

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

8 Momentum

Exercise B, Question 2

Question:

Particle A has mass 2 kg and velocity $\begin{bmatrix} 6 \\ -2 \end{bmatrix} \text{ m s}^{-1}$ when it collides with particle B , which has mass 3 kg and velocity $\begin{bmatrix} 10 \\ 8 \end{bmatrix} \text{ m s}^{-1}$. After the collision the particles move together. Find the velocity of the combined particles after the collision.

Solution:

The combined particles have mass 5 kg and travel with final velocity \mathbf{v} .
Using conservation of momentum

$$2 \begin{bmatrix} 6 \\ -2 \end{bmatrix} + 3 \begin{bmatrix} 10 \\ 8 \end{bmatrix} = 5\mathbf{v}$$

$$\begin{bmatrix} 12 \\ -4 \end{bmatrix} + \begin{bmatrix} 30 \\ 24 \end{bmatrix} = 5\mathbf{v}$$

$$5\mathbf{v} = \begin{bmatrix} 42 \\ 20 \end{bmatrix}$$

$$\therefore \mathbf{v} = \begin{bmatrix} 8.4 \\ 4 \end{bmatrix} \text{ m s}^{-1}$$