

Cambridge International AS & A Level

<https://babacambridgesolutions.com>

Mathematics 9709/42

Paper 4 Mechanics October/November 2020

Question No (1)

1 Two particles P and Q , of masses 0.2 kg and 0.5 kg respectively, are at rest on a smooth horizontal plane. P is projected towards Q with speed 2 m s^{-1} .

(a) Write down the momentum of P .

(b) After the collision P continues to move in the same direction with speed 0.3 m s^{-1} .

Find the speed of Q after the collision.

Solution:

Given for
particle P

$$m = 0.2 \text{ kg}$$

$$v = 2 \text{ m/s}$$

$$u_p = 2 \text{ m/s} \quad u_q = 0$$

$$0.2 \text{ kg}$$

$$0.5 \text{ kg}$$

$$\text{Momentum} = mv$$

$$= (0.2)(2)$$

$$= 0.4 \text{ kg m/s}$$

(b)

Given

$$m_p = 0.2 \text{ kg}, \quad m_q = 0.5 \text{ kg}$$

before collision $u_p = 2 \text{ m/s}, \quad u_q = 0 \text{ m/s}$ (at rest)

after collision $v_p = 0.2 \text{ m/s}, \quad v_q = ?$

using law of conservation of momentum

$$m_p u_p + m_q u_q = m_p v_p + m_q v_q$$

$$\Rightarrow (0.2)(2) + (0.5)(0) = (0.2)(0.2) + (0.5) v_q$$

$$0.4 + 0 = 0.08 + 0.5 v_q$$

$$0.5 v_q = 0.34$$

$$\Rightarrow v_q = \frac{0.34}{0.5} = 0.68 \text{ m/s}$$

$$\Rightarrow v_q = 0.68 \text{ m/s}$$

