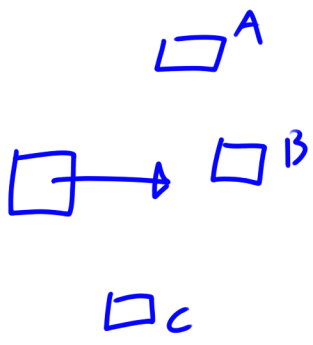
A 300-kg space vehicle traveling with a velocity $\mathbf{v}_0 = (360 \text{ m/s})\mathbf{i}$ passes through the origin $O$ at $t = 0$. Explosive charges then separate the vehicle into three parts $A$, $B$, and $C$, with mass, respectively, 150 kg, 100 kg, and 50 kg. Knowing that at $t = 4$ s, the positions of parts $A$ and $B$ are observed to be $A$ (1170 m, –290 m, –585 m) and $B$ (1975 m, 365 m, 800 m), determine the corresponding position of part $C$. Neglect the effect of gravity.




$$m\bar{r} = \sum_{i=1}^{n} m_i \vec{r}_i$$

$m = 300 \text{ kg}$ $\quad m_A = 150 \text{ kg}$ $\quad m_B = 100 \text{ kg}$ $\quad m_C = 50 \text{ kg}$

$\vec{r}_A = 1170\,\mathbf{i} - 290\,\mathbf{j} - 585\,\mathbf{k}$ m

$\vec{r}_B = 1975\,\mathbf{i} + 365\,\mathbf{j} + 800\,\mathbf{k}$ m

$$\bar{r} = V_0 t = 360\,\mathbf{i}\ \frac{\text{m}}{\text{s}}\ 4\text{ s} = 1440\,\mathbf{i}\ \text{m}$$

$$300\text{ kg}\ 1440\,\mathbf{i}\ \text{m} = 150\text{ kg}\,(1170\,\mathbf{i} - 290\,\mathbf{j} - 585\,\mathbf{k})\ \text{m} + 100\text{ kg}\,(1975\,\mathbf{i} + 365\,\mathbf{j} + 800\,\mathbf{k})\ \text{m} + 50\text{ kg}\ \vec{r}_C$$

$$\frac{300\text{ kg}\ 1440\text{ m} - 150\text{ kg}\ 1170\text{ m} - 100\text{ kg}\ 1975\text{ m}}{50\text{ kg}}\,\mathbf{i} + \frac{-150\text{ kg}(-290)\text{ m} - 100\text{ kg}\ 365\text{ m}}{50\text{ kg}}\,\mathbf{j} + \frac{-150\text{ kg}(-585)\text{ m} - 100\text{ kg}\ 800\text{ m}}{50\text{ kg}}\,\mathbf{k} = \vec{r}_C$$

$$\boxed{\vec{r}_C = 1130\,\mathbf{i} + 140\,\mathbf{j} + 155\,\mathbf{k}\ \text{m}}$$