

Momentum and collisions – AS Further Mathematics Mechanics1. [June/2022/Paper_7366/02/No.2](#)

Two particles of equal mass are moving on a horizontal surface when they collide.

Immediately before the collision, their velocities are $\begin{bmatrix} 2 \\ 4 \end{bmatrix} \text{ m s}^{-1}$ and $\begin{bmatrix} 6 \\ -2 \end{bmatrix} \text{ m s}^{-1}$

As a result of the collision the particles coalesce to become a single particle.

Find the velocity of the single particle, immediately after the collision.

Circle your answer.

[1 mark]

$$\begin{bmatrix} 4 \\ 1 \end{bmatrix} \text{ m s}^{-1}$$

$$\begin{bmatrix} 4 \\ 3 \end{bmatrix} \text{ m s}^{-1}$$

$$\begin{bmatrix} 8 \\ 2 \end{bmatrix} \text{ m s}^{-1}$$

$$\begin{bmatrix} 8 \\ 6 \end{bmatrix} \text{ m s}^{-1}$$

2. June/2022/Paper_7366/02/No.6

An ice hockey puck, of mass 0.2 kg, is moving in a straight line on a horizontal ice rink under the action of a single force which acts in the direction of motion.

At time t seconds, the force has magnitude $(2t + 3)$ newtons.

The force acts on the puck from $t = 0$ to $t = T$

- (a) Show that the magnitude of the impulse of the force is $aT^2 + bT$, where a and b are integers to be found.

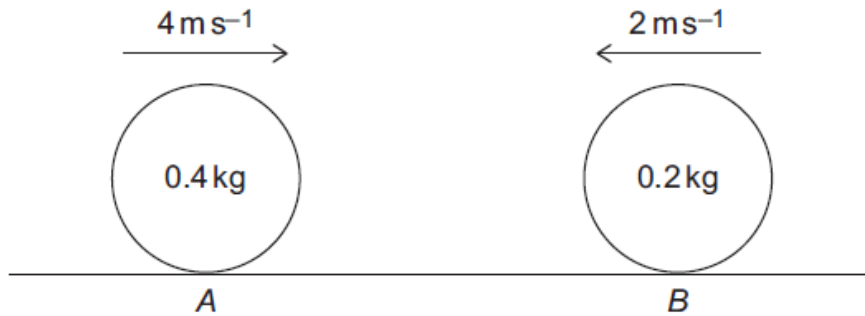
[3 marks]

3. June/2022/Paper_7366/02/No.7

The particles A and B are moving on a smooth horizontal surface directly towards each other.

Particle A has mass 0.4 kg and particle B has mass 0.2 kg

Particle A has speed 4 ms^{-1} and particle B has speed 2 ms^{-1} when they collide, as shown in the diagram below.



The coefficient of restitution between the particles is e

- (a) Find the magnitude of the total momentum of the particles before the collision.

[2 marks]
