



QUESTION WORKBOOK

Oblique impact and impact with a smooth surface

Further Mechanics 1 · Year FM

7 questions · 27 marks

PRINT EDITION

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]