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AS Mechanics -Forces And Moments Revision

Assignment Questions

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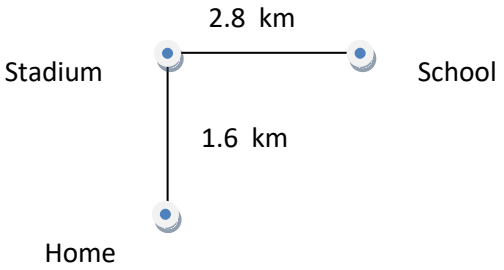
Year 2021

Forces, Equilibrium And Moments:

Q1 : A 3 N force and 4 N force act at right angles to one and another. A third force is applied and now the system is in equilibrium. What is magnitude of third force?

Q2: Fig shows the location of a stadium and school from home.



a) Calculate the distance of school from home.

b) A person standing at home , facing Stadium. He then turns clockwise to face the school. Calculate the size of through which person has turned.

Q3: A small object of weight 8 N is at rest on a rough slope , which is at angle of 45^0 to the horizontal.

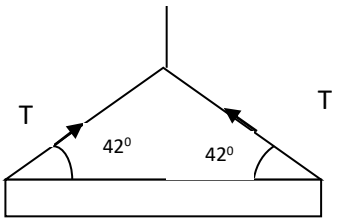
a) Sketch a diagram and show forces acting on the object.

b) Calculate i) the frictional force on the object ii) support force from the slope on the object.

Q4 : Fig shows a uniform steel bar held from a crane. If tension T in each cable is 800 N.

Calculate : i) Horizontal and vertical components of the tension in each cable.

ii) The weight of the steel bar.



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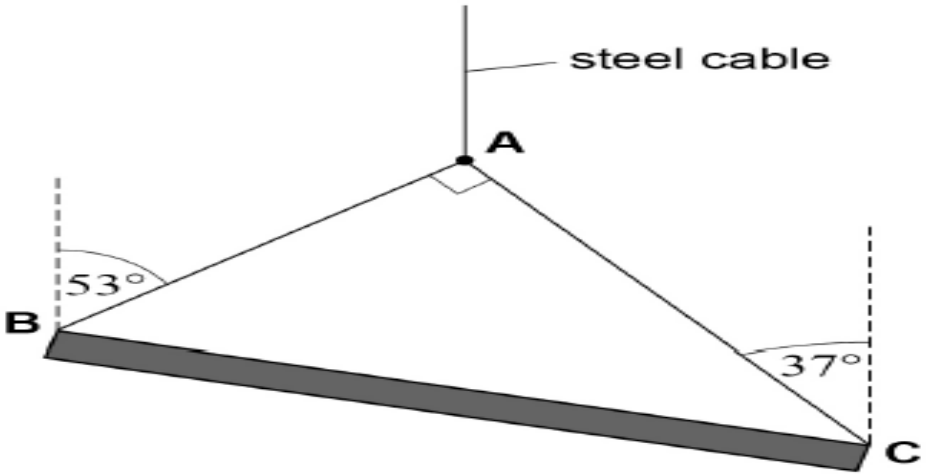
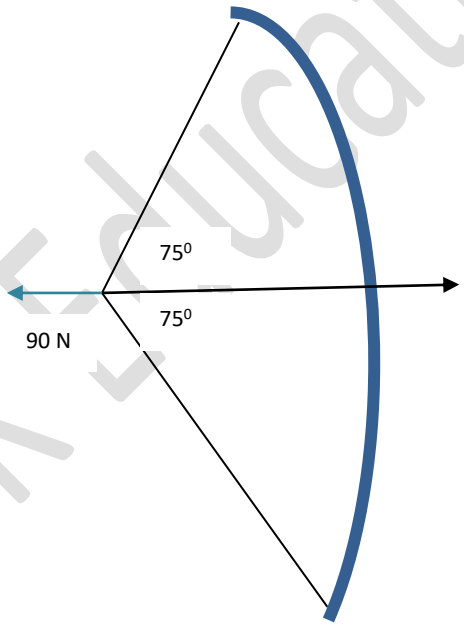
Q 5: Figure shows a uniform beam supported by two light cables, **AB** and **AC**, which are attached to a single steel cable from a crane. The beam is stationary and in equilibrium.



The weight of the beam is $12\ 000\ \mathrm{N}$ .Calculate the tension T_1 in cable **AB** and the tension T_2 in cable **AC**.

Q6: An archer pulled a bowstring back until the two halves of the string are at 150^0 to each other as shown in figure, If the force needed to hold string in the position was 90 N. Calculate the tension in each part of the bowstring in this position.



Q 7:The diagram shows a uniform metre ruler of weight 1.5 N pivoted 15 cm from one end for use as a simple balance.

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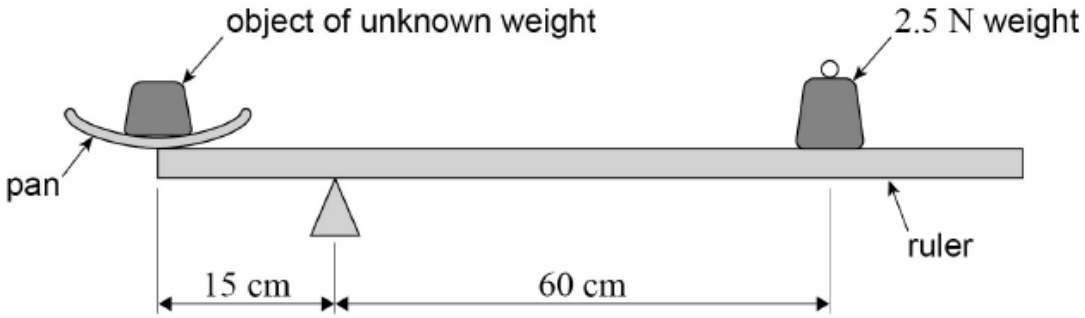
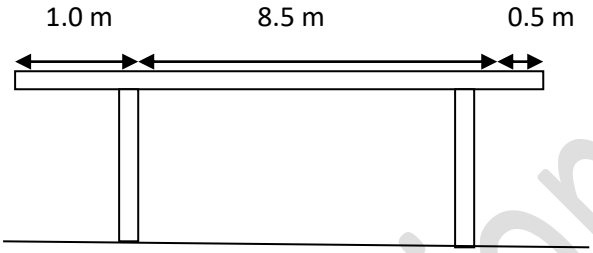


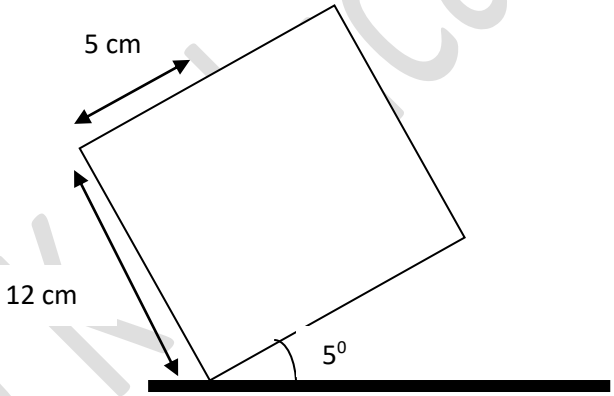
A scale pan of weight 0.5 N is placed at the end of the ruler and an object of unknown weight is placed in the pan. The ruler moves to a steady horizontal position when a weight of 2.5 N is added at a distance of 60 cm from the pivot as shown. What is the weight of the object?

Q 8: A uniform beam of weight 620 N and of length 10m rests horizontally on top of two brick walls 8.5m apart as shown in figure.

Calculate the support force of each wall on beam.



Q 9: A box is pushed so that it tilts at angle of 5^0 from the horizontal , as shown in figure.



a) State what is meant by centre of mass.

b) If pushing force is removed the box will fallen back on its base. Using the idea of moments and centre of mass , explain why box not topple over.

c) By looking at dimensions of the box given , calculate the maximum angle from the horizontal that the box can be pushed before it topples over.

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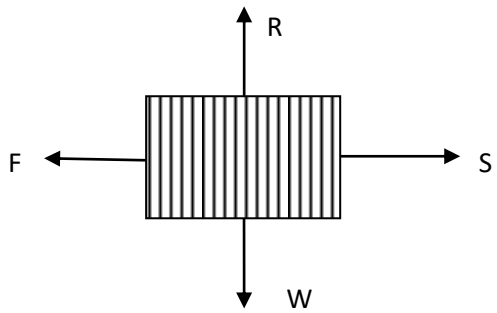
Q10: These are the forces which acted upon a box



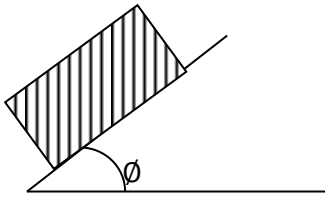
Where R is reaction force , W is weight , F is frictional force and S is sliding force

F_{max} is the maximum value of friction after which the object start sliding as sliding force becomes more than friction.

F_{max} is proportional to R and the constant of proportionality between them is μ known as the coefficient of friction.

$F_{max} = \mu \times R$

Wooden crate is now placed on a slope inclined at angle Ø as shown

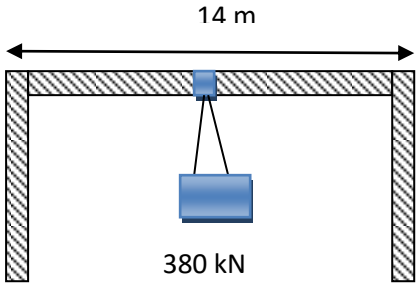


a) Write down the blocks weight component parallel to slope.

b) The slope is increased to a critical angle , such that crate is on verge of sliding. Show that

$$\tan \emptyset = \mu$$

Q11 : A bridge crane used at a freight depot consists of a horizontal span of length 14 m fixed at each end to a vertical pillar as shown in figure. When the bridge crane supports a load of 380 kN at its centre , a force of 1600 kN is exerted on each pillar. Calculate the weight of the horizontal span.



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