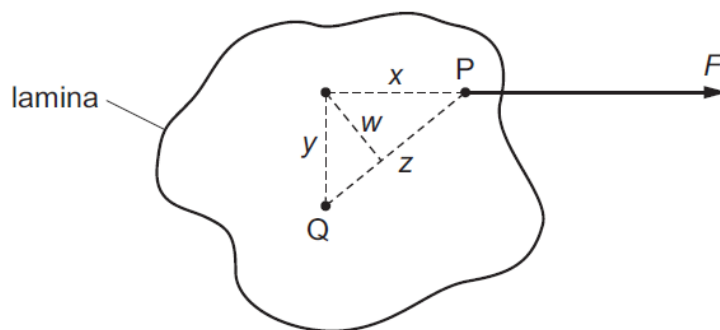


1. Nov/2020/Paper_11/No.10

A length of thread is attached to a lamina at point P, as shown in the diagram.



The lamina is free to rotate about point Q.

The tension in the thread is F .

What is the moment of F about Q?

A Fw

B Fx

C Fy

D Fz

Fig. 3.1 shows a door and an automatic door-closer viewed from above.

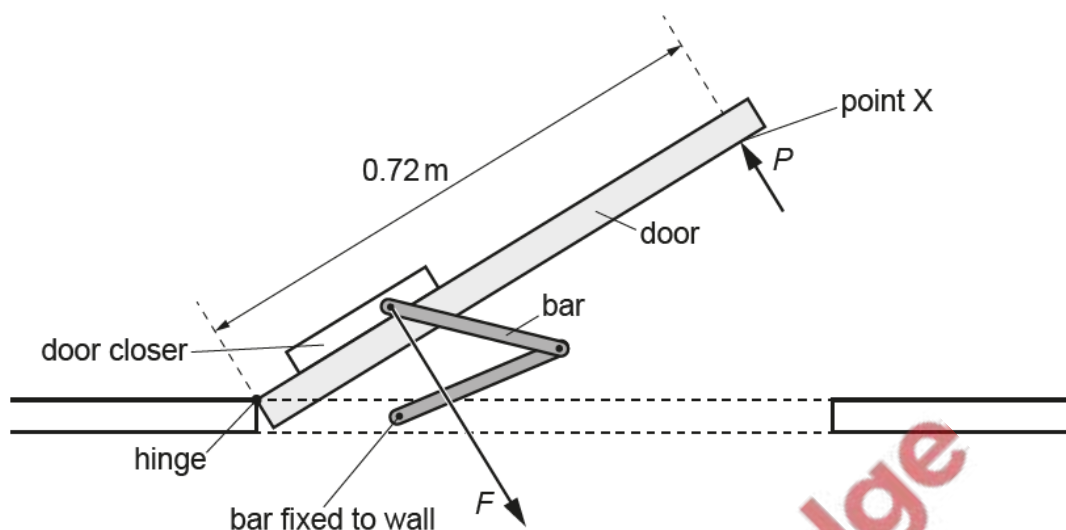


Fig. 3.1

When the door opens and closes, the hinge acts as a pivot.

A girl opens the door by exerting a force P at point X.

Force P is perpendicular to the surface of the door.

- (a) Fig. 3.1 shows that point X is a distance of 0.72 m along the front of the door from the hinge. The force P is 25 N.

- (i) Calculate the moment of force P about the hinge.



moment of force = [2]

- (ii) The door rotates about the hinge by 90° . The circumference of a circle of radius 0.72 m is 4.5 m.

Calculate the work done on the door by force P .

work done = [2]

(b) As the door opens, there is a force F on the door in the direction shown in Fig. 3.1.

Although force F is larger than force P , the door rotates about the hinge.

Explain why.

.....

.....

.....

..... [2]

[Total: 6]

3. Nov/2020/Paper_22/No.1

A glass beaker has a mass of 50 g. A liquid of density 1.8 g/cm^3 is poured into the beaker until it reaches the 200 cm^3 mark.

(a) Calculate the total mass of the beaker and its contents.

mass = [3]

(b) The centre of mass of a metre rule is at the 50 cm mark.

(i) State what is meant by *centre of mass*.

.....

..... [1]

- (ii) The metre rule is placed on a pivot. The tip of the pivot is under the 80 cm mark on the rule.

The beaker with its contents is then placed at different positions along the rule until the rule is balanced.

Fig. 1.1 shows the arrangement with the rule balanced.

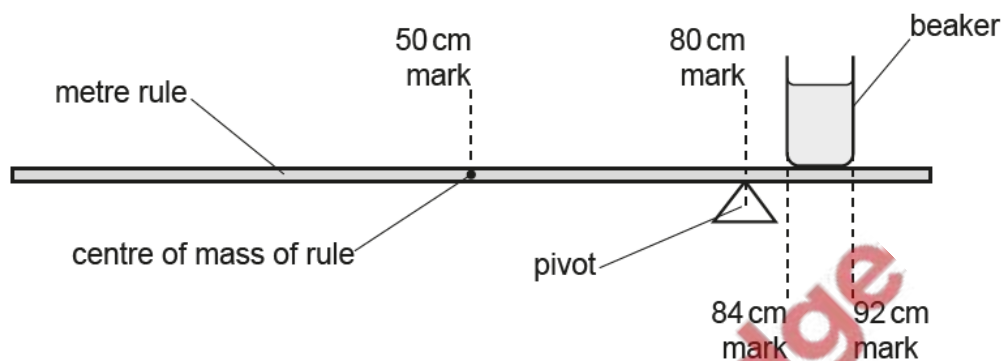


Fig. 1.1

One side of the beaker is at the 84 cm mark and the other side is at the 92 cm mark.

Calculate the mass of the rule.

mass = [3]

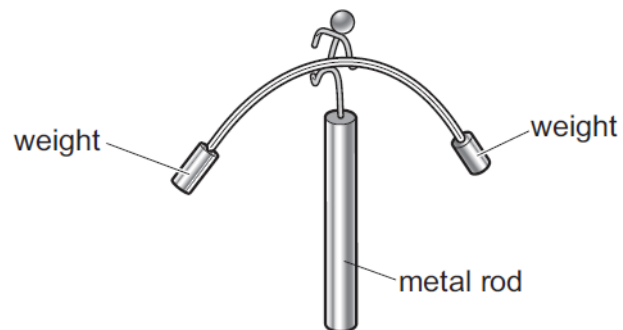
[Total: 7]

4. [June/2020/Paper_12/No.11](#)

Which single item can be used to find the centre of mass of a plane lamina of irregular shape?

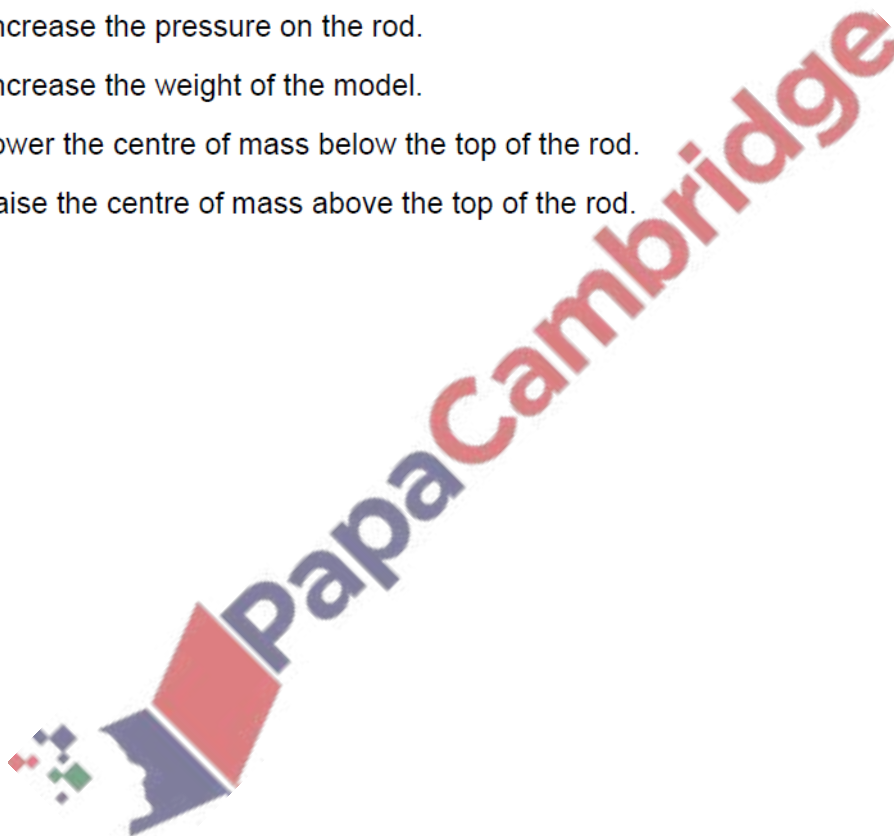
- A a balance
- B a measuring tape
- C a micrometer
- D a vertical pin

A student makes a model toy which balances on the end of a metal rod.



Why are the weights needed?

- A They increase the pressure on the rod.
- B They increase the weight of the model.
- C They lower the centre of mass below the top of the rod.
- D They raise the centre of mass above the top of the rod.



6. June/2020/Paper_21/No.2

A student performs an experiment to mark the centre of mass C on a thin piece of card. There are two holes in the card.

Fig. 2.1 shows the card and two lines that the student draws on the card.

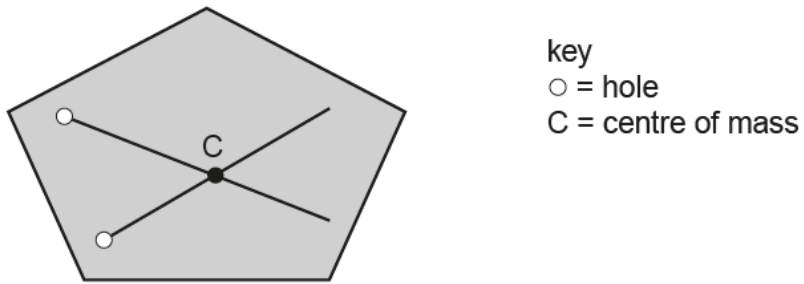
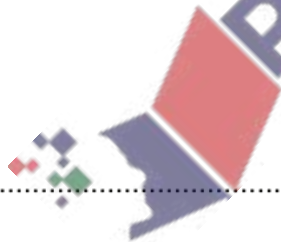


Fig. 2.1

- (a) Describe a method used to draw these two lines in their correct positions on the card.

Make clear what extra apparatus is needed. You may draw a diagram, if you wish.



[3]

- (b) The student holds the card loosely between her fingers. The card is vertical, resting with its lower edge on a bench as shown in Fig. 2.2.

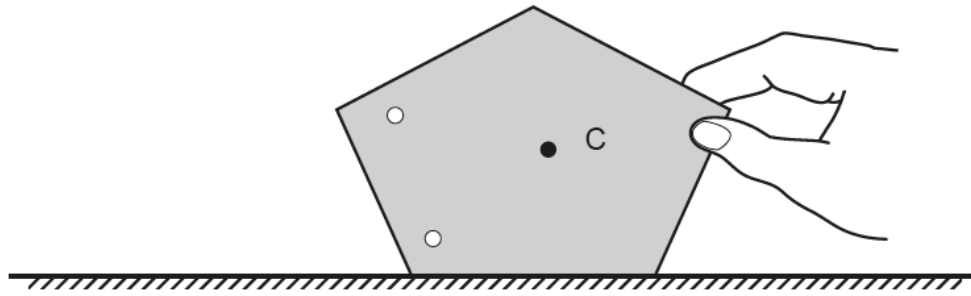


Fig. 2.2

The card is tilted slightly, as shown in Fig. 2.3, and then released.

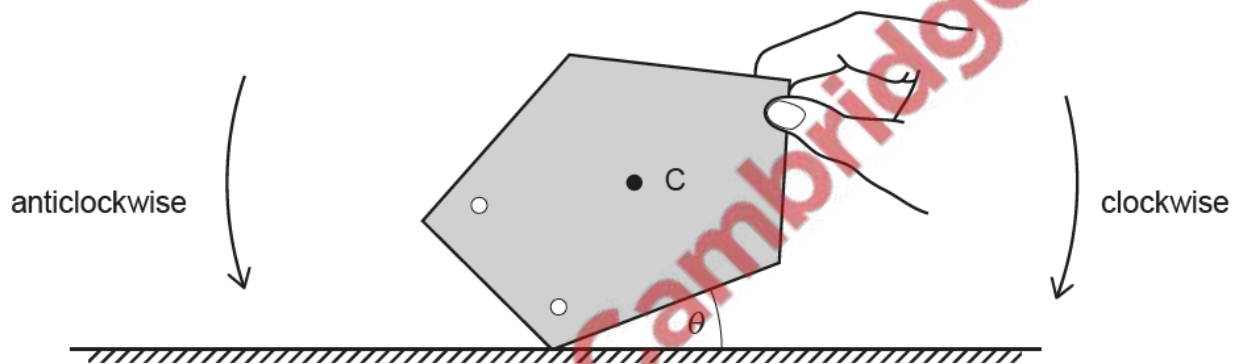


Fig. 2.3

When angle θ is small, the card falls clockwise, back to the position shown in Fig. 2.2.

- (i) Explain why the card falls anticlockwise when θ is large.

.....

.....

.....

..... [2]

- (ii) State one change to the card that makes it more stable.

.....

..... [1]

[Total: 6]

Fig. 3.1 shows part of a hydraulic press that is used to compress waste paper into a brick for burning.

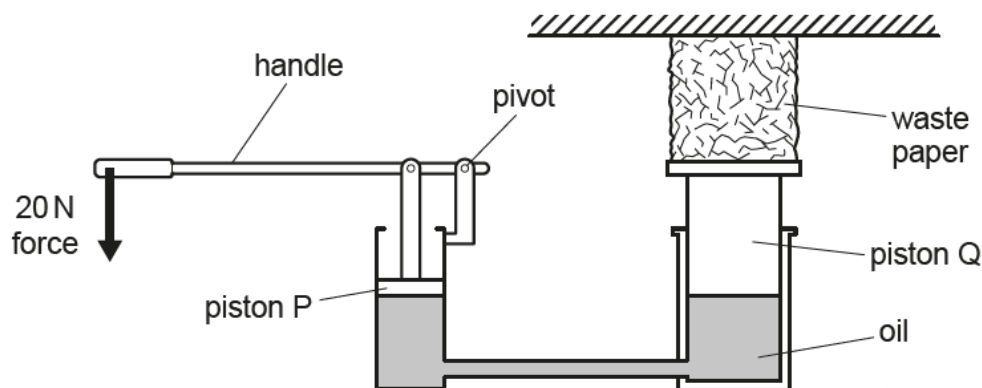


Fig. 3.1

A force of 20 N is exerted downwards on the end of the handle.

(a) The force on the handle creates a moment about the pivot.

(i) Define the *moment of a force*.

.....

.....

.....

..... [2]

(ii) Explain why the force exerted on piston P is greater than the force exerted on the handle.

.....

.....

..... [1]

(b) Explain how the hydraulic press enables a greater force to be exerted on piston Q than is exerted on piston P.

.....

.....

.....

.....

..... [2]