InkMaths

QUESTION WORKBOOK

Equilibrium, suspension, toppling and sliding

Further Mechanics 2 · Year FM

6 questions · 22 marks

PRINT EDITION

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SECTION A · Warm-up

A1 State where the centre of mass lies when a body is suspended freely, and why. [2]

A2 A lamina has its centre of mass 2 units horizontally and 3 units vertically from the corner it is hung from. Find the angle the vertical edge makes with the vertical. [3]

SECTION B · Standard

B1 A uniform block 0.5 m wide and 1.2 m tall stands on a rough plane with coefficient of friction 0.5. The plane is slowly tilted. Find whether it topples or slides, and at what angle. [4]

B2 A uniform block 0.5 m wide and 1.2 m tall stands on a rough plane which is slowly tilted. Find the coefficient of friction for which toppling and sliding would happen at the same angle, and state what happens for coefficients above and below that value. [4]

B3 Explain why the toppling condition is about the line of the weight rather than the height of the centre of mass. [3]

SECTION C · Stretch

C1 A uniform block of weight 200 N stands on rough horizontal ground. Its base is a square of side 0.6 m and its height is 1.0 m, and the coefficient of friction between the block and the ground is 0.4. A horizontal force P is applied at the middle of the top edge and slowly increased. Determine whether the block slides or topples first, and find the value of P at which it does so. [6]