

Answer on Question #34639 – Physics – Mechanics | Relativity

A man weighting 80 kg is standing in a trolley weighting 320 kg. The trolley is resting on frictionless horizontal rails. If man starts walking on the trolley with a speed of 1m/s then after 4 sec his displacement relative to the ground will be...

Solution.

$$m_1 = 80 \text{ kg} - \text{man weight}$$
$$m_2 = 320 \text{ kg} - \text{trolley weight}$$

Change in impulse for the total system must be zero:

$$v_1 = 1 \frac{m}{s} - \text{velocity (man)}$$
$$v_2 - \text{velocity (trolley)}$$

$$p = mv - \text{impulse}$$

So

$$p_1 = p_2$$

$$m_1 v_1 = -m_2 v_2$$

$$80 \cdot 1 = -320 v_2$$

Express v_2 from the equation:

$$v_2 = -\frac{80}{320} = -0.25 \frac{m}{s}$$

Man's effective velocity is:

$$V = v_1 - v_2 = 1 - 0.25 = 0.75 \frac{m}{s}$$

After 4 seconds, he travelled the distance:

$$S = Vt = 0.75 \cdot 4 = 3 \text{ m}$$

Answer: 3 m