A Level · OCR · Physics

11 mins 11 questions

Multiple Choice Questions

Scalars & Vectors

Scalars & Vectors / Combining Vectors / Resolving Vectors

Easy (2 questions)	/2
Medium (5 questions)	/5
Hard (4 questions)	/4
Total Marks	**/11**

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Easy Questions

1 Which set of quantities are all scalar?

A. acceleration, displacement, velocity

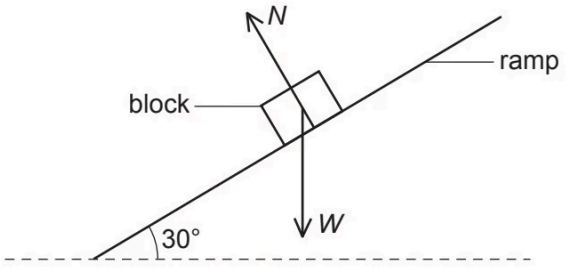
B. energy, mass, power

C. extension, force, gravitational potential energy

D. weight, kinetic energy, work done

(1 mark)

2 A wooden block is **stationary** on a ramp.

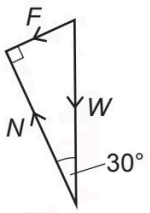


The diagram is **not** drawn to scale.

The block has weight *W*. The normal contact force on the block is *N*. The frictional force *F* on the block is not shown on the diagram.

Which triangle of forces diagram is correct?

A



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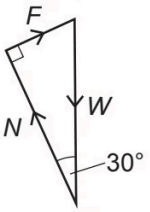

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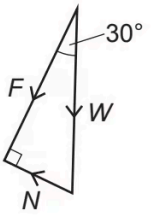
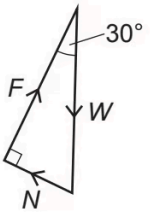


D



(1 mark)

Medium Questions

1 An object is falling.

The weight of the object is 4.5 N.

The wind provides a horizontal force of magnitude *F* on the object.

The **resultant** force on the object is 5.8 N.

Air resistance and upthrust on the object are negligible.

What is the value of *F*?

A. 1.3 N

B. 3.7 N

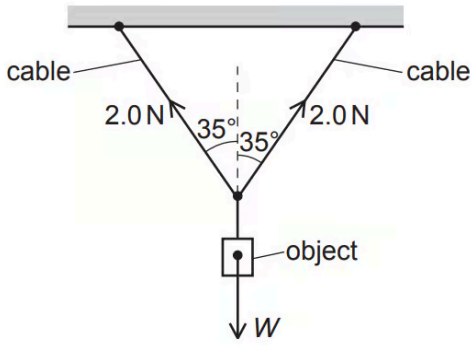
C. 7.3 N

D. 13 N

(1 mark)

2 An object of weight *W* is suspended from two identical cables.

The tension in each cable is 2.0 N. Each cable makes an angle of 35° to the vertical.



What is the weight *W* of the object?

A. 1.6 N

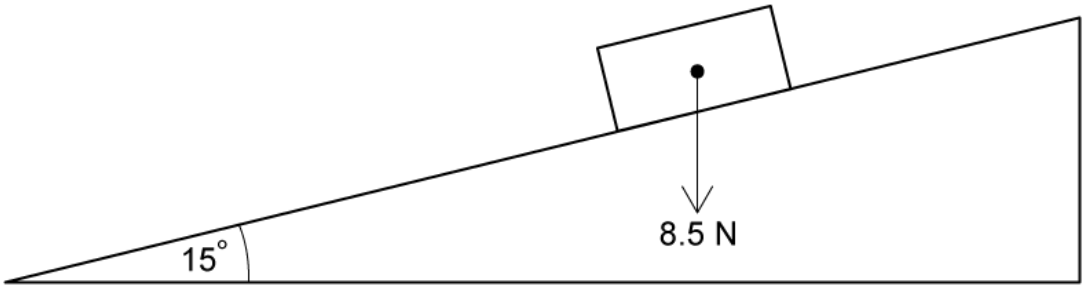
B. 2.3 N

C. 2.8 N

D. 3.3 N

(1 mark)

3 A block of weight 8.5 N sits on a slope angled at 15° to the horizontal as shown.



Which row of the table gives the correct components of weight parallel and perpendicular to the slope?

	Component of weight parallel to slope / N	**Component of weight perpendicular to slope / N**
A	2.2	8.2
B	2.5	8.1
C	2.8	8.0
D	3.1	7.9

(1 mark)

4 A kayaker wishes to travel due east across a river. They can paddle at a speed of 1.3 ms^{-1} in still water. There is a current of 0.95 ms^{-1} flowing due south in the river.

In which direction should the kayaker paddle in order to travel due east?

A. 47° south of east

B. 36° south of east

C. 36° north of east

D. 47° north of east

(1 mark)

5 A particle is acted upon by two coplanar forces of magnitude 1.0 N and *X* N. The directions of the forces are not known. The resultant force on the particle is 3.0 N.

What can be determined about the value of *X*?

A. $X = 2.0$

B. $X = 4.0$

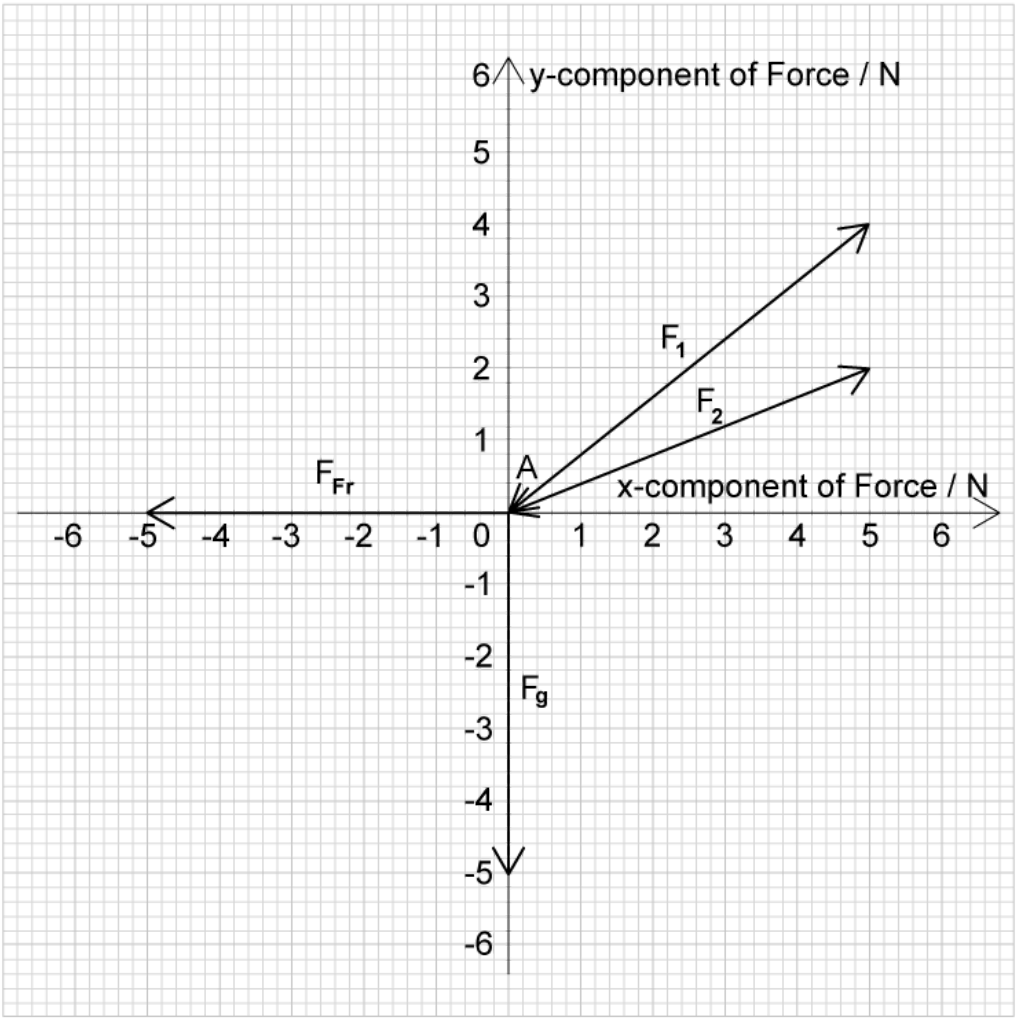
C. $2.0 \leq X \leq 4.0$

D. $3.0 \leq X \leq 4.0$

(1 mark)

Hard Questions

1 The diagram below represents the x and y components of four forces acting on an object at point A. The forces are F_{Fr} (frictional force), F_g (force due to gravity), and the force due to two ropes pulling on the object, F_1 and F_2.



What is the magnitude and direction of the resultant force on the object?

A. 5.1 N, 24.5° below the horizontal anticlockwise

B. 5.1 N, 11.3° above the horizontal anticlockwise

C. 6.0 N, 11.3° above the horizontal anticlockwise

D. 6.0 N, 24.5° below the horizontal clockwise

(1 mark)

2 A bead of mass 150 g is threaded onto a horizontal wire.

The bead is initially at rest and exerted upon by a force of 15 N at an angle of 45° anticlockwise above the horizontal wire for 3 seconds. The bead experiences a constant frictional force of 10 N as it moves along the wire.

What distances does the bead travel along the wire in the 3 seconds to 2 significant figures?

A. 18 m

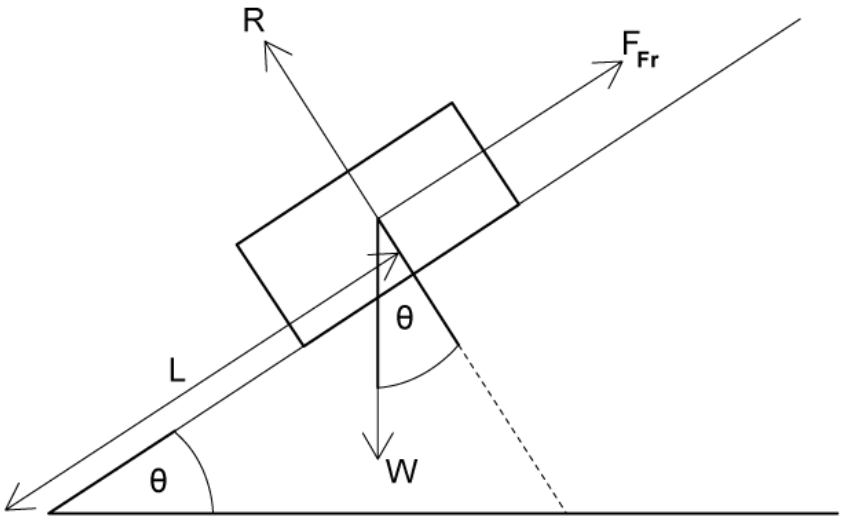
B. 33 m

C. 40 m

D. 150 m

(1 mark)

3 A box of mass *m* sits at a distance *L* on a ramp inclined at an angle *θ* to the horizontal. A normal force and a frictional force proportional to the normal force with a constant of proportionality, *μ*, act on the box.



Which of the following expressions represents the time it takes the box to slide halfway down the ramp?

A. $t_{\frac{L}{2}} = \sqrt{\frac{L}{2g(\mu \sin(\theta) - \cos(\theta))}}$

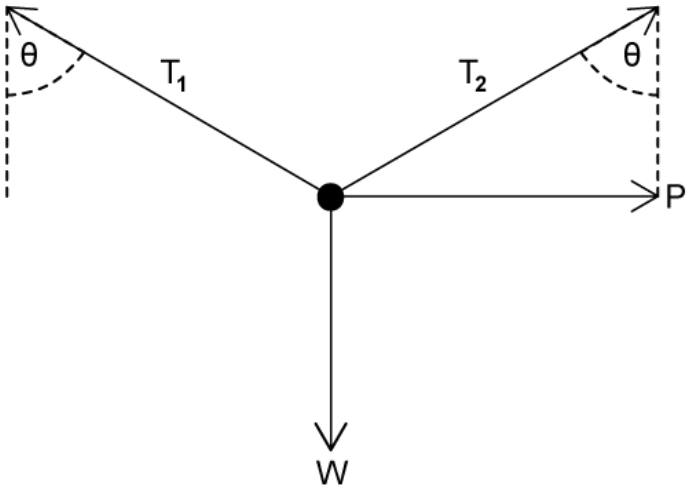
B. $t_{\frac{L}{2}} = \sqrt{\frac{L}{g(\sin(\theta) - \mu \cos(\theta))}}$

C. $t_{\frac{L}{2}} = \sqrt{\frac{L}{g(\sin(\theta) + \mu \cos(\theta))}}$

D. $t_{\frac{L}{2}} = \sqrt{\frac{L}{g(\cos(\theta) - \mu \sin(\theta))}}$

(1 mark)

4 The diagram shows a ball of mass *m* hung by two ropes of equal length pinned at one end to a wall and pulled on by a string which exerts a constant force *P* on the ball in the horizontal direction. The ball is pulled down by its weight until it is in equilibrium. The angles made by each rope to the vertical *θ* are both equal to each other.



What is the expression for the ratio of the tension in the left rope T_1 to the tension in the right rope T_2?

A. $\frac{\left(1 - \frac{P}{mg\tan(\theta)}\right)}{\left(\frac{P}{mg\tan(\theta)} - 1\right)}$

B. $\frac{\left(1-\frac{P\tan(\theta)}{mg}\right)}{\left(\frac{P\tan(\theta)}{mg}-1\right)}$

C. $\frac{\left(1+\frac{P}{mg\tan(\theta)}\right)}{\left(1-\frac{P}{mg\tan(\theta)}\right)}$

D. $\frac{\left(1-\frac{P\tan(\theta)}{mg}\right)}{\left(1+\frac{P\tan(\theta)}{mg}\right)}$

(1 mark)