Save My Exams

**O Level · Cambridge (CIE) · Physics**

🕐 39 mins   ❓ 39 questions

Multiple Choice Questions

1.5 Forces

Resultant Forces / Newton's First Law / Newton's Second Law / Newton's Third Law / Investigating Force & Extension / Hooke's Law / Circular Motion / Friction / Stopping Distances / Moments / Equilibrium / Centre of Gravity / Investigating Centre of Gravity

Easy (10 questions)	/10
Medium (19 questions)	/19
Hard (10 questions)	/10
Total Marks	**/39**

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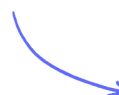
Easy Questions

1 A planet orbits a star at a constant speed in a **circular** orbit.

Which of the statements below, about the force needed to maintain this motion, is correct?

A. No force is required

B. The force is directed away from the centre of the circle

C. The force is directed in the direction the planet is travelling

D. The force is directed towards the centre of the circle

(1 mark)

2 A car is driving round a circular track at a constant speed.

Which statement describes the motion of the car?

A. The car is accelerating because its speed is changing

B. The car is not accelerating as it is moving at a constant speed

C. The car is accelerating because its velocity is changing

**D.** The car is not accelerating, but its velocity is changing.

(1 mark)

3 In which of the following situations would no resultant force be required?

A. A motorbike travelling round a bend at a constant speed.

B. A rocket accelerating straight upwards into space.

C. A ship sailing at a constant speed across the ocean.

D. A Formula One car accelerating off the starting grid.

(1 mark)

**4** The Moon orbits the Earth at a constant speed.
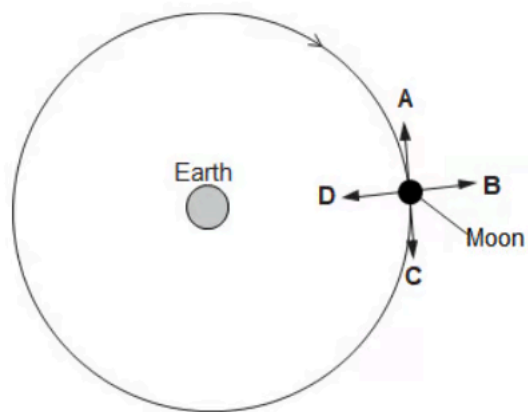
Which of the arrows on the diagram shows the direction of the resultant force on the Moon?
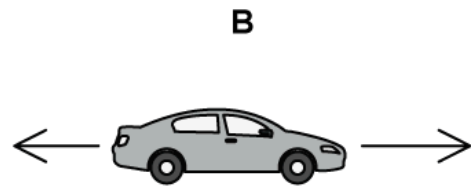
(1 mark)

5 A car starts from rest and rapidly increases speed.

There is a forward acting force on the car from the engine, and a backward acting force on the car from air resistance and friction.
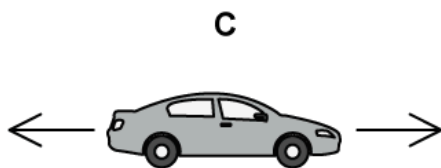
Choose the force diagram and description that best describes the magnitude of the opposing forces.
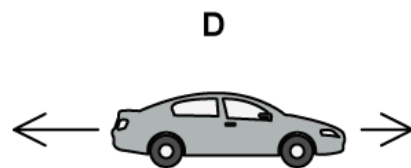
A
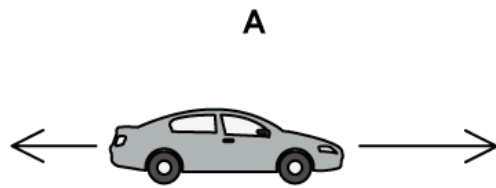
The forward acting force is much larger than the backward acting force

B

The forward acting force is slightly larger than the backward acting force

C

The forward acting force is exactly the same size as the backward acting force
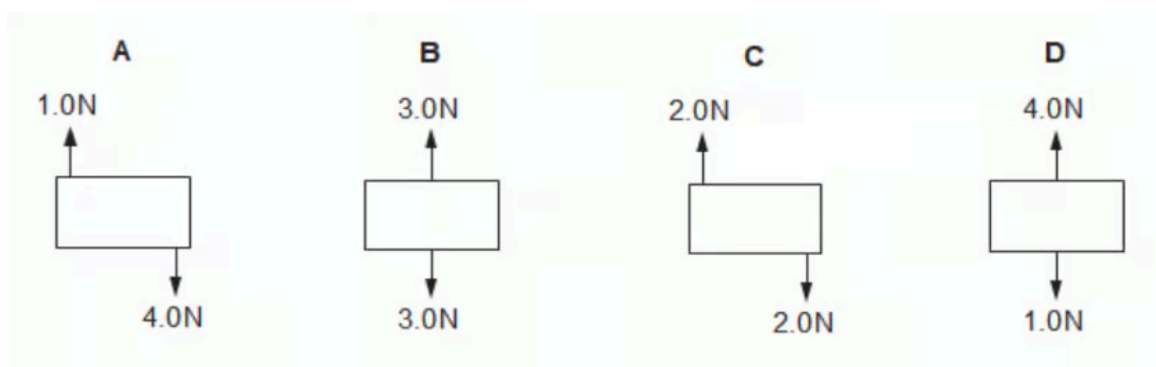
D

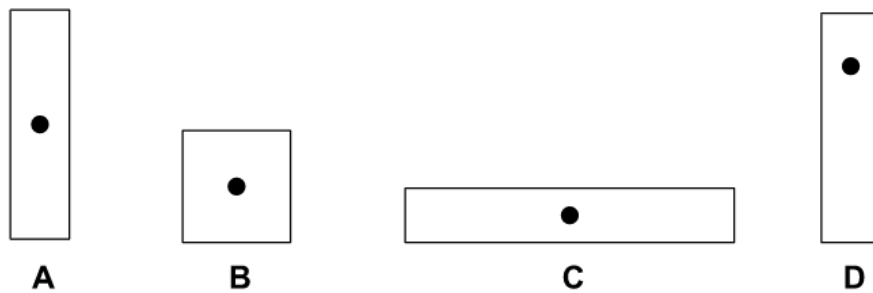The forward acting force is smaller than the backward acting force

(1 mark)

6 Four objects are shown below. Each is acted on by two forces.

Which of the objects is in equilibrium?

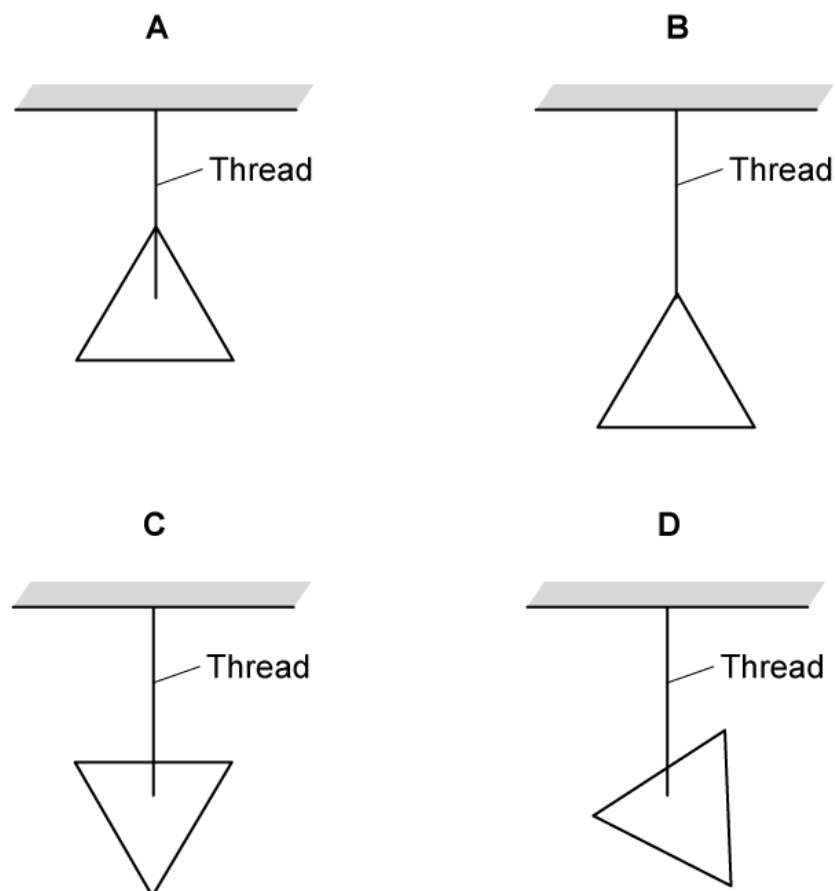| A	B	C	D
1.0N	3.0N	2.0N	4.0N
4.0N	3.0N	2.0N	1.0N

(1 mark)

7 Four cuboids are shown in the diagram below. The position of their centre of mass is also shown.

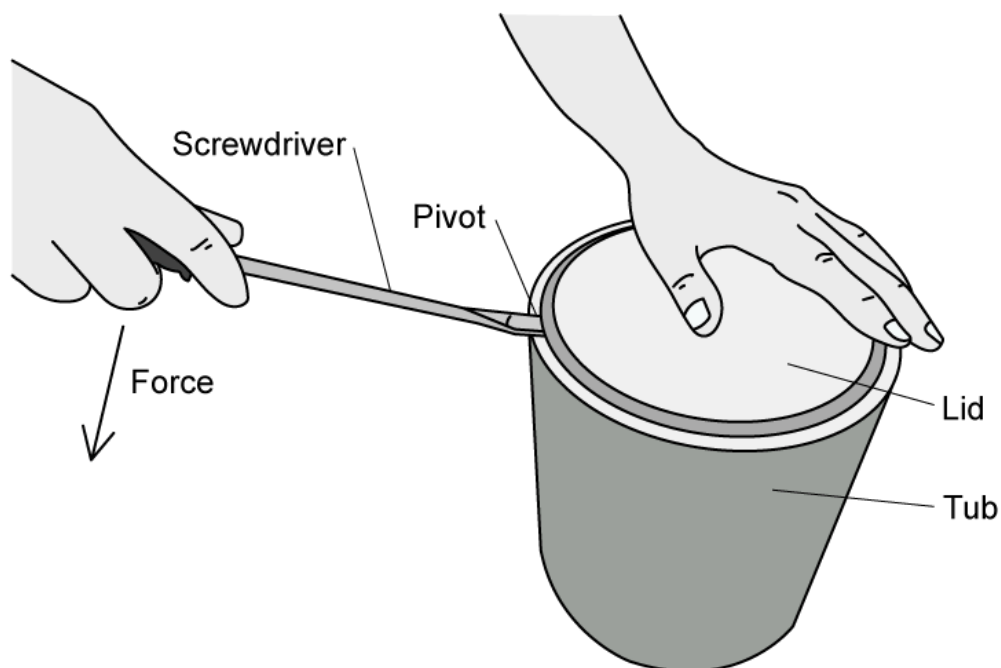Which of the cuboids is the most stable?

(1 mark)

8 A triangle with uniform density is suspended from a thread. Which diagram shows a system which is **not** in equilibrium?

**9** A woman is using a screwdriver to prise the lid off a cylindrical tub of paint.

Which row states how she would increase the moment applied by the greatest amount?

	Type of screwdriver	Force applied
A	Wider	Double
B	Wider	Half
C	Longer	Double
D	Longer	Half

(1 mark)

10 In a classroom, a uniform beam with a pivot at its centre has a 15 N weight suspended from one end. An instrument fixed to the ceiling is attached to the same end.
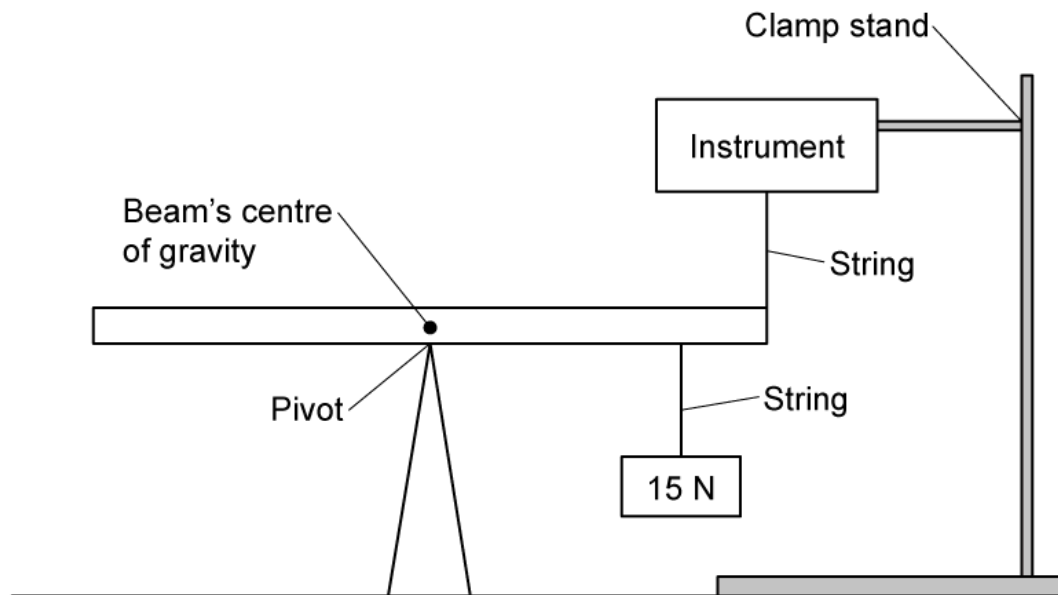
What instrument must be used to show that the resultant moment on a system in equilibrium is zero?
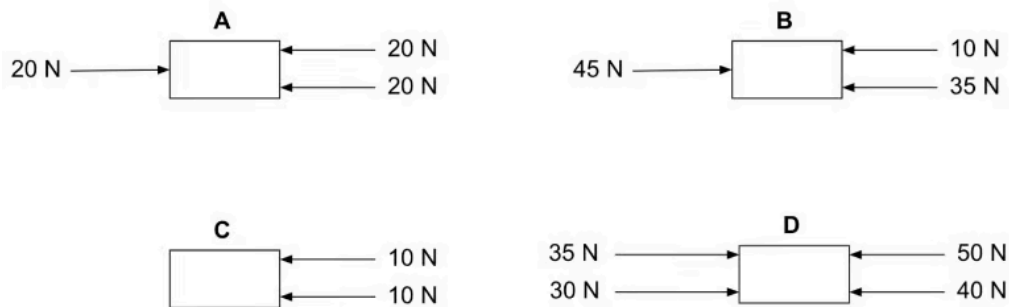
A. Joulemeter

B. Force meter

C. Ruler
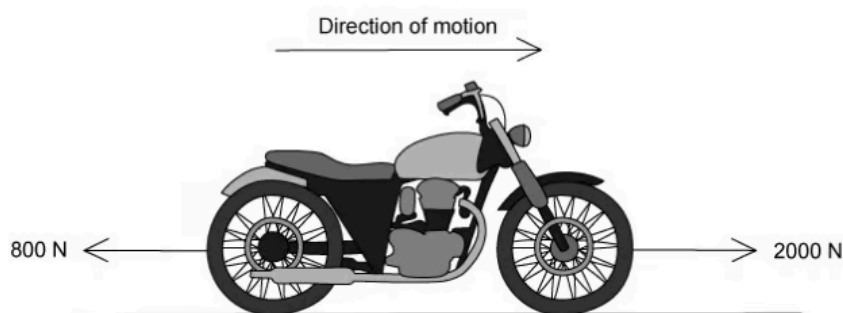
D. Momentmeter

(1 mark)

Medium Questions

1 The diagram shows four objects, each with the same mass. Each object is acted on by the forces shown.

Which object will experience the largest acceleration to the left?

(1 mark)

2 A motorbike travels at a constant speed along a flat road. Three horizontal forces act on the motorbike. Two of them are shown in the diagram below.

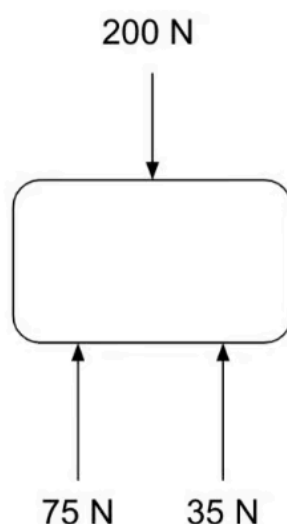What is the size and direction of the third force?

   A. 2800 N forwards

   B. 1200 N backwards

C. 1200 N forwards

D. 2800 N backwards

(1 mark)

3 An object with three forces acting on it is shown below.

What is the resultant force acting on the object?

A. 90 N downwards.

B. 110 N upwards

C. 200 N downwards

D. 90 N upwards

(1 mark)

4 Two students were discussing Newton's first and second laws of motion.

Which statement correctly summarises these two laws?

A. An object will not change its speed or direction unless a resultant force acts upon it equal to $F = ma$

B. An object will not move unless a force acts upon it

C. An object will speed up if a resultant force acts upon it equal to $F = ma$

D. An object will only change its direction if a force acts at a right angle to it

5 A car slows down as it approaches a traffic light. The car was traveling at 13.5 m/s and it takes 22 s to come to a stop.
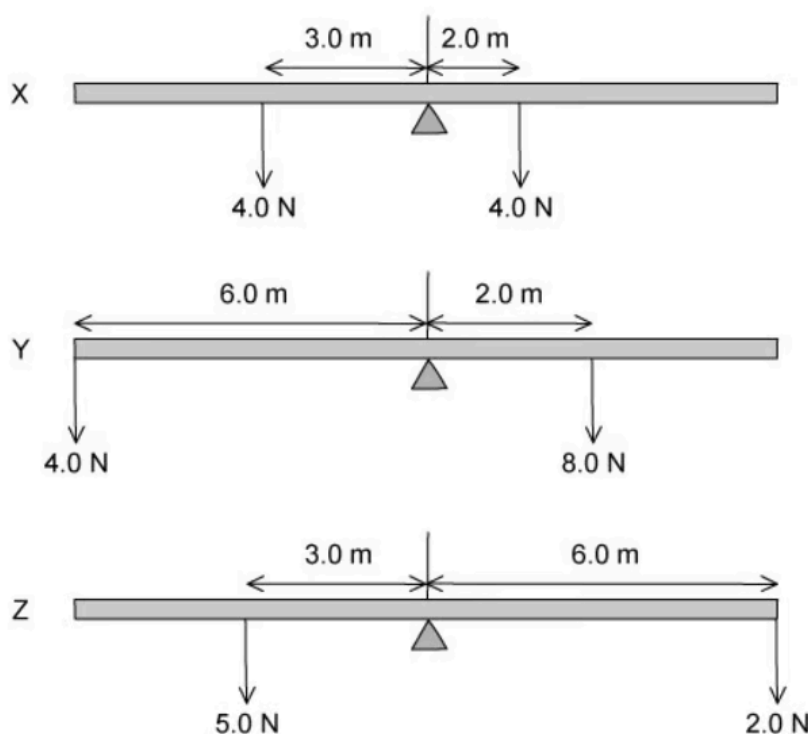
The mass of the car is 950 kg.

Calculate the force required to stop the car.

A. 580 N

B. – 580 N

C. 618 N

D. 1548 N

6 The diagrams below show three beams, each is pivoted at the centre. Each beam also has two forces acting on it, as shown.


Which of the beams will rotate clockwise?

A. X and Y

B. Y and Z

C. Z only

D. None of them

(1 mark)

7 A 'yardarm' is a stick, hung from a string, that is used to weigh goods. Goods are placed in the pan on the left, and weights are added to the box on the right side until it balances.

The weight of the pan and the box are such that the weight of the yardarm itself is entirely balanced by the pan.
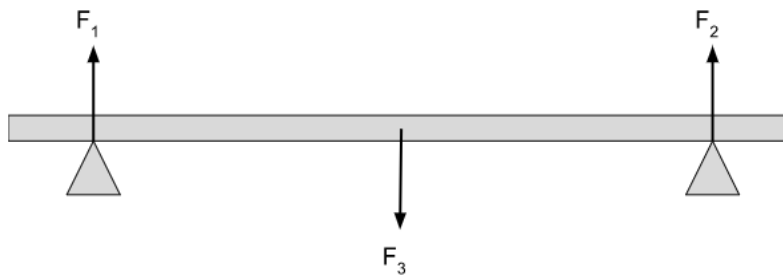
The yardarm is 65 cm long.
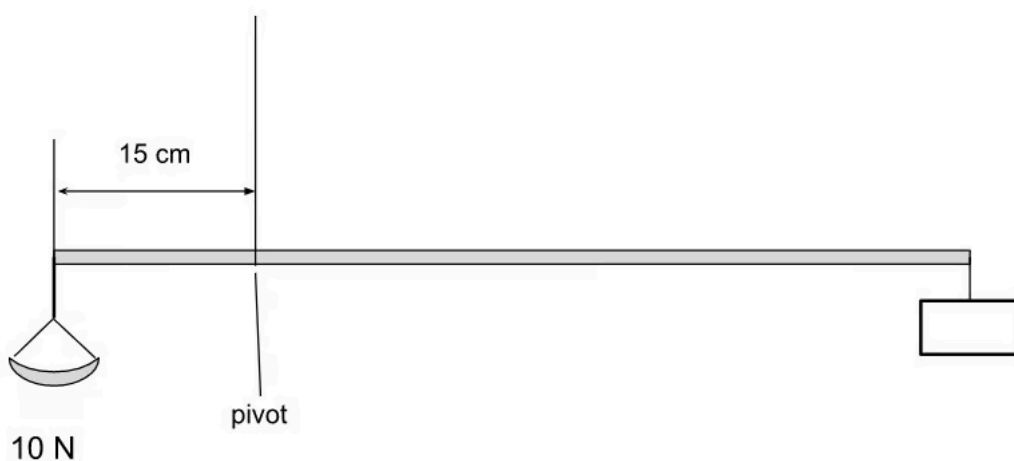
How many 0.5 N weights need to be added to the box in order to balance the yardarm?

A. 2

B. 3

C. 6

D. 12

(1 mark)

8 A plank rests on two supports, as shown in the diagram. The plank is in equilibrium. Three forces act on the plank.



Which statement is true?

A. The upward force is larger than the downward force.

B. The resultant force on the beam is zero and the resultant moment on the beam is zero.

C. The resultant moment on the beam is zero, but the resultant force is not zero.

D. All three forces are equal in size.

(1 mark)

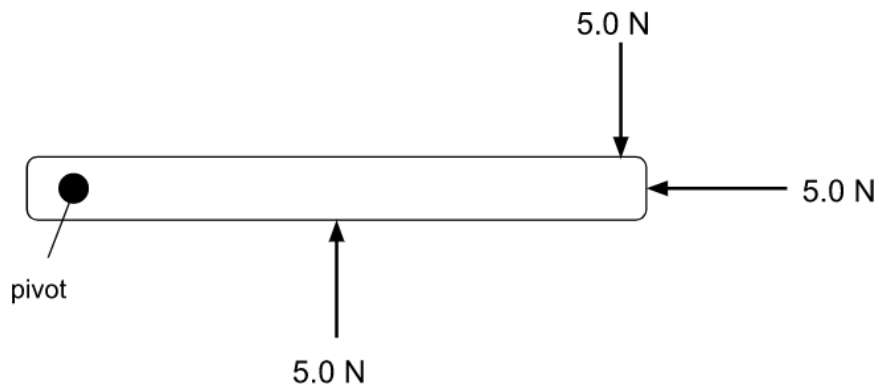**9** A corkscrew is used to open a bottle of delicious wine.

An overworked teacher in self-isolation applies two forces at each of the positions shown below.
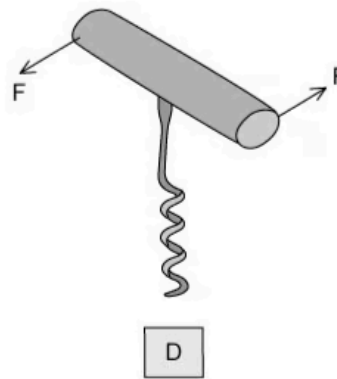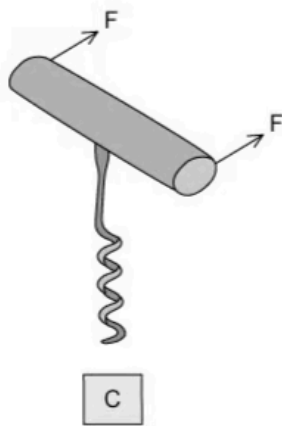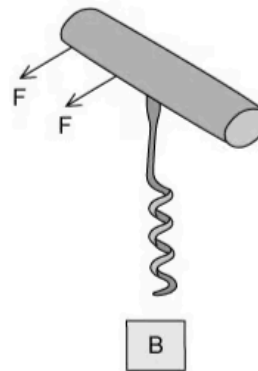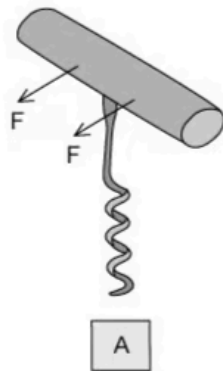
Which pair of forces produces the greatest turning force?

(1 mark)

**10** The diagram shows a door handle with three forces acting on it.
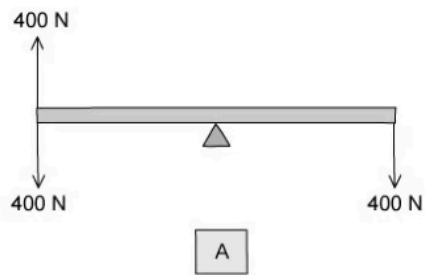

How will the door handle move?

   A. It will turn clockwise.

   B. It will turn anticlockwise.

   C. It will move to the left.

   D. It will not move at all.

(1 mark)

11 The diagrams each show a beam resting on a pivot and being acted on by some forces.
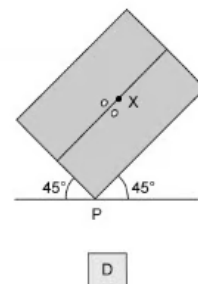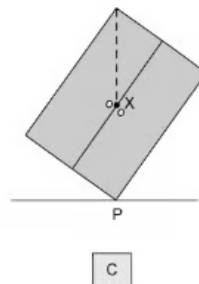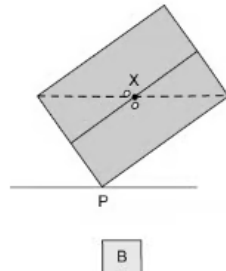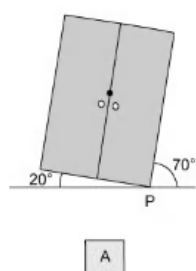
The beam is not attached to the pivot. The pivot is in the centre of the rod in each case.
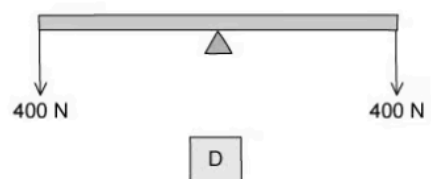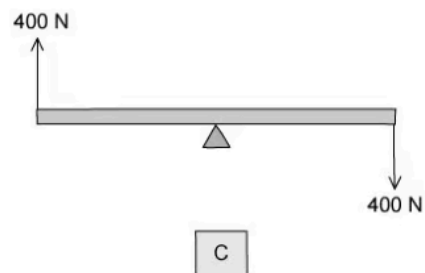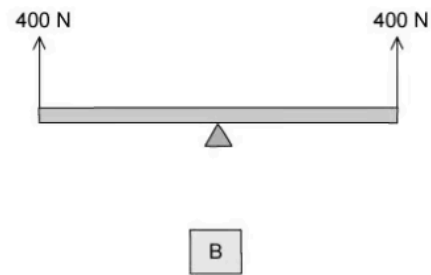
Which of the beams is in equilibrium?

(1 mark)

12 A wardrobe is shown tilted at a variety of angles.

In which position is the wardrobe in equilibrium?
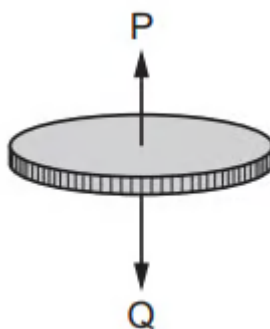
(1 mark)

13 Why are passengers not allowed to stand up on the top deck of a double decker bus?

    A. They cannot be trusted to stand where the driver can't see them.

    B. They would raise the pressure exerted by the bus on the road.

    C. They would increase the gravitational potential energy of the bus.

    D. They would raise the centre of mass of the bus, causing it to become less stable

(1 mark)

14 A coin falls from rest through the air and eventually reaches a constant speed.

There is a resultant force acting on the coin due to the two forces P and Q shown in the diagram.

What happens to force P and what happens to the resultant force before the coin reaches constant speed?

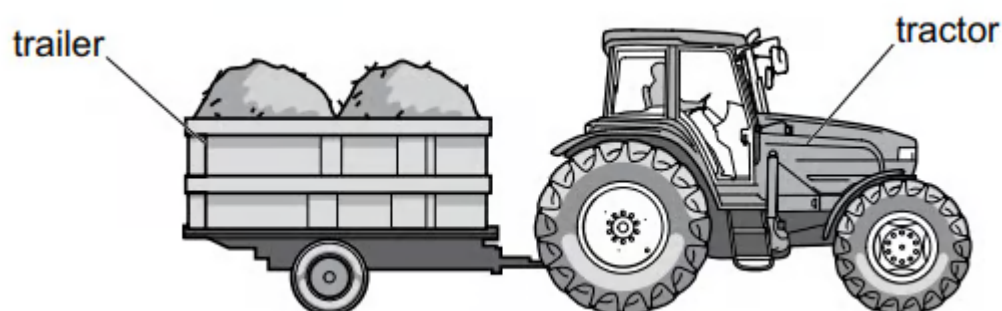|	Force P	Resultant force
A	decreases	increases
B	decreases	decreases
C	increases	decreases
D	increases	increases

15 Which object has the largest resultant force acting on it?
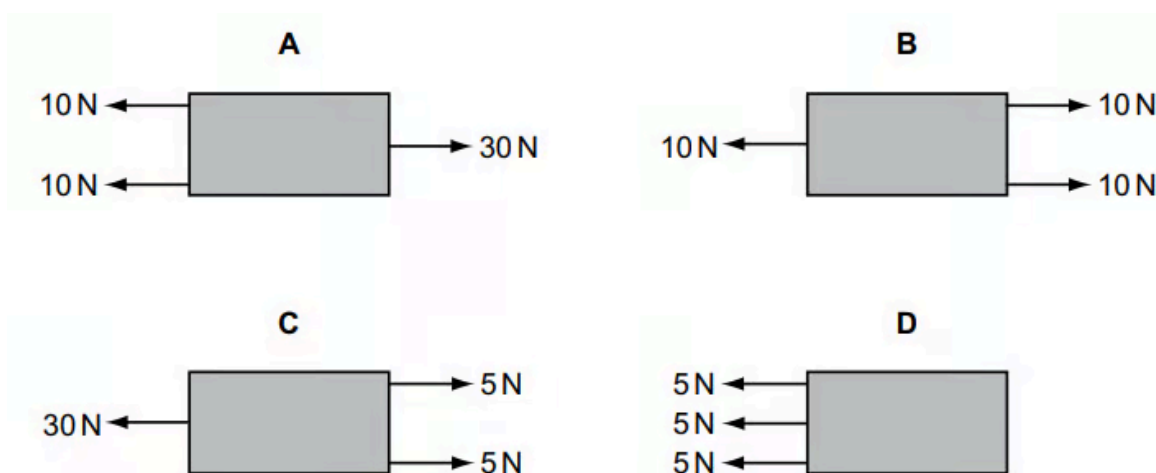
16 A tractor pulls a trailer at a constant speed.

The tractor exerts a force of 1600 N forwards on the trailer.

What force is exerted by the trailer on the tractor?

  A. 0N

  B. 1600N backwards

  C. 1600N forwards

  D. 3200N forwards

17 Which car experiences a resultant force that is **not** zero?

 A. a car moving along a straight horizontal road at constant speed

 B. a car moving around a bend at constant speed

 C. a car moving up a hill at constant velocity

 D. a car that is at rest

(1 mark)

18 A horizontal beam is pivoted at X. A mass of 200 g rests on the beam as shown. The centre of mass of the beam is 50 cm from the right-hand end of the beam.
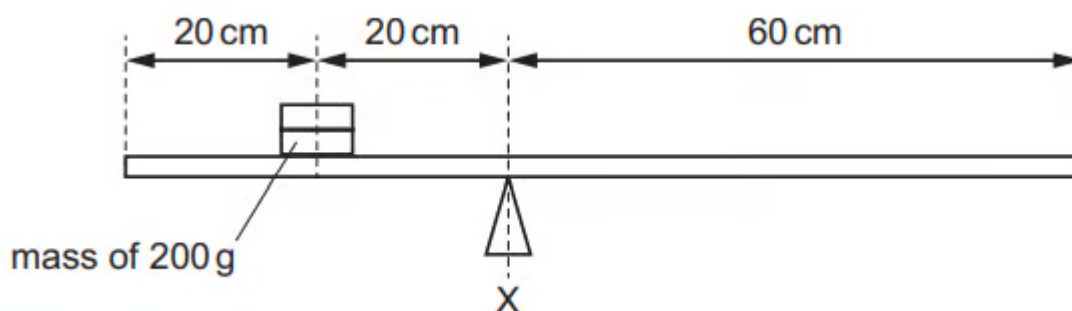
The beam is balanced.

What is the mass of the beam?

 A. 80 g

 B. 100 g

 C. 400 g

 D. 800 g

(1 mark)

19 A car is designed to be stable.

Where **must** the centre of gravity of the car be?

A. above the front wheels

B. above the rear wheels

C. as high in the car as possible

D. as low in the car as possible

(1 mark)

Hard Questions

1 A skydiver is falling at terminal velocity. He has not yet opened his parachute.

He opens his parachute.

What is the direction of both the velocity of the skydiver, and his acceleration?

	Direction of the skydiver's velocity	Direction of the skydiver's acceleration
A	upwards	upwards
B	upwards	downwards
C	downwards	upwards
D	downwards	downwards

(1 mark)

2 A bus drives along a flat road. Its engine produces a forward driving force of 7000 N. Drag forces, *D* also act on the bus.

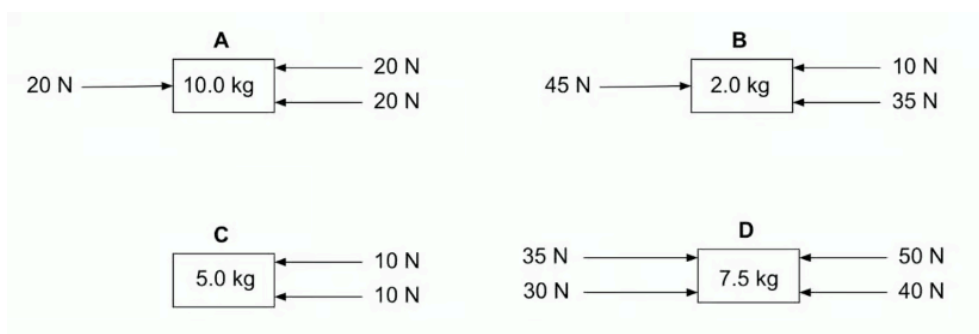The bus has an acceleration of 1.2 m/s^2 and a mass of 2500 kg.
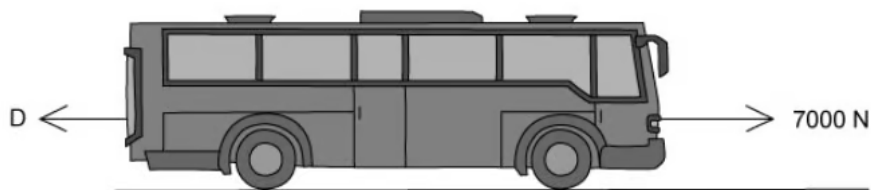
What is the value of D?

A. 3000 N
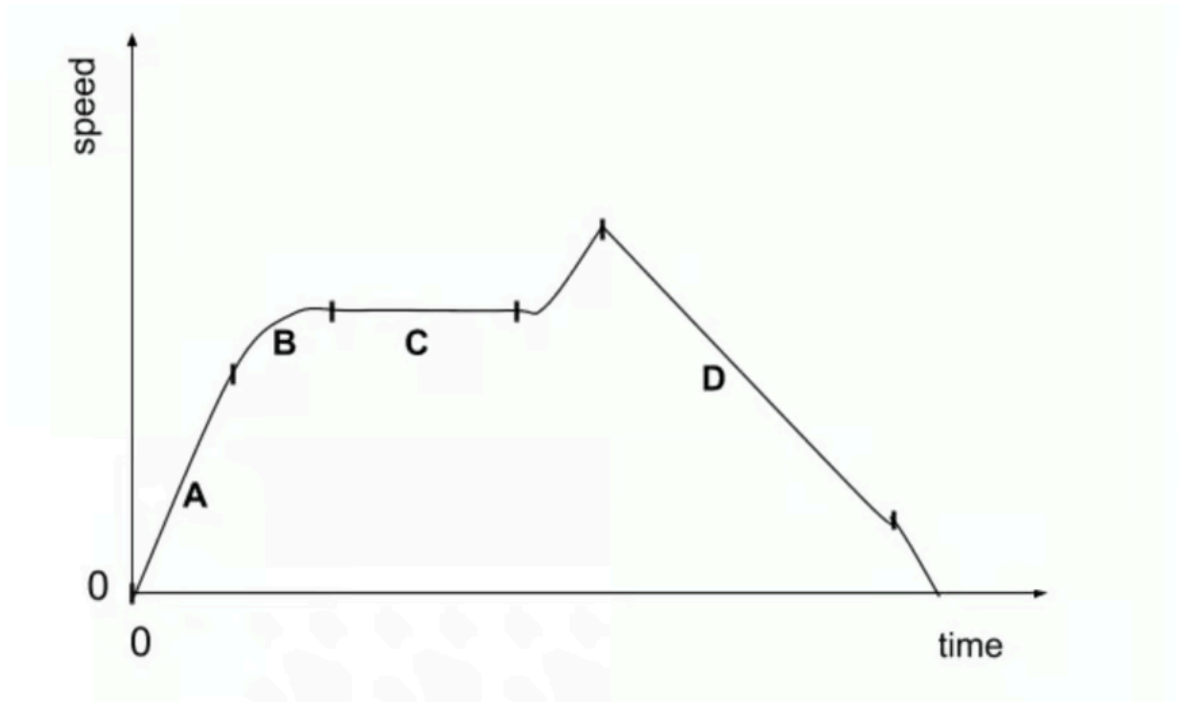
B. 4500 N

C. 4917 N

D. 4000 N

(1 mark)

3   The diagram shows four objects, each with a different mass. Each object is acted on by the forces shown.

Which object will experience the largest acceleration?

(1 mark)

**4** The graph below shows the journey of a truck along a straight, flat road.

During which part of the journey is the resultant force on the truck equal to zero?

(1 mark)

5 A car is driving on a motorway at a constant speed of 70 miles per hour.

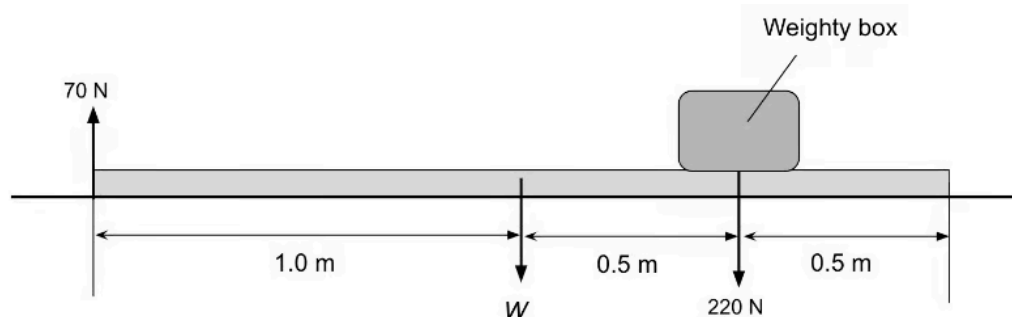The driver notices a queue of traffic up ahead and begins to slow down.

Which diagram best describes the resultant force acting on the car as it slows down?
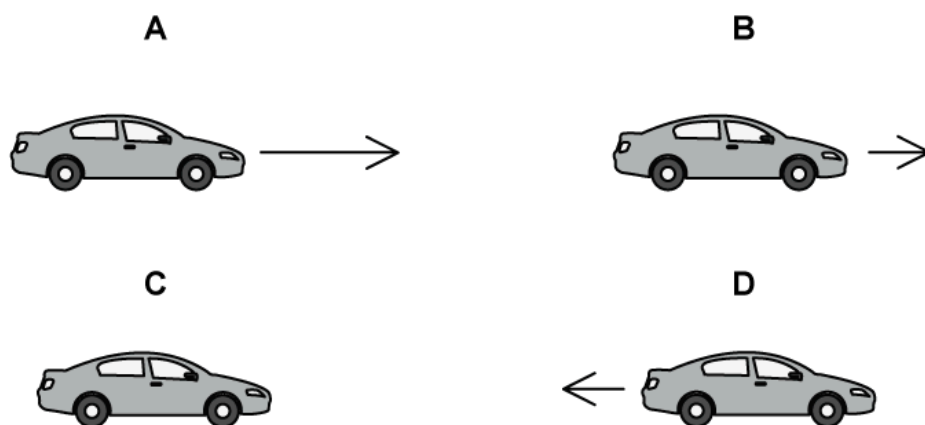
6 A plank is placed on the floor, with a weighty box on top of it, as shown in the diagram.

A force of 70 N is required to lift one end of the plank, while the other rests on the floor.
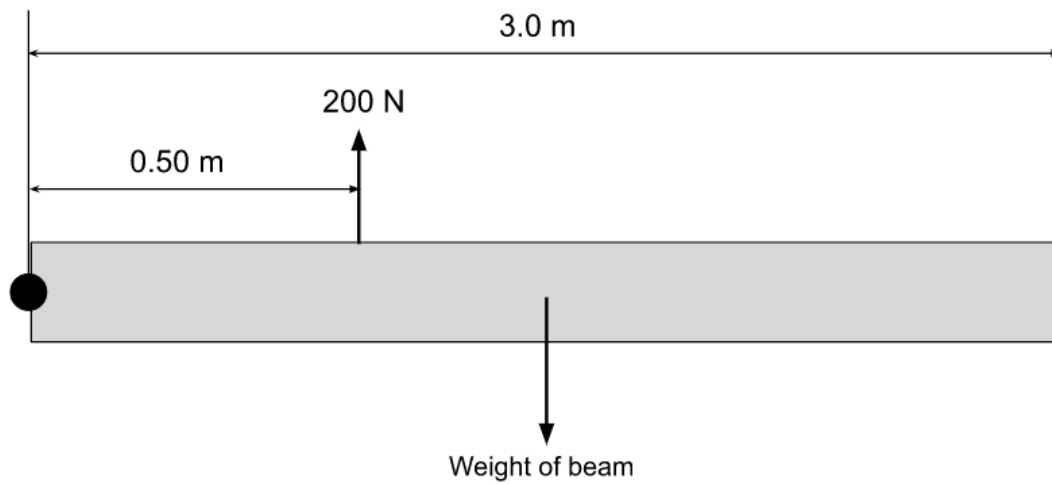

What is the weight of the plank, *W*?

A. 60 N

B. 80 N

C. 150 N

D. 30 N

(1 mark)

7 A uniform beam is pivoted at one end and suspended by a 200 N force as shown in the diagram.

The beam is in equilibrium.
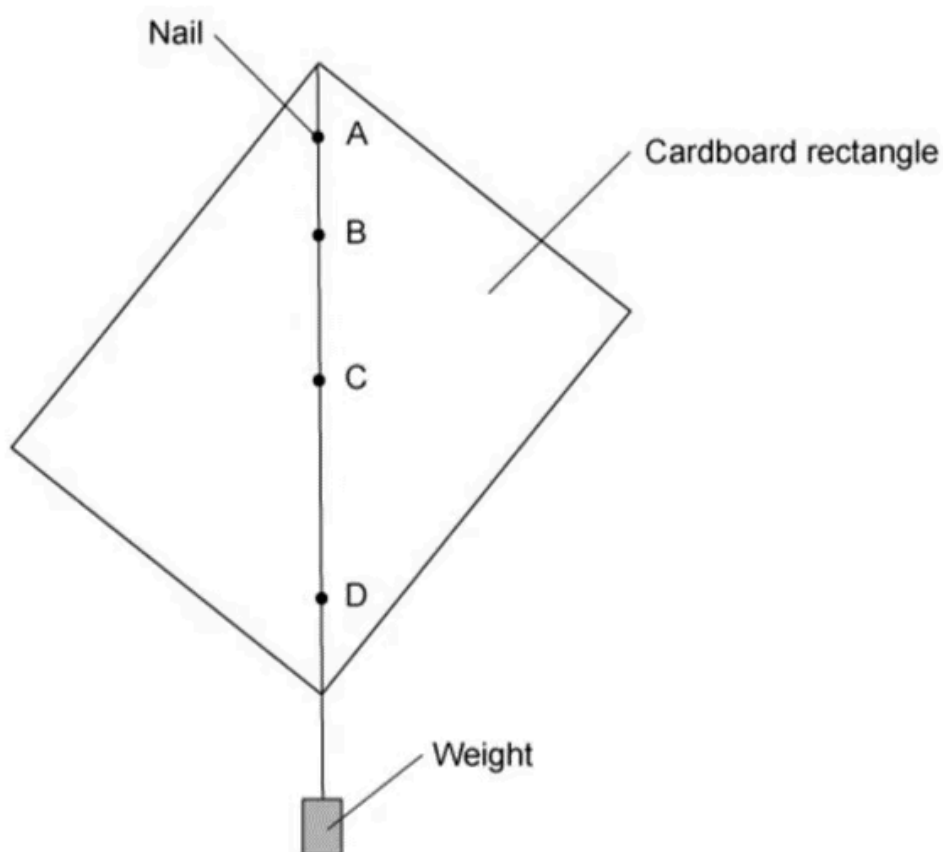

What is the weight of the beam?

A. 66.7 N

B. 33.3 N

C. 1200 N

D. 200 N

(1 mark)

8 A cardboard rectangle is hung from a nail as shown in the diagram.

A plumb line is also hung from the nail.

Which of the points labelled shows the centre of gravity of the cardboard rectangle?

(1 mark)

9 A uniform beam of wood of mass M rests on a pivot. The far left side of the wood is tied to a bolt in the floor with a length of rope with tension T, such that it lies completely horizontal. An object of mass m is placed with its centre of gravity on the very end of the right hand side of the beam.

The perpendicular distance from the rope to the pivot is one quarter of the beam's length.

Which expression for the mass of the beam is correct?
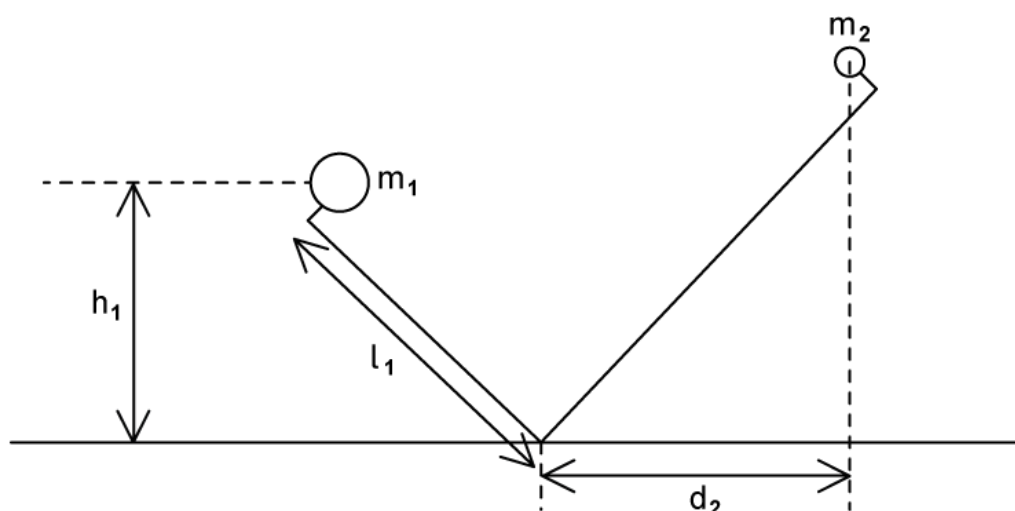
A. $M = \dfrac{T}{g} - 3m$

B. $M = 4T + 12m$

C. $M = T - 3m$

D. $M = Tg - 3mg^2$

<div align="right">

(1 mark)

</div>

10 A "V" shaped object has a sphere attached to either end of the "V" and is balanced on its point. The length of the short arm of the object is l_1. The sphere of mass m_1 is a height h_1 off the ground. The sphere of mass m_2 is a horizontal distance of d_2 from the point of the shape.

The object is in equilibrium. Which expression for d_2 is correct?

A. $d_2 = \dfrac{m_1 l_1}{m_2}$

B. $d_2 = \dfrac{m_1 \sqrt{l_1^2 - h_1^2}}{m_2}$

C. $d_2 = \dfrac{m_1 \sqrt{l_1^2 + h_1^2}}{m_2}$

D. $d_2 = \dfrac{m_1 h_1}{m_2}$

<div align="right">

(1 mark)

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