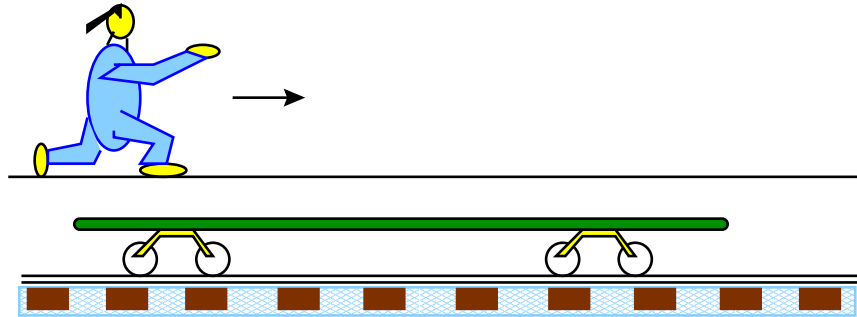


Ex : A **2140 kg** railroad car, which can move with negligible friction, is motionless next to a platform. A **242 kg** sumo wrestler runs at **5.3 m/s** along the platform (parallel to the track) and then jumps onto the car.



a). What is the speed of the flatcar if he then stands on it?

Use conservation of momentum: $P_i^s + P_i^c = P_f^s + P_f^c$

$$m_s v_i^s + 0 = (m_s + m_c) v_{sc}$$

$$v_{sc} = \frac{m_s v_i^s}{m_s + m_c} = \frac{242 \text{ kg} \cdot 5.3 \text{ m/s}}{242 \text{ kg} + 2140 \text{ kg}} = 0.54 \text{ m/s}$$

b). What is the speed of the car if he continues running on it at **5.3 m/s**?

$$P_i^s + P_i^c = P_f^s + P_f^c, \quad m_s v_i^s + 0 = m_s v_f^s + m_c v_f^c$$

$$v_f^s = v_f^c + v_{rel}$$

$$m_s v_i^s = m_s v_f^c + m_s v_{rel} + m_c v_f^c$$

$$v_f^c = \frac{m_s v_i^s - m_s v_{rel}}{m_s + m_c} = 0$$