





2. June/2022/Paper\_9709/41/No.7

Two particles  $A$  and  $B$ , of masses  $0.4\text{ kg}$  and  $0.2\text{ kg}$  respectively, are moving down the same line of greatest slope of a smooth plane. The plane is inclined at  $30^\circ$  to the horizontal, and  $A$  is higher up the plane than  $B$ . When the particles collide, the speeds of  $A$  and  $B$  are  $3\text{ m s}^{-1}$  and  $2\text{ m s}^{-1}$  respectively. In the collision between the particles, the speed of  $A$  is reduced to  $2.5\text{ m s}^{-1}$ .

- (a) Find the speed of  $B$  immediately after the collision. [2]

.....

.....

.....

.....

.....

.....

.....

.....

After the collision, when  $B$  has moved  $1.6\text{ m}$  down the plane from the point of collision, it hits a barrier and returns back up the same line of greatest slope.  $B$  hits the barrier  $0.4\text{ s}$  after the collision, and when it hits the barrier, its speed is reduced by  $90\%$ . The two particles collide again  $0.44\text{ s}$  after their previous collision, and they then coalesce on impact.

- (b) Show that the speed of  $B$  immediately after it hits the barrier is  $0.5\text{ m s}^{-1}$ . Hence find the speed of the combined particle immediately after the second collision between  $A$  and  $B$ . [7]

.....

.....

.....

.....

.....

.....

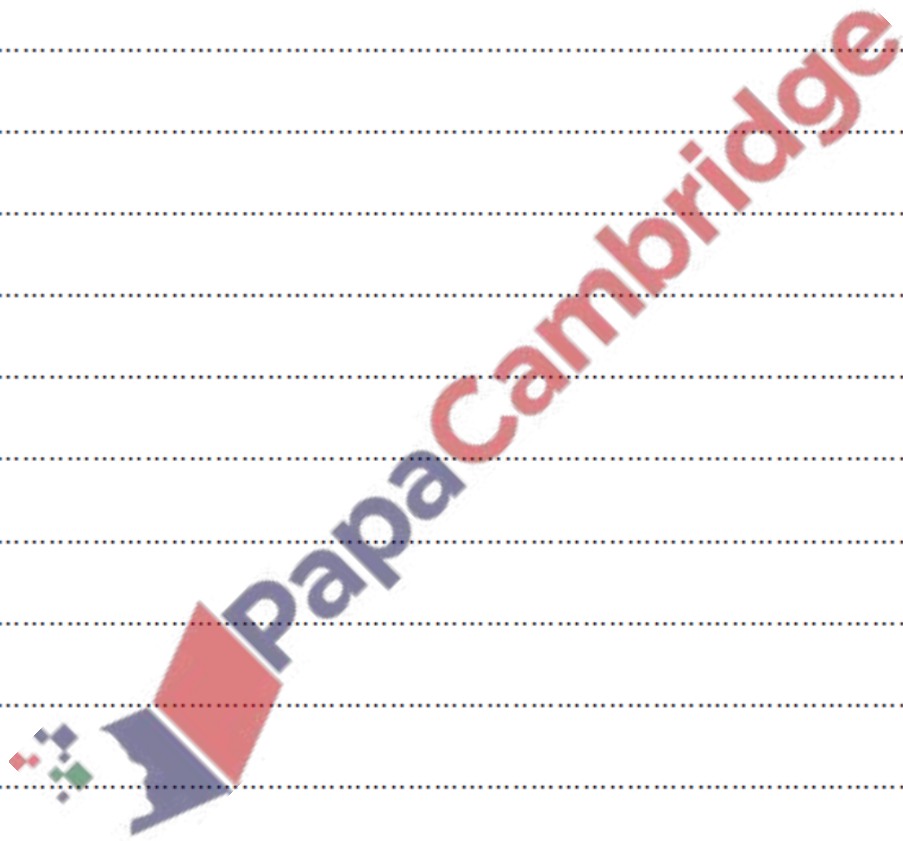
.....

.....

.....

.....

.....





4. June/2022/Paper\_9709/43/No.1

Two particles  $P$  and  $Q$ , of masses  $0.3\text{ kg}$  and  $0.2\text{ kg}$  respectively, are at rest on a smooth horizontal plane.  $P$  is projected at a speed of  $4\text{ m s}^{-1}$  directly towards  $Q$ . After  $P$  and  $Q$  collide,  $Q$  begins to move with a speed of  $3\text{ m s}^{-1}$ .

- (a) Find the speed of  $P$  after the collision. [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

After the collision,  $Q$  moves directly towards a third particle  $R$ , of mass  $m\text{ kg}$ , which is at rest on the plane. The two particles  $Q$  and  $R$  coalesce on impact and move with a speed of  $2\text{ m s}^{-1}$ .

- (b) Find  $m$ . [2]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....