InkMaths

QUESTION WORKBOOK

Oblique impact and impact with a smooth surface

Further Mechanics 1 · Year FM

7 questions · 27 marks

NAVY SCREEN EDITION

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SECTION A · Warm-up

A1 State what happens to each component of a ball's velocity when it strikes a smooth plane surface, and why. [2]

A2 A ball moving at 12 m/s strikes a smooth wall at 40° to the wall, with e = 0.6. Find the speed immediately afterwards. [3]

SECTION B · Standard

B1 A ball moving at 12 m/s strikes a smooth wall at 40° to the wall, with e = 0.6. Find the angle its path makes with the wall afterwards, and the percentage of kinetic energy lost. [4]

B2 A ball strikes a smooth wall at 45° to the wall and leaves at 30° to it. Find the coefficient of restitution. [4]

B3 Explain why the angle to a smooth surface always decreases in an oblique impact unless e = 1. [2]

B4 A ball moving in a horizontal plane strikes a smooth vertical wall, then a second smooth vertical wall at right angles to the first, with the same coefficient e at each. Show that it ends up moving in exactly the opposite direction to its original one. [4]

SECTION C · Stretch

C1 Two smooth spheres A and B of equal mass and equal radius lie on a smooth horizontal table. B is at rest, and A is moving at 6 m/s in a direction making an angle of 30° with the line of centres at the moment of impact. The coefficient of restitution between them is 0.5. Find the speed and direction of each sphere after the impact, and the fraction of the kinetic energy lost. [8]