

Ex: A bomb initially at rest explodes and splits up into three fragments in the mass ratio 1: 1: 2. The two lighter parts fall at distance 1m each, towards east and north respectively. Find the position of the point where the third fragment falls.

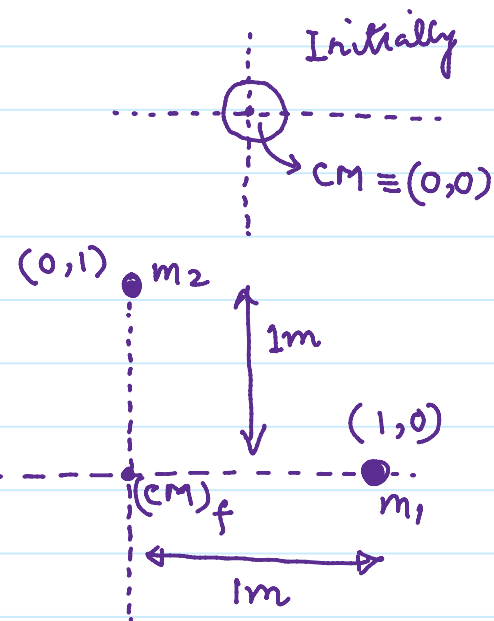
$$m_1 = m, \quad m_2 = m, \quad m_3 = 2m$$

$\therefore F_{\text{ext}} = 0$, CM of the system do not change its position

$$(CM)_f \equiv (0,0)$$

Finally

$$m_3 \text{ at } (x_3, y_3)$$



Finally
$$x_{cm} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3}{m_1 + m_2 + m_3}$$

$$0 = \frac{m \times 1 + m \times 0 + 2m \cdot x_3}{m + m + 2m} \Rightarrow 0 = \frac{m + 2m \cdot x_3}{4m}$$

$$m + 2m \cdot x_3 = 0$$

$$2m \cdot x_3 = -m \Rightarrow x_3 = \frac{-m}{2m} \Rightarrow \boxed{x_3 = -1/2 m}$$

$$y_{cm} = \frac{m_1 y_1 + m_2 y_2 + m_3 y_3}{m_1 + m_2 + m_3} = \frac{m \times 0 + m \times 1 + 2m \cdot y_3}{m + m + 2m}$$