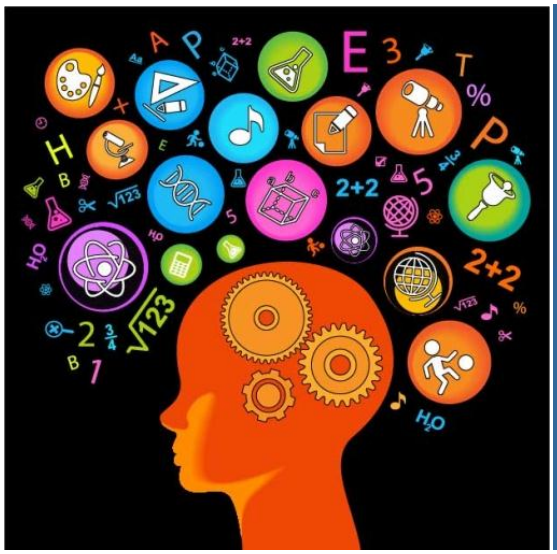
PHYSICS 2

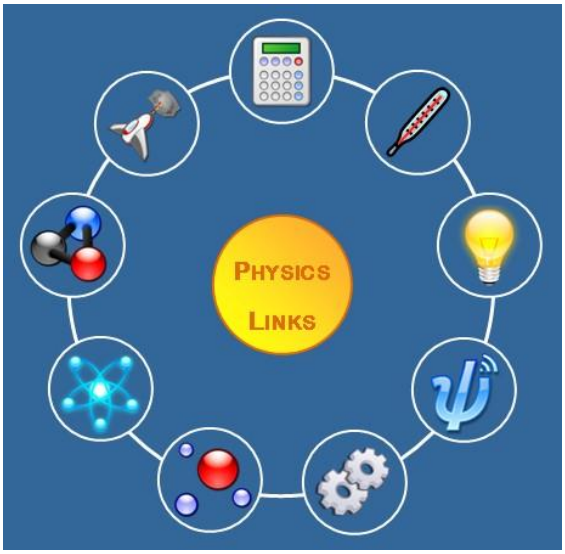
# PHYSICS

## GRADE 10

## TERM 2 PORTFOLIO TASKS 3, 4, 5

## 2013-2014






| Unit/Topic | Performance Criteria | Assess Event | Date | Time |
|---|---|---|---|---|
| Forces, effects, scalars and vectors, turning effects, c.o.e, c.o.m | 6.1 – 6.5<br>7.1-7.2<br>8.1,9.1-9.2 | Portfolio Tasks 3,4,5 | Term 2 | WEEKs 6-11 |
| **Student Name** | **Teacher** | **Class** | **Total Mark** | |
| | | | | |
| **Marked and feedback provided by:** | | **Signature:** | **Date:** | |
| **Teacher Comment:** | | | | |
| | | | | |
| **Feedback acknowledgement** | I certify that the work submitted is my own. I acknowledge that I have received and understood feedback about this assignment. | | | |
| **Student Comment:** | | | | |
| **Student Signature:** | | **Date:** | | |

## Multiple Choice

1.

A force acts on a moving rubber ball.

How many of the following changes could happen to the ball because of the force?

- a change in direction
- a change in shape
- a change in mass
- a change in speed

**A** 1 **B** 2 **C** 3 **D** 4

2.

Three children, X, Y and Z, are using a see-saw to compare their weights.


Which line in the table shows the correct order of the children's weights?

| | heaviest ⟷ | | lightest |
|---|---|---|---|
| **A** | X | Y | Z |
| **B** | X | Z | Y |
| **C** | Y | X | Z |
| **D** | Y | Z | X |

3.

Below are four statements about the effects of forces on objects.

Three of the statements are correct.

Which statement is **incorrect**?

**A** A force can change the length of an object.

**B** A force can change the mass of an object.

**C** A force can change the shape of an object.

**D** A force can change the speed of an object.

4.

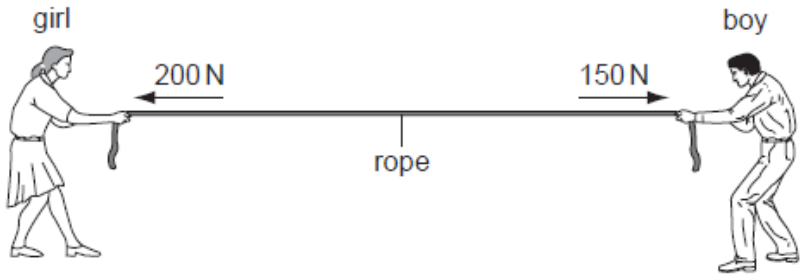
The weights of four objects, 1 to 4, are compared using a balance.


Which object is the lightest?

**A** object 1 **B** object 2 **C** object 3 **D** object 4

5.

A girl and a boy are pulling in opposite directions on a rope. The forces acting on the rope are shown in the diagram.




Which single force has the same effect as the two forces shown?

**A** 50 N acting towards the girl

**B** 350 N acting towards the girl

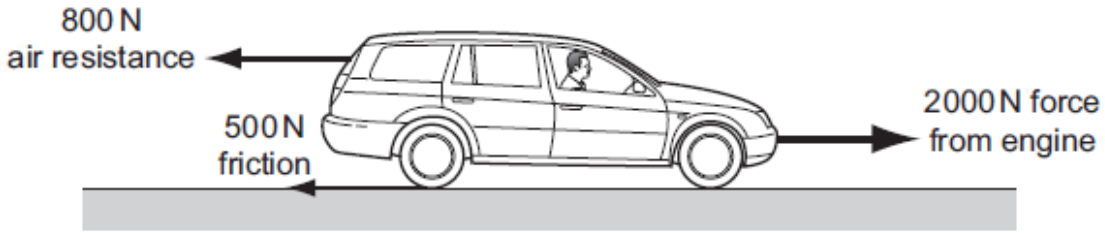
**C** 50 N acting towards the boy

**D** 350 N acting towards the boy

6.

A car moves along a level road.

The diagram shows all of the horizontal forces acting on the car.




Which statement is correct?

**A** The car is slowing down.

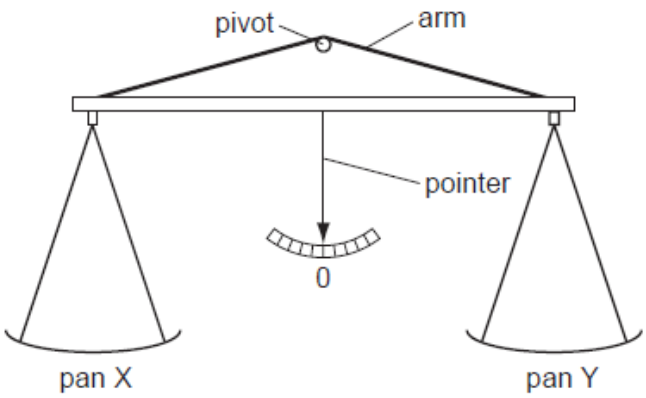
**B** The car is speeding up.

**C** The car is moving at a constant speed.

**D** The car is moving backwards.

7.

A simple balance has two pans suspended from the ends of arms of equal length. When it is balanced, the pointer is at 0.




Four masses (in total) are placed on the pans, with one or more on pan X and the rest on pan Y.

Which combination of masses can be used to balance the pans?

**A** 1 g, 1 g, 5 g, 10 g

**B** 1 g, 2 g, 2 g, 5 g

**C** 2 g, 5 g, 5 g, 10 g

**D** 2 g, 5 g, 10 g, 10 g

8.

Two forces act on an object.

In which situation is it **impossible** for the object to be in equilibrium?

**A** The two forces act in the same direction.

**B** The two forces act through the same point.

**C** The two forces are of the same type.

**D** The two forces are the same size.

9.

Which property of an object **cannot** be changed by a force?

**A** its mass

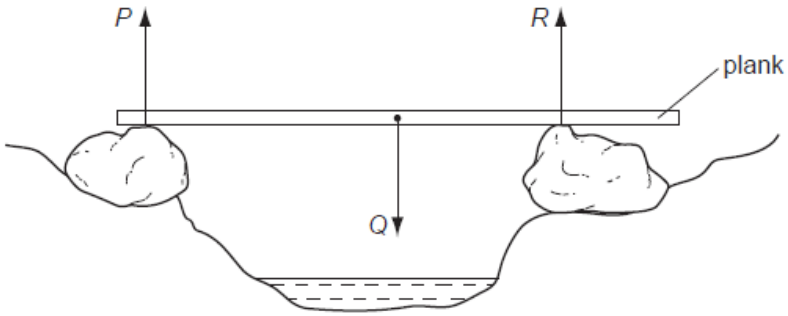
**B** its motion

**C** its shape

**D** its size

10.

A wooden plank rests in equilibrium on two boulders on opposite sides of a narrow stream. Three forces of size *P*, *Q* and *R* act on the plank.




How are the sizes of the forces related?

**A** $P + Q = R$

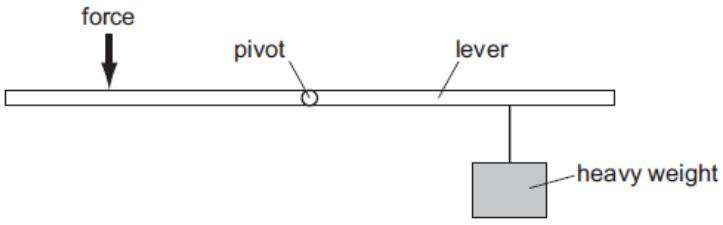
**B** $P + R = Q$

**C** $P = Q = R$

**D** $P = Q + R$

11.

The diagram shows a force being applied to a lever to lift a heavy weight.




Which change would enable the heavy weight to be lifted with a smaller force?

**A** Move the force to the right.

**B** Move the heavy weight to the right.

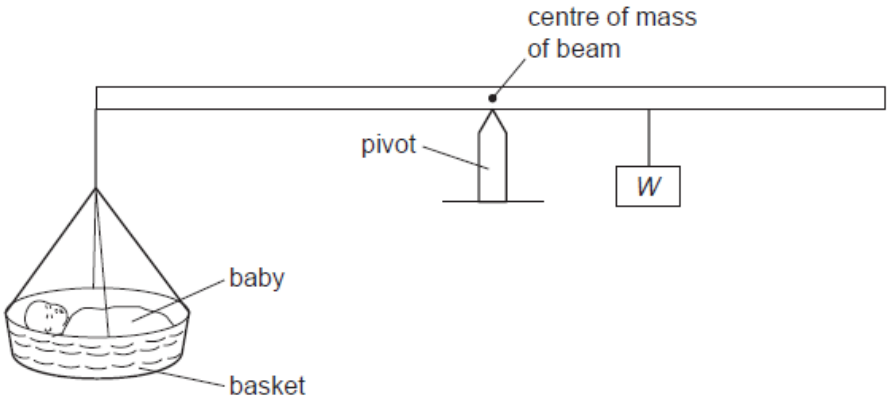
**C** Move the force to the left.

**D** Move the pivot to the left.

12.

The diagram shows a balance being used to find the weight of a baby. The weight of the basket can be ignored.

At equilibrium, the pivot is nearer to the weight *W* than to the baby.




What is the weight of the baby?

**A** less than *W*

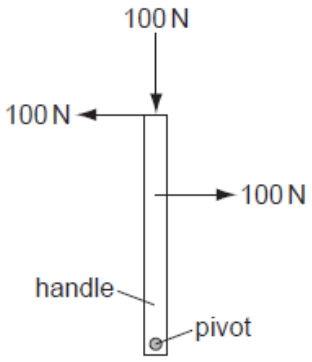
**B** more than *W*

**C** *W*

**D** impossible to tell

13.

The diagram shows a handle with three forces, each 100 N, applied to it. The handle is free to move.




What is the effect of the forces on the handle?

**A** The handle will move downwards.

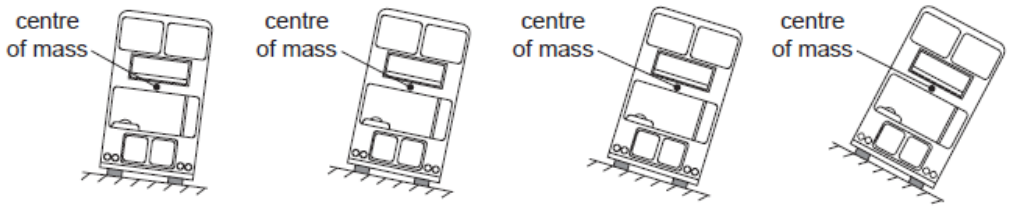
**B** The handle will not move.

**C** The handle will turn anticlockwise (to the left).

**D** The handle will turn clockwise (to the right).

14.

The diagram shows four models of buses placed on different ramps.



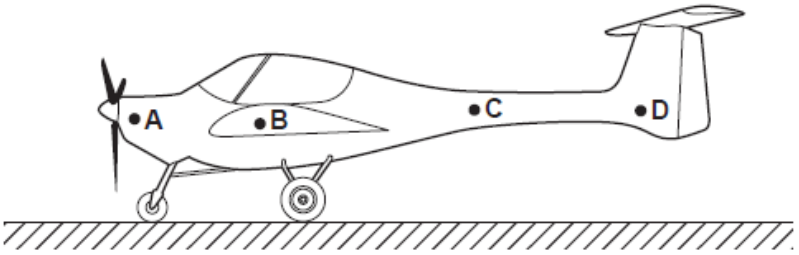

How many of these models will fall over?

**A** 1 **B** 2 **C** 3 **D** 4

15.

A light aircraft stands at rest on the ground. It stands on three wheels, one at the front and two further back.

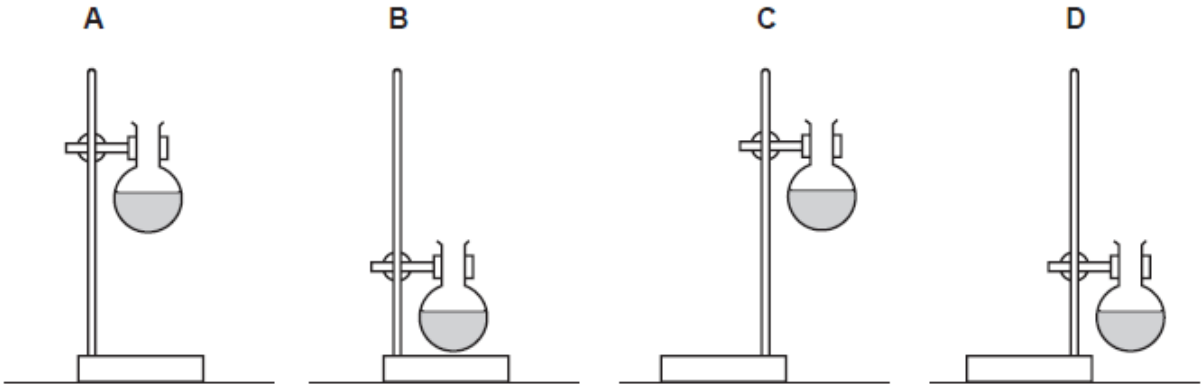
Which point could be its centre of mass?




16 .

A student uses a stand and clamp to hold a flask of liquid.

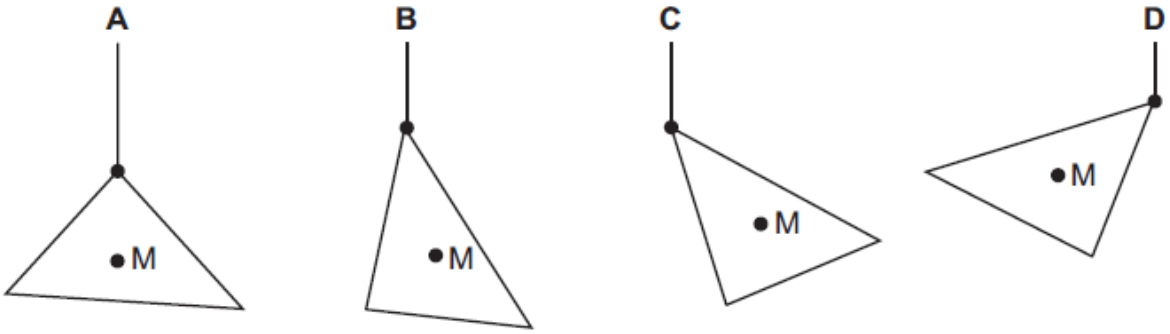
Which diagram shows the most stable arrangement?



17.

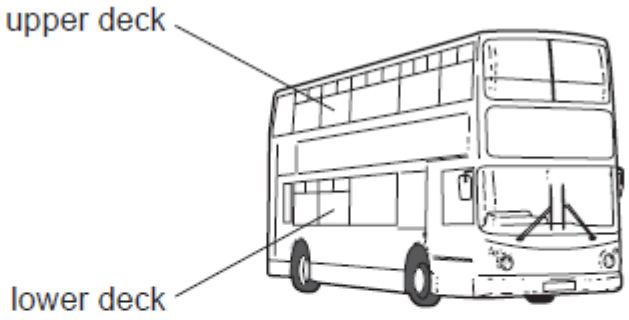
A piece of card has its centre of mass at M.

Which diagram shows how it hangs when suspended by a thread?




18.

Passengers are **not** allowed to stand on the upper deck of double-decker buses.




Why is this?

**A** They would cause the bus to become less stable.

**B** They would cause the bus to slow down.

**C** They would increase the kinetic energy of the bus.

**D** They would lower the centre of mass of the bus.

## Theory Questions

1.

**(a)** The object illustrated in Fig. 4.1 is not in equilibrium. It has a weight of 12 N.

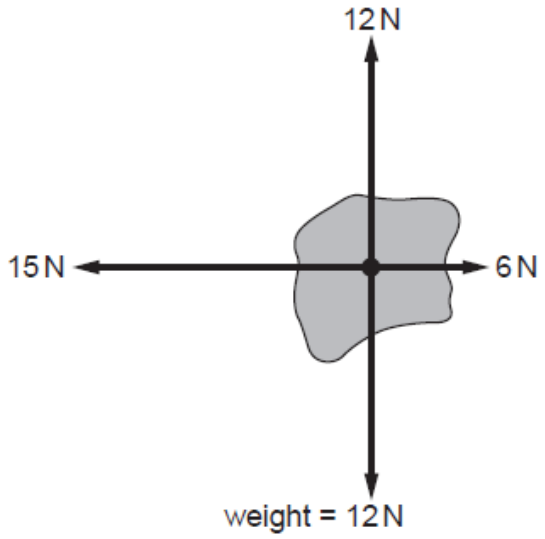



**Fig. 4.1**

**(i)** State what happens to the object.

.....

..... [2]

**(ii)** On Fig. 4.1, draw an arrow to show the extra force necessary to bring the object to a state of equilibrium. Label the arrow with the size of the force. [2]

**(iii)** On Fig. 4.1, show where the centre of mass of the object is situated, using the letter G. [1]

**(b)** Fig. 4.2 shows a car transporter, first unloaded and then loaded with two cars on the upper deck.

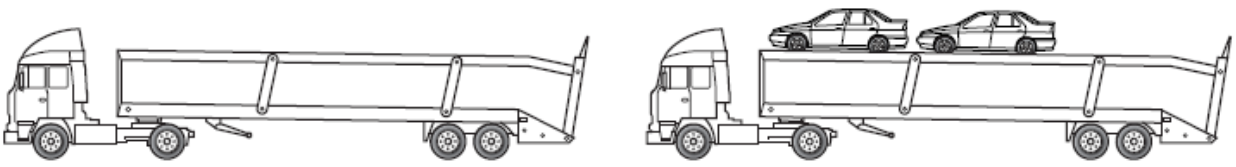


**Fig. 4.2**

**(i)** What happens to the centre of mass of the transporter and its load when the cars are loaded?

Tick one box.

| | |
|---|---|
| rises | ☐ |
| stays at the same height | ☐ |
| falls | ☐ |

[1]

**(ii)** How do the two loaded cars affect the stability of the transporter?

Tick one box.

| | |
|---|---|
| more stable | ☐ |
| no effect | ☐ |
| less stable | ☐ |

[1]

[Total: 7]

2

**(a)** State the two factors on which the turning effect of a force depends.

1. .....

2. ..... [2]

**(b)** Forces $F_1$ and $F_2$ are applied vertically downwards at the ends of a beam resting on a pivot P. The beam has weight $W$. The beam is shown in Fig. 5.1.

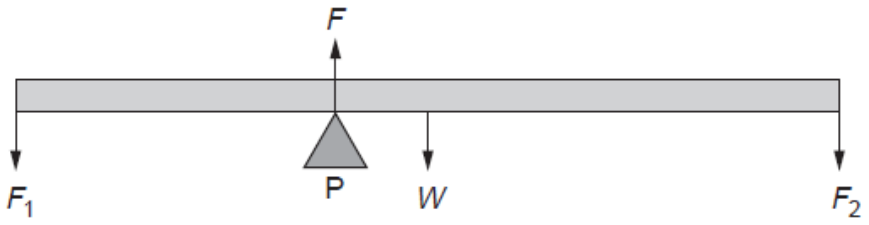



**Fig. 5.1**

**(i)** Complete the statements about the two requirements for the beam to be in equilibrium.

1. There must be no resultant .....

2. There must be no resultant .....

**(ii)** The beam in Fig. 5.1 is in equilibrium. $F$ is the force exerted on the beam by the pivot P.

Complete the following equation about the forces on the beam.

$F$ = .....

**(iii)** Which one of the four forces on the beam does **not** exert a moment about P?

.....

[4]

3. Fig. 2.1 shows a hinged rail in a fence. The rail has to be lifted vertically in order to let people through.

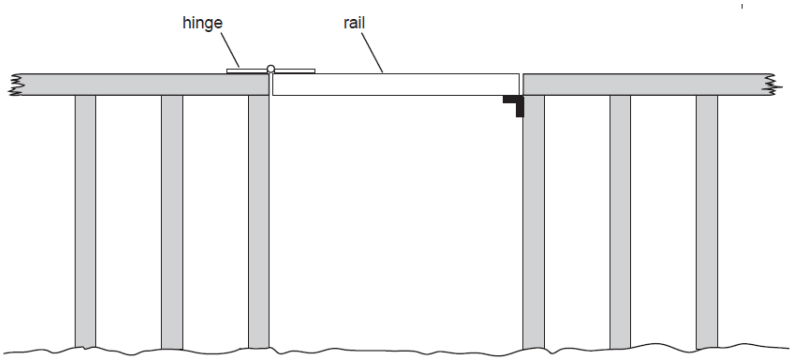



Fig. 2.1

**(a)** On Fig. 2.1, draw an arrow to show the position and direction of the smallest force that would be needed to begin to raise the rail. [3]

**(b)** What is the correct Physics term for the turning effect of a force?

Tick one box.

| | |
|---|---|
| force | ☐ |
| work | ☐ |
| moment | ☐ |
| movement | ☐ |

[1]

**(c)** Suggest one way the designer of the fence could have reduced the force needed to lift the rail.

.....

.....[1]

4.

A student carried out a 'principle of moments' experiment using a metre rule placed on a pivot at the 50.0 cm mark. The aim was to determine an unknown weight. The arrangement of the apparatus is shown in Fig. 3.1.

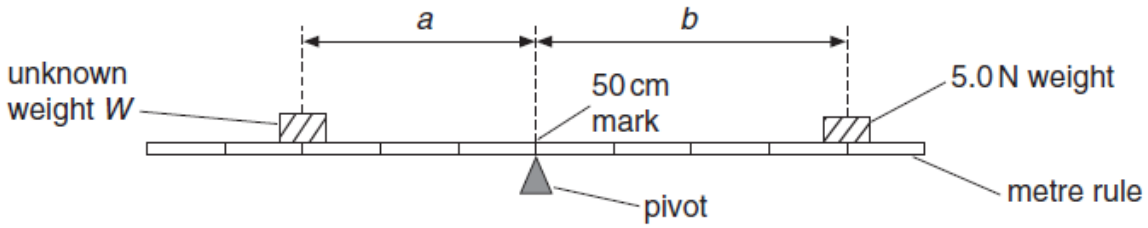


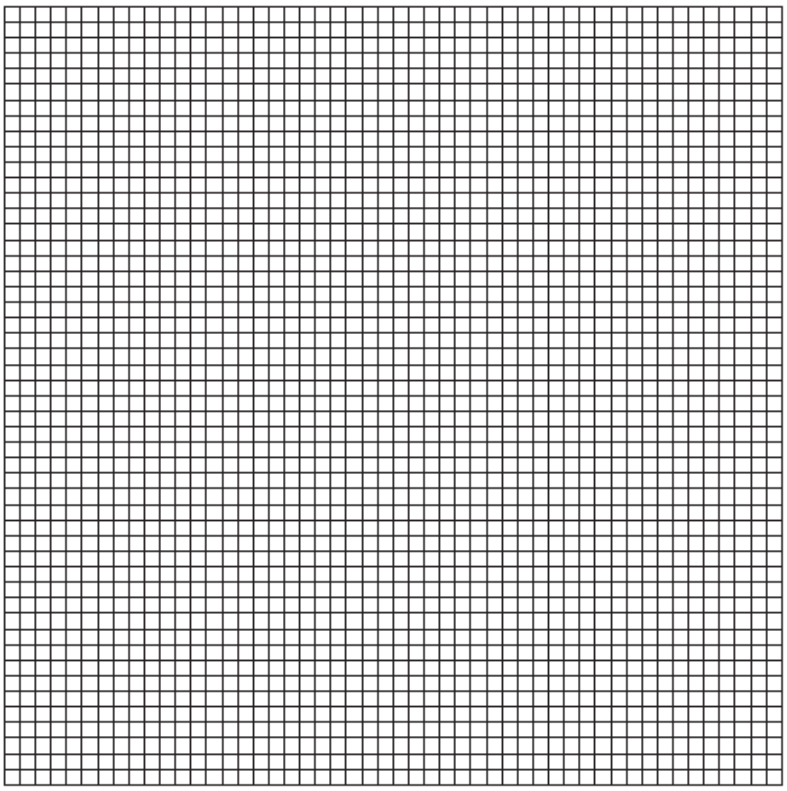

**Fig. 3.1**

The student placed the unknown weight *W* at a convenient distance *a* from the pivot. He found *b*, the distance from the pivot that the 5.0 N weight must be placed so that the rule balanced horizontally. He then repeated the experiment using different values of *a*.
The readings are shown in the table below.

| *a*/m | *b*/m |
|---|---|
| 0.100 | 0.122 |
| 0.200 | 0.238 |
| 0.250 | 0.302 |
| 0.300 | 0.360 |
| 0.350 | 0.435 |
| 0.400 | 0.470 |

**(a)** **(i)** Plot the graph of $b$/m ($y$-axis) against $a$/m ($x$-axis).

**(ii)** Draw the best-fit straight line.



[6]

**(iii)** Determine $G$, the gradient of the line.

$G$ = .....

**(iv)** Determine $W$, the unknown weight, using the equation

$$W = XG$$

where $X$ = 5.0 N.

$W$ = .....

**(v)** Explain why the student could not choose distance *a* to have a value of 0.450 m.

.....

.....[5]

**(b)** Another student, who was performing this experiment, found that the unloaded metre rule balanced on the pivot at the 50.3 cm mark, instead of the 50.0 cm mark.
Suggest what the student should do to obtain the correct value for *W* from the experiment.

.....

.....[1]

5.

**(a)** The block of wood in Fig. 1.1 will balance on a horizontal table.

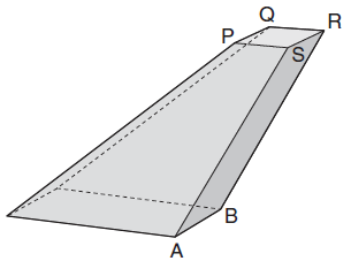



**Fig. 1.1**

If the block is tilted slightly clockwise about AB, it returns to its original position when released.

**(i)** On Fig. 1.1, mark with the letter G where the centre of mass of the block might be.

**(ii)** Small masses are added to the top PQRS of the block until it is just about to topple (fall over). Fig. 1.2 shows a side view of the block.

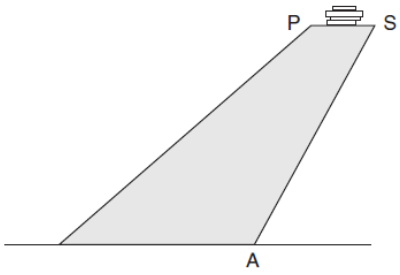



**Fig. 1.2**

On Fig. 1.2, draw a line along which the centre of mass of the arrangement must now lie.

[2]

**(b)** Fig. 1.3 shows two ways of using a laboratory retort stand.

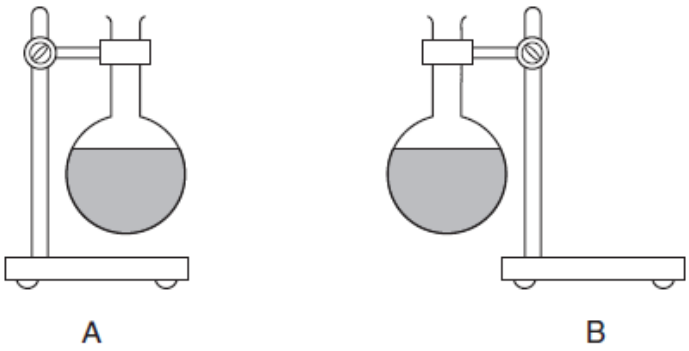



**Fig. 1.3**

Which diagram shows the safer arrangement? .....

Give a reason for your choice.

.....

..... [2]

**(c)** Some office filing cabinets have a mechanism that allows only one drawer to be opened at a time, as shown in Fig. 1.4.

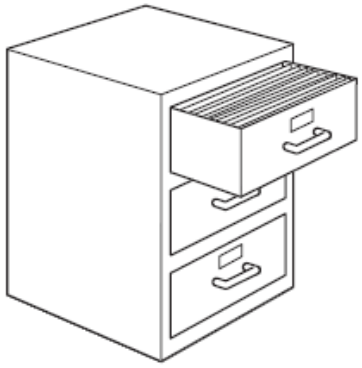


**Fig. 1.4**

Suggest why they have this mechanism.

.....

..... [1]

6.

**(a)** A small pin is fixed to the edge of a bench. A triangular piece of card with a small hole in each corner is hung on the pin from corner A and allowed to settle, as shown in Fig. 12.1. A plumb-line is then hung from the pin and the vertical line AP is marked on the card.

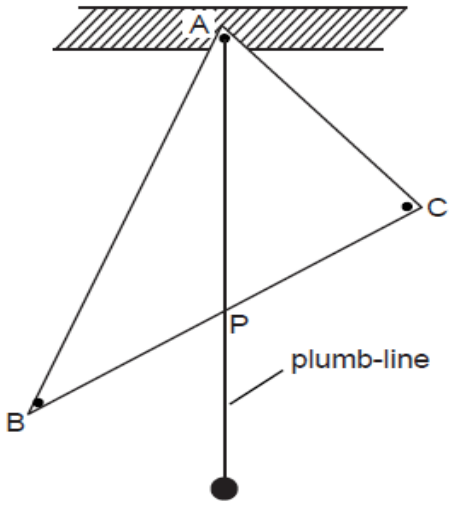



**Fig. 12.1**

This procedure is then repeated with the card hanging from C and the vertical line CQ is marked.
After this, the card is as shown in Fig. 12.2.

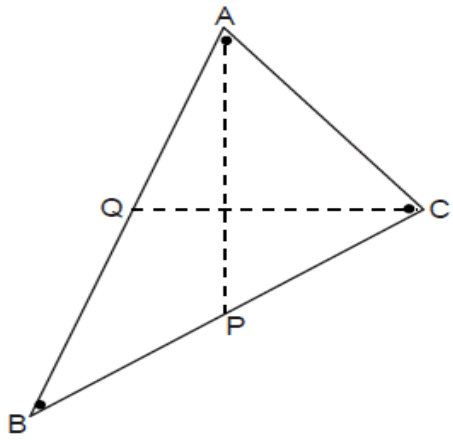



**Fig. 12.2**

On Fig. 12.2,

**(i)** draw the vertical line that would be obtained if the card were hung from B,

**(ii)** clearly mark the centre of mass of the card using a dot labelled G. [2]

**(b)** Fig. 12.3a shows a glass ornament standing on a shelf. Fig. 12.3b shows an identical ornament filled with coloured glass beads.

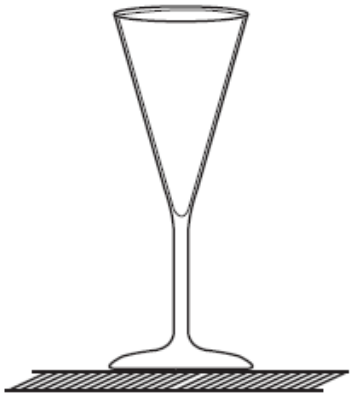


**Fig. 12.3a**

**Fig. 12.3b**

State which ornament is more stable, and why.

.....

.....[2]

**(c)** Fig. 12.4 shows two wooden blocks standing on a hinged board with a rough surface.

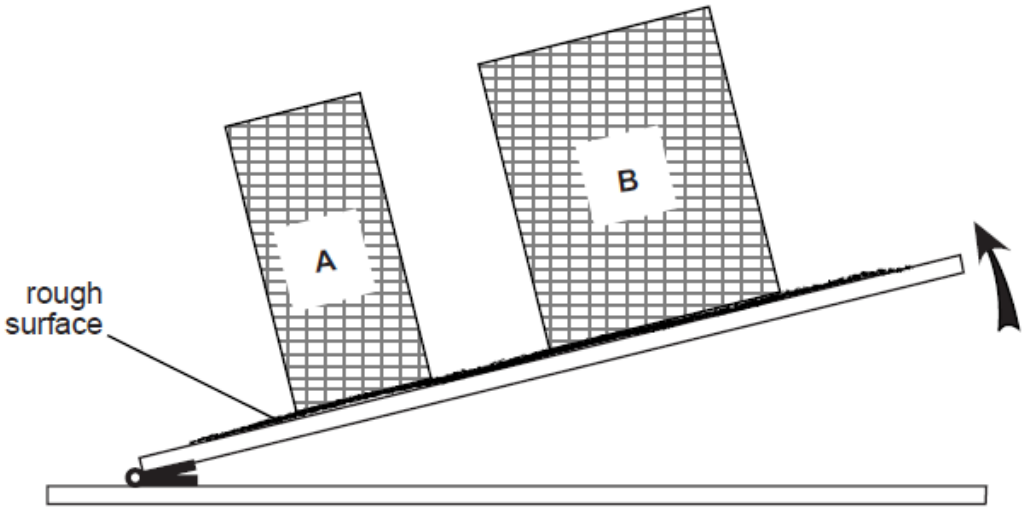



**Fig. 12.4**

The board is slowly tilted. The blocks do not slip. State which block falls over first, and explain why.

.....

.....[2]