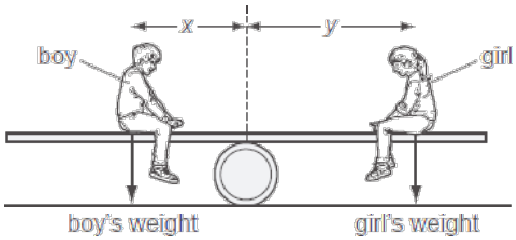
General Physics – Revision 1

MCQ

1. A see-saw is made by resting a long plank of wood with its centre of mass on a barrel.



A boy sits on one side of the barrel and a girl sits on the other side so that the see-saw is balanced.

Which statement **must** be true?

A boy's weight = girl's weight

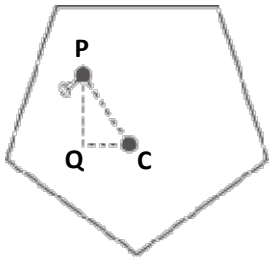
B distance *x* = distance *y*

C total downward force = total moment about the barrel

D resultant force and resultant moment are both zero ( )

2. A plane lamina is freely suspended from point **P**. The weight of the lamina is 2.0 N and the centre of gravity is at **C**.

PC = 0.50 m
PQ = 0.40 m
QC = 0.30 m



The lamina is displaced to the position shown. What is the moment that will cause the lamina to swing?

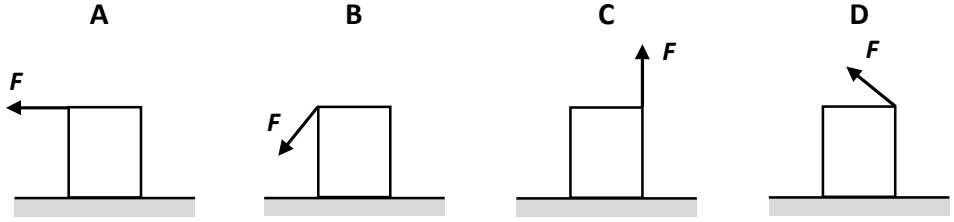
A 0.60 N m clockwise

B 0.80 N m anticlockwise

C 1.0 N m clockwise

D 1.0 N m anticlockwise ( )

3. At which position and angle should a force be applied, so that the **least** amount of force is needed to topple the block?



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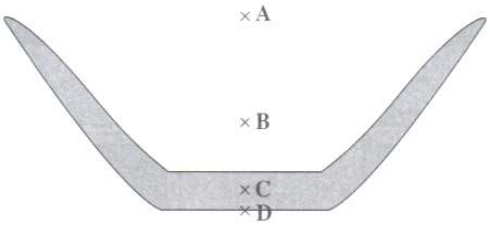
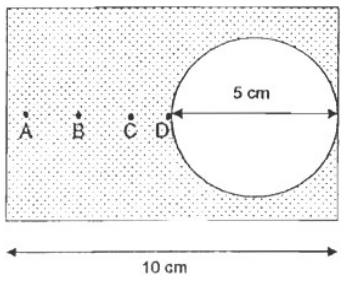
4. The figure shows the cross-section of a steel bowl. The bowl is made from a material that has a uniform density.



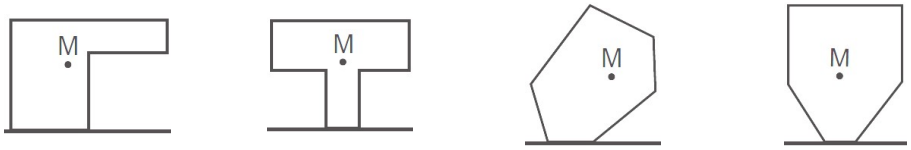
Where is the centre of mass of the bowl most likely to be located? ( )

5. A uniform wooden lamina has a circular hole of diameter 5 cm.



At which point **A**, **B**, **C** or **D** will the centre of gravity be? ( )

6. The diagram shows four objects standing on a flat surface. The centre of mass of each object is marked M. Which object will fall over?



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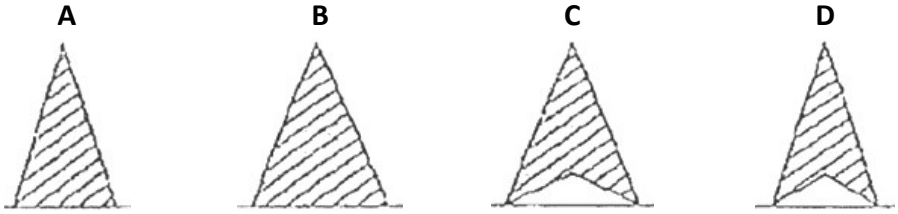
7. The diagram shows four objects standing on a flat surface. Which object is the least stable?



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8. A small electric motor is used to raise a weight of 2.0 N at constant speed through a vertical height of 80 cm in 4.0 s. Assuming that the motor is 100% efficient, what is the electrical power supplied to the motor?

A 0.40 W
B 1.6 W
C 6.4 W
D 40 W ( )

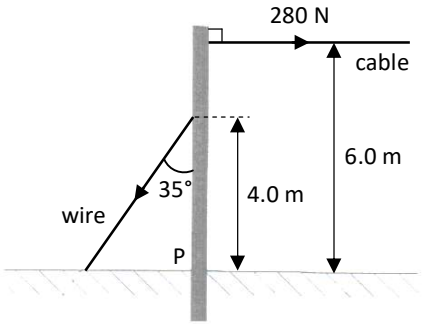
9. A crane uses a petrol engine to lift a heavy girder. What is the overall energy conversion in the system when the girder (building support beam) is moving at a steady rate?

A Chemical into kinetic
B Chemical into potential
C Kinetic into potential
D Potential into kinetic ( )

Structured

1. An electricity cable is attached to a pole at a height of 6.0 m above the ground as shown.

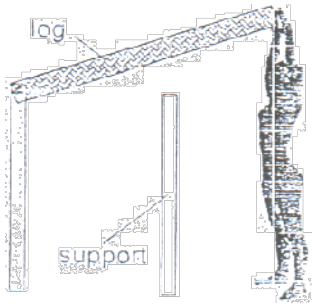
The cable exerts a force of 280 N on the pole at an angle of 90° to the pole. To ensure that there is zero turning moment on the pole itself, a wire under tension is attached to the pole at a height of 4.0 m and it makes an angle of 35° to the pole.



Calculate the tension necessary in the wire. [2]

5

2. As part of a fitness programme, an athlete performs lifts on a uniform wooden log with a mass of 40 kg and a length of 2.4 m. Lifts involve the repeated raising of the athletes arms as shown, raising the log from the support.



Each time she lifts the log, her body is stiff and the centre of gravity of the log is raised by 0.30 m.

(a) Calculate the force exerted by the athlete to raise the log. [2]

(b) Calculate the potential energy gained by the log each time it is raised. [2]

(c) If the athlete's muscles are 80% efficient, determine the energy expended by the athlete to raise the log. [2]

(d) Calculate the power of the muscles if the athlete can perform 50 lifts in a minute. [2]

(e) Without making changes to the equipment and the type of exercise, suggest and explain one way to increase the level of difficulty of the workout. [2]

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10