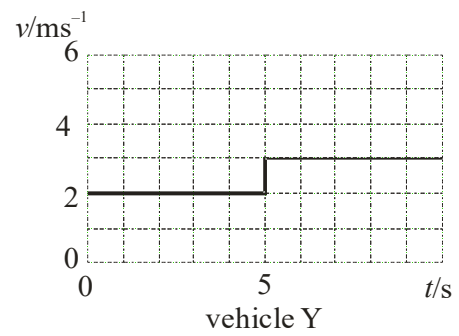
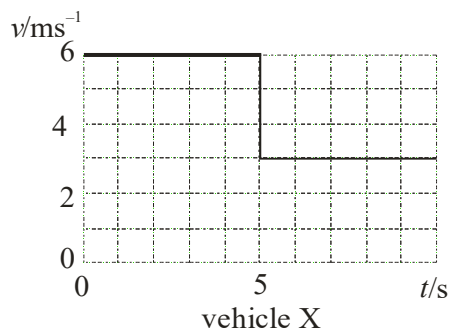


# Impulse & Momentum – 1 – Practice

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- A tennis ball of mass 0.060 kg is moving horizontally to the right, with a speed of 20 m/s. A player hits it straight back, so that it leaves the racket with a speed of 25 m/s to the left.
  - Calculate the size of the change of momentum of the ball? (2.7 kgm/s)  
*Hint: take care with directions*
  - What is the direction of the change of momentum of the ball? (left)
- Snooker ball **A**, of mass 0.15 kg, travelling at speed 0.50 m/s, hits an identical stationary ball **B** head-on. After the collision **B** moves off at a speed 0.45 m/s. Calculate the velocity of **A** after the impact. (0.05 m/s)
- A snooker ball, mass 0.15 kg, travelling at speed 0.30 m/s hits the cushion head-on and receives an impulse of 0.075 Ns. *Hint: take care with directions*  
Calculate the speed at which it bounces back. (0.20 m/s)
- A free-running trolley, mass 0.60 kg, travelling at 0.20 m/s, collides and sticks to a stationary trolley, mass 0.15 kg.  
Calculate:
  - the momentum of the 0.60 kg trolley before the collision (0.12 kgm/s)
  - the velocity of the two trolleys when they have stuck together after the collision (0.16 m/s)
  - the kinetic energy of the 0.60 kg trolley before the collision  
(kinetic energy is given by  $\frac{1}{2}mv^2$ ) (0.012 J)
  - the kinetic energy of the two trolleys together after the collision ( $9.6 \times 10^{-3}$  J)
  - the impulse of the collision (0.024 kgm/s)
- An air rifle pellet of mass 10 g is fired into a block of wood of mass 200 g and becomes embedded in it. The speed of the bullet was 500 m/s.  
Calculate the speed of the block immediately after the impact. (24 m/s)
- A football of mass 0.45 kg falls vertically to hit the floor at a speed of 5.0 m/s, and rebounds with a speed of 3.0 m/s.  
Calculate the impulse exerted on the ball by the floor. (3.6 Ns)
- An air rifle pellet of mass 12 g is fired into a block of wood, mass 200 g.  
The block with the pellet embedded in it moves off with a speed of 25 m/s.  
Calculate the speed of the bullet. (440 m/s)

8. Two vehicles, X and Y, travel in the same direction along the same straight line. After a time of 5.0 s the vehicles collide and stick together. The velocity-time graphs for the motion are shown.



The mass of vehicle X is 2.0 kg. Calculate the mass of vehicle Y. (6.0 kg)