1. Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 m/s and 1 m/s respectively. They collide and after the collision the first object moves at a velocity of 1.67 m/s. Determine the velocity of the second object.

ANS Mass of object 1 = $\frac{100}{1000}$ = 0.1 kg

Mass of second object = $\frac{200}{1000}$ = 0.2 kg

Initial velocity of 1st object = 2 m/s
Initial velocity of 2nd object = 1 m/s

Final velocity of 1st object = 1.67 m/s
Final velocity of 2nd object = v

From the law of conservation of momentum

$= 0.1 \times 2 + 0.2 \times 1 = 0.1 \times 1.67 + 0.2V$

$= 0.2 + 0.2 = 0.167 + 2V$

$= 0.4 - 0.167 = 2V$

$= 0.233 = 2V$

$= \frac{0.233}{2} = V$

$V = 116.5 \text{ m/s}$

2. From a rifle of mass 4kg, a bullet of mass 50g is fired with an initial velocity of 35 m/s. Calculate the initial recoil velocity of the rifle.

Ans

Mass of rifle = 4kg

Mass of bullet = 50g = 0.05kg

Initial velocity of rifle and bullet = 0

Final velocity of bullet = 35 m/s

Final velocity of rifle = V

According to the law of conservation of momentum,

Total momenta after the fire = Total momenta before the fire

$$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2$$

$$0.05 \times 35 + 4 v_2 = 0 + 0$$

$$\Rightarrow \quad v_2 = -\frac{0.05 \times 35}{4}$$

$$= \frac{-7}{16} = -0.44 \text{ m/s}$$