5. **(a)** Three identical smooth spheres, A, B and C, lie at rest on a smooth horizontal table with their centres in a straight line. Sphere A is projected towards B with speed u. Sphere A collides directly with B and then B collides directly with C. Sphere C moves, after the collision, with a speed of $\dfrac{5u}{8}$.

The coefficient of restitution for each of the two collisions is e.

Find e, correct to two places of decimals.

PCM $\qquad m(u) + m(0) = mv_1 + mv_2$ $\qquad\qquad$ 5

NEL $\qquad v_1 - v_2 = -e(u - 0)$ $\qquad\qquad$ 5

$\Rightarrow \qquad v_2 = \dfrac{u}{2}(1 + e)$ $\qquad\qquad$ 5

PCM $\qquad m.\left\{\dfrac{u}{2}(1 + e)\right\} + m(0) = mv_3 + m.\left\{\dfrac{5u}{8}\right\}$

NEL $\qquad v_3 - \left\{\dfrac{5u}{8}\right\} = -e\left\{\dfrac{u}{2}(1 + e) - 0\right\}$ $\qquad\qquad$ 5

$2e^2 + 4e - 3 = 0$

$e = \dfrac{\sqrt{40} - 4}{4}$

$= 0.58$ $\qquad\qquad$ 5 $\qquad$ 25