



QUESTION WORKBOOK

Successive impacts and impacts with a wall

Further Mechanics 1 · Year FM

7 questions · 29 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** Explain why momentum is not conserved when a ball bounces off the floor, and say what does apply. [2]

- A2** A ball is dropped from 3 m onto a floor with $e = 0.7$. Find the height of the first rebound. [3]

SECTION B · Standard

- B1** A ball is dropped from a height h onto a floor with coefficient of restitution e . Prove that the total distance it travels before coming to rest is $h(1 + e^2)/(1 - e^2)$. [4]

- B2** A ball is dropped from 3 m onto a floor with $e = 0.7$. Find the total distance it travels before coming to rest. [4]

- B3** Sphere A of mass 2 kg moving at 6 m/s strikes stationary sphere B of mass 1 kg with coefficient of restitution 0.5. B then hits a wall at right angles and rebounds with coefficient of restitution $1/3$. Show that A and B collide again. [5]

- B4** A ball strikes a floor at 7 m/s and rebounds to a height of 0.9 m. Find the coefficient of restitution, taking $g = 9.8 \text{ m/s}^2$. [3]

SECTION C · Stretch

- C1** Three smooth spheres A, B and C, of masses $3m$, m and $2m$, lie at rest in that order in a straight line on a smooth horizontal table. A is projected directly towards B with speed u . The coefficient of restitution is $1/2$ at every impact. Find the velocity of each sphere after A has struck B and B has struck C, and determine whether A strikes B a second time. [8]