

Impulse & Momentum – 1 – Tutorial

1. A free-running vehicle **A**, mass 0.20 kg, travelling to the right at 0.80 m/s, hits a vehicle **B**, mass 0.60 kg, which is stationary.
After impact, **A** bounces back with a speed of 0.40 m/s.
 - (a) Calculate the change of momentum of **A**. (*0.24 kgm/s*)
 - (b) Calculate the speed and direction of **B** after the collision. (*0.40 m/s, R*)
 - (c) Show whether the collision is elastic. (*Yes, ke before & after = 0.064 J*)
2. A free-running trolley **A**, mass 0.80 kg, travelling to the right at 0.30 m/s collides with a second free-running trolley **B**, mass 0.40 kg, initially stationary.
After the collision, trolley **A** moves to the right at 0.10 m/s.
 - (a) Calculate the velocity of trolley **B** after the collision. (*0.40 m/s*)
 - (b) Show that the collision is elastic.
3. An empty truck of mass M rolls along a track with speed 3.0 m/s and hits a stationary truck of the same mass, which is loaded with 2000 kg of coal. After the impact, the two trucks couple together and move off with the same speed of 1.0 m/s. Calculate M . (*2000 kg*)
4. Particles **A**, **B** and **C**, of masses 100 g, 200 g and 400 g respectively, are initially all at rest in a straight line ABC on a smooth table with $AB = 0.20$ m and $BC = 0.20$ m.
 - (a) **A** is now set moving with speed 0.30 m/s towards **B**.
After **A** collides with **B**, **B** moves off towards **C** with speed 0.20 m/s.
Calculate the new speed of **A**. (*-0.1 m/s*)
 - (b) After **B** hits **C**, **C** moves off with speed 0.10 m/s.
Calculate the new speed of **B**. (*0 m/s*)
 - (c) Determine whether there will be any more collisions.
(*A & C moving in opposite directions, B at rest, so 'no'*)