown in Fig. 7.2.

- (a) Find the value of S and the value of α .

[6]

A small ring of mass 0.6 kg is threaded on a rough straight horizontal wire. The four forces shown in Fig. 7.1 act on the ring and are in the same vertical plane as the wire. The ring starts from rest and takes 3 s to travel a distance of 2 m along the wire.

- (b) Find the coefficient of friction between the ring and the wire.

[5]

8

Additional page

If you use the following page to complete the answer to any question, the question number must be clearly shown.

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