→ $m_B = 0.02\,kg$

$V_B = 80\,m/s$

$m_G = 100\,kg$

$$V_G = -\frac{m_B \times V_B}{m_G} = -\left(\frac{0.02 \times 80}{100}\right)$$

$$= 0.016\,m/s$$

$n = 15$ bullets/second

$$F = n \times m_B \times V_B = 15 \times \frac{2}{100} \times 80$$

$$= 24\,N$$

2. State and prove law of conservation of linear momentum.

→ Law of conservation of linear momentum states that the total final momentum of the isolated system equals its total initial momentum.

Consider two bodies A and B of mass m_A and m_B moving with velocities $\vec{V_A}$ and $\vec{V_B}$ respectively. Their initial momenta are P_A and P_B. After collision and getting apart let final momenta be P_A' and P_B' respectively.

By newton's Second law, $\vec{F}_{AB} \times \Delta t = P_A' - P_B'$

and $\vec{F}_{BA} \times \Delta T = P_B' - P_B'$

By newton's third law, $\vec{F}_{AB} = -\vec{F}_{BA}$

$\Rightarrow \vec{F}_{AB} \times \Delta T = -F_{BA} \times \Delta T$

$\Rightarrow P_A' - P_A = -(P_B' - P_B)$

$\Rightarrow P_A' + P_B' = \vec{P_A} + P_B$

1. An object of ~~Mass~~ mass 1.5kg travelling in a straight line with a velocity of 5m/s collides with a wooden block of mass 5kg resting on the floor. This object sticks with wooden block after collision and both move together in a straight line.

The total momentum after collision is.
According to law of conservation of momentum

$$P_{\text{O}}^{\text{i}} + P_B^{\text{i}} = P_{\text{O}}' + P_B'$$

$$\Rightarrow (1.5)\,\text{kg} \times (5)\,\text{m/s} + (5)\,\text{kg} \times (0)\,\text{m/s}$$

~~$= 7.5\,\text{kgm/s}$~~ (3)

$$= 7.5\,\text{kg m/s}$$

The velocity of the ~~comb~~ combination of these objects after collision

Total mass = 6.5

Total velocity = $\frac{6.5 \text{ kg m/s}}{6.5 \text{ kg}}$

$= 1.15 \text{ m/s}$