

(2)

(4)

2. An athlete runs along a straight road. She starts from rest and moves with constant acceleration for 5 seconds, reaching a speed of 8 ms^{-1} . This speed is then maintained for T seconds. She then decelerates at a constant rate until she stops. She has run a total of 500 m in 75 s.

(a) In the space below, sketch a speed-time graph to illustrate the motion of the athlete. (3)

(b) Calculate the value of T . (5)



3.

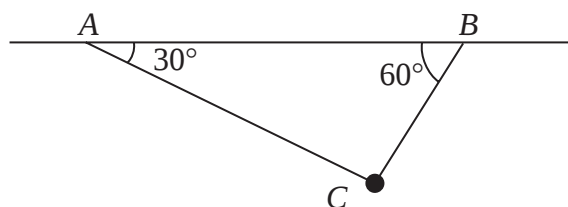


Figure 1

A particle of mass m kg is attached at C to two light inextensible strings AC and BC . The other ends of the strings are attached to fixed points A and B on a horizontal ceiling. The particle hangs in equilibrium with AC and BC inclined to the horizontal at 30° and 60° respectively, as shown in Figure 1.

Given that the tension in AC is 20 N , find

(a) the tension in BC ,

(4)

(b) the value of m . (4)

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- (3)

- (5)

A diagram showing a block on an inclined plane. The incline makes an angle of 30° with the horizontal. A horizontal force of $X \text{ N}$ is applied to the block, pushing it up the incline.

(c) Find the value of X .

(7)

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6.

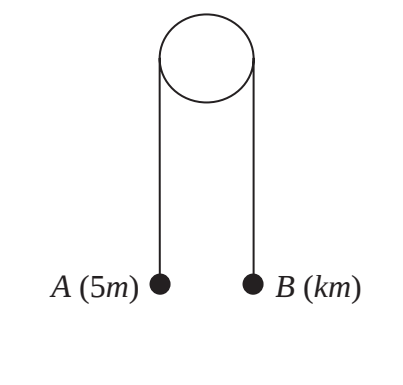


Figure 4

Two particles A and B have masses $5m$ and km respectively, where $k < 5$. The particles are connected by a light inextensible string which passes over a smooth light fixed pulley. The system is held at rest with the string taut, the hanging parts of the string vertical and with A and B at the same height above a horizontal plane, as shown in Figure 4. The system is released from rest. After release, A descends with acceleration $\frac{1}{4}g$.

- (a) Show that the tension in the string as A descends is $\frac{15}{4}mg$. (3)
- (b) Find the value of k . (3)
- (c) State how you have used the information that the pulley is smooth. (1)

After descending for 1.2 s, the particle A reaches the plane. It is immediately brought to rest by the impact with the plane. The initial distance between B and the pulley is such that, in the subsequent motion, B does not reach the pulley.

- (d) Find the greatest height reached by B above the plane. (7)





(a) the speed of S ,

(b) the direction in which S is moving, giving your answer as a bearing. (2)

(c) Show that $\mathbf{s} = (3t + 9)\mathbf{i} + (4t - 6)\mathbf{j}$. (2)

(d) Find the possible values of T . (6)

[illegible]

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(Total 14 marks)

Q7

TOTAL FOR PAPER: 75 MARKS

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