7. Particle P has mass $3m$ and particle Q has mass km. The particles are moving towards each other on the same straight line on a smooth horizontal surface.
The particles collide directly.
Immediately **before** the collision, the speed of P is $2u$ and the speed of Q is $3u$.
Immediately **after** the collision, the speed of P is u and the speed of Q is v.

The direction of motion of P is unchanged by the collision.

(a) Show that $v = \dfrac{(3 - 3k)}{k} u$

(3)

(b) Find, in terms of m and u, the magnitude of the impulse received by Q in the collision.

(2)

The coefficient of restitution between P and Q is e.

Given that $v \neq u$

(c) find the range of possible values of k.

(5)

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