



FM1 (Year 2) – Momentum As A Vector Exam Questions (Edexcel)

Q1.

A ball of mass 0.4 kg is moving in a horizontal plane when it is struck by a bat. The bat exerts an impulse $(-5\mathbf{i} + 3\mathbf{j})$ N s on the ball. Immediately after receiving the impulse the ball has velocity $(12\mathbf{i} + 15\mathbf{j})$ m s⁻¹.

Find

(a) the speed of the ball immediately before the impact,

(4)

(b) the size of the angle through which the direction of motion of the ball is deflected by the impact.

(3)

(Total 7 marks)

(Q02 6678/01/R, June 2014)

Q2.

A particle of mass 2 kg is moving with velocity $(5\mathbf{i} + \mathbf{j})$ m s⁻¹ when it receives an impulse of $(-6\mathbf{i} + 8\mathbf{j})$ N s. Find the kinetic energy of the particle immediately after receiving the impulse.

(5)

(Total 5 marks)

(Q01 6678/01, Jan 2011)

Q3.

A particle P of mass 0.4 kg is moving with velocity $7\mathbf{i}$ ms⁻¹ when it receives an impulse of magnitude $\sqrt{1.6}$ N s.

The velocity of P immediately after it receives the impulse is $\lambda(2\mathbf{i} + \mathbf{j})$ ms⁻¹, where λ is a constant.

Find the two possible values of λ

(6)

(Total for question = 6 marks)

(Q03 9FM0/03C, June 2025)

Q4.

A particle P has mass 0.5 kg. It is moving in the xy plane with velocity $8\mathbf{i}$ m s⁻¹ when it receives an impulse $\lambda(-\mathbf{i} + \mathbf{j})$ N s, where λ is a positive constant.

The angle between the direction of motion of P immediately before receiving the impulse and the direction of motion of P immediately after receiving the impulse is θ°

Immediately after receiving the impulse, P is moving with speed $4\sqrt{10}$ m s⁻¹

Find (i) the value of λ

(ii) the value of θ

(8)

(Total for question = 8 marks)

(Q04 9FM0/03C, Oct 2021)



Q5.

A particle P of mass 0.5 kg is moving with velocity $(4\mathbf{i} + 3\mathbf{j})$ m s⁻¹ when it receives an impulse \mathbf{J} N s. Immediately after receiving the impulse, P is moving with velocity $(-\mathbf{i} + 6\mathbf{j})$ m s⁻¹.

(a) Find the magnitude of \mathbf{J} .

(4)

The angle between the direction of the impulse and the direction of motion of P immediately before receiving the impulse is α°

(b) Find the value of α

(3)

(Total for question = 7 marks)

(Q01 9FM0/03C, Oct 2020)

Q6.

A particle P , of mass 0.5 kg, is moving with velocity $(4\mathbf{i} + 4\mathbf{j})$ m s⁻¹ when it receives an impulse \mathbf{I} of magnitude 2.5 Ns.

As a result of the impulse, the direction of motion of P is deflected through an angle of 45°

Given that $\mathbf{I} = (\lambda\mathbf{i} + \mu\mathbf{j})$ Ns, find all the possible pairs of values of λ and μ .

(Total for question = 9 marks)

(Q03 9FM0/03C, June 2019)

Q7.

A particle of mass 0.25 kg is moving with velocity $(3\mathbf{i} + 7\mathbf{j})$ m s⁻¹ when it receives the impulse $(5\mathbf{i} - 3\mathbf{j})$ N s.

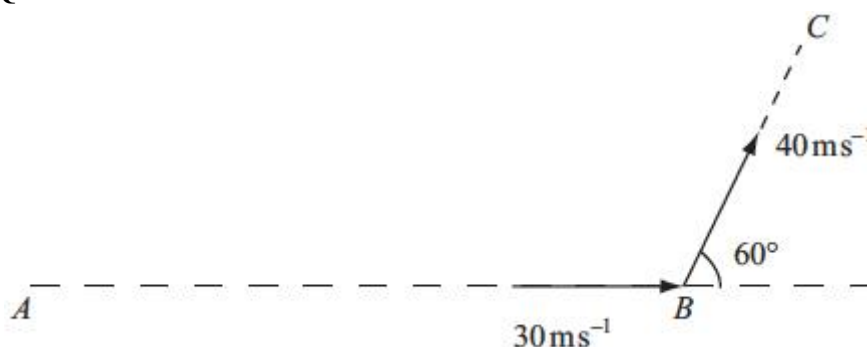
Find the speed of the particle immediately after the impulse.

(5)

(Total 5 marks)

(Q01 6678/01, June 2009)

Q8.



The points A , B and C lie in a horizontal plane. A batsman strikes a ball of mass 0.25 kg. Immediately before being struck, the ball is moving along the horizontal line AB with speed 30 m s⁻¹. Immediately after being struck, the ball moves along the horizontal line BC with speed 40 m s⁻¹. The line BC makes an angle of 60° with the original direction of motion AB , as shown in Figure 1.

Find, to 3 significant figures,

(i) the magnitude of the impulse given to the ball,

(ii) the size of the angle that the direction of this impulse makes with the original direction of motion AB .

(8)

(Total 8 marks)



Q9.

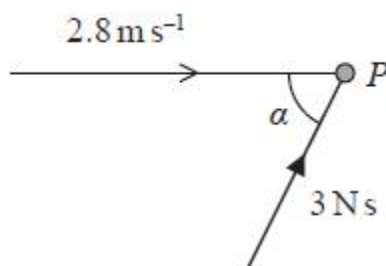


Figure 2

A particle P of mass 0.5 kg is moving in a straight line with speed 2.8 m s^{-1} when it receives an impulse of magnitude 3 N s .

The angle between the direction of motion of P immediately before receiving the impulse and the line of action of the

impulse is α , where $\tan \alpha = \frac{4}{3}$, as shown in Figure 2.

Find the speed of P immediately after receiving the impulse.

(Total for question = 5 marks)

(Q03 9FM0/03C, June 2022)