

2. Two particles  $A$  and  $B$ , of mass  $3\text{ kg}$  and  $2\text{ kg}$  respectively, are moving in the same direction on a smooth horizontal table when they collide directly. Immediately before the collision, the speed of  $A$  is  $4\text{ m s}^{-1}$  and the speed of  $B$  is  $1.5\text{ m s}^{-1}$ . In the collision, the particles join to form a single particle  $C$ .

(a) Find the speed of  $C$  immediately after the collision.

(3)

Two particles  $P$  and  $Q$  have mass  $3\text{ kg}$  and  $m\text{ kg}$  respectively. They are moving towards each other in opposite directions on a smooth horizontal table. Each particle has speed  $4\text{ m s}^{-1}$ , when they collide directly. In this collision, the direction of motion of each particle is reversed. The speed of  $P$  immediately after the collision is  $2\text{ m s}^{-1}$  and the speed of  $Q$  is  $1\text{ m s}^{-1}$ .

(b) Find

(i) the value of  $m$ ,

(3)

(ii) the magnitude of the impulse exerted on  $Q$  in the collision.

(2)

JAN 2006



4. A particle  $P$  of mass  $0.3 \text{ kg}$  is moving with speed  $u \text{ m s}^{-1}$  in a straight line on a smooth horizontal table. The particle  $P$  collides directly with a particle  $Q$  of mass  $0.6 \text{ kg}$ , which is at rest on the table. Immediately after the particles collide,  $P$  has speed  $2 \text{ m s}^{-1}$  and  $Q$  has speed  $5 \text{ m s}^{-1}$ . The direction of motion of  $P$  is reversed by the collision. Find

(a) the value of  $u$ ,

(4)

(b) the magnitude of the impulse exerted by  $P$  on  $Q$ .

(2)

Immediately after the collision, a constant force of magnitude  $R$  newtons is applied to  $Q$  in the direction directly opposite to the direction of motion of  $Q$ . As a result  $Q$  is brought to rest in  $1.5 \text{ s}$ .

(c) Find the value of  $R$ .

(4)









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1. Two particles  $B$  and  $C$  have mass  $m$  kg and 3 kg respectively. They are moving towards each other in opposite directions on a smooth horizontal table. The two particles collide directly. Immediately before the collision, the speed of  $B$  is  $4 \text{ m s}^{-1}$  and the speed of  $C$  is  $2 \text{ m s}^{-1}$ . In the collision the direction of motion of  $C$  is reversed and the direction of motion of  $B$  is unchanged. Immediately after the collision, the speed of  $B$  is  $1 \text{ m s}^{-1}$  and the speed of  $C$  is  $3 \text{ m s}^{-1}$ .

(a) the value of  $m$ ,

(3)

- (b) the magnitude of the impulse received by C.

(2)

- Modelling the trucks as particles, find

- (2)

- (3)



JUNE 2006

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2. Two particles  $A$  and  $B$  have mass  $0.4\text{ kg}$  and  $0.3\text{ kg}$  respectively. They are moving in opposite directions on a smooth horizontal table and collide directly. Immediately before the collision, the speed of  $A$  is  $6\text{ m s}^{-1}$  and the speed of  $B$  is  $2\text{ m s}^{-1}$ . As a result of the collision, the direction of motion of  $B$  is reversed and its speed immediately after the collision is  $3\text{ m s}^{-1}$ . Find

- (a) the speed of  $A$  immediately after the collision, stating clearly whether the direction of motion of  $A$  is changed by the collision,

(4)

- (b) the magnitude of the impulse exerted on  $B$  in the collision, stating clearly the units in which your answer is given.

(3)



N 2 2 3 3 1 A 0 4 1 6



2. Two particles  $A$  and  $B$ , of mass  $0.3\text{ kg}$  and  $m\text{ kg}$  respectively, are moving in opposite directions along the same straight horizontal line so that the particles collide directly. Immediately before the collision, the speeds of  $A$  and  $B$  are  $8\text{ m s}^{-1}$  and  $4\text{ m s}^{-1}$  respectively. In the collision the direction of motion of each particle is reversed and, immediately after the collision, the speed of each particle is  $2\text{ m s}^{-1}$ . Find

(a) the magnitude of the impulse exerted by  $B$  on  $A$  in the collision,

(3)

(b) the value of  $m$ .

(4)



JUN 6 2009

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3. Two particles  $A$  and  $B$  are moving on a smooth horizontal plane. The mass of  $A$  is  $2m$  and the mass of  $B$  is  $m$ . The particles are moving along the same straight line but in opposite directions and they collide directly. Immediately before they collide the speed of  $A$  is  $2u$  and the speed of  $B$  is  $3u$ . The magnitude of the impulse received by each particle in the collision is  $\frac{7mu}{2}$ .

Find

- (a) the speed of  $A$  immediately after the collision,

(3)

- (b) the speed of  $B$  immediately after the collision.

(3)



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2. Particle  $P$  has mass  $m$  kg and particle  $Q$  has mass  $3m$  kg. The particles are moving in opposite directions along a smooth horizontal plane when they collide directly. Immediately before the collision  $P$  has speed  $4u$  m s<sup>-1</sup> and  $Q$  has speed  $ku$  m s<sup>-1</sup>, where  $k$  is a constant. As a result of the collision the direction of motion of each particle is reversed and the speed of each particle is halved.

- (a) Find the value of  $k$ .

(4)

- (b) Find, in terms of  $m$  and  $u$ , the magnitude of the impulse exerted on  $P$  by  $Q$ .

(3)

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- (a) Find the speed of each particle after the collision.

(b) Find the magnitude of the impulse exerted on  $P$  by  $Q$ .

M1 May 2012

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1. Two particles  $A$  and  $B$ , of mass  $5m$  kg and  $2m$  kg respectively, are moving in opposite directions along the same straight horizontal line. The particles collide directly. Immediately before the collision, the speeds of  $A$  and  $B$  are  $3 \text{ m s}^{-1}$  and  $4 \text{ m s}^{-1}$  respectively. The direction of motion of  $A$  is unchanged by the collision. Immediately after the collision, the speed of  $A$  is  $0.8 \text{ m s}^{-1}$ .



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- (a) Find the magnitude of the impulse exerted on  $P$  in the collision.

(3)

- (b) Find the value of  $m$ .

(3)

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