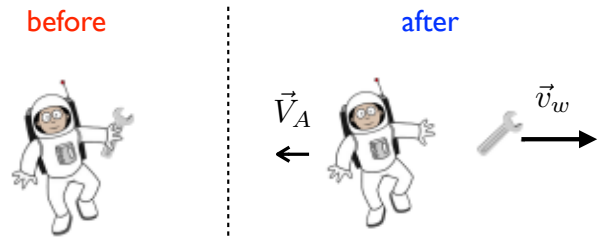


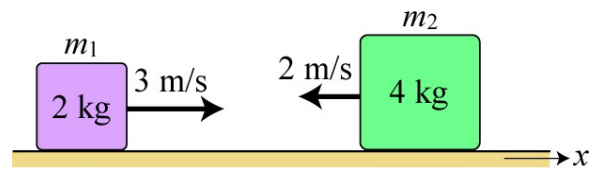
Momentum

1. **Recoil of an astronaut:** An astronaut of mass $m_A = 95$ kg, is initially at rest and holds a wrench of mass $m_w = 1800$ g. He throws the wrench with a velocity $\vec{v}_w = 7$ m/s.

What is the recoil velocity \vec{V}_A of the astronaut?

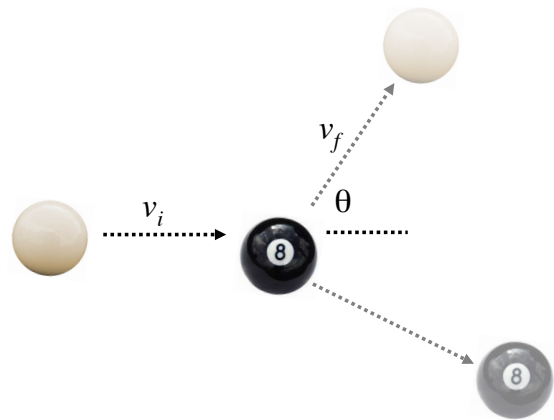


2. **Perfectly inelastic collision:** Two masses sliding on a frictionless surface have a completely inelastic head-on collision. Following impact, the velocity of the 4 kg mass is:



3. **Billiards:** A cue ball of mass m_c strikes a stationary eight ball of mass m_8 with speed v_i . It continues at angle θ with speed v_f . What is the velocity of the eight ball?

(Let $m_c = 170$ g, $m_8 = 160$ g, $v_i = 12$ m/s, $v_f = 2.1$ m/s and $\theta = 30^\circ$.)



4. On a frictionless horizontal air table, puck A (with mass 0.251 kg) is moving toward puck B (with mass 0.375 kg), which is initially at rest. After the collision, puck A has velocity 0.120 m/s to the left, and puck B has velocity 0.650 m/s to the right.
- What was the speed v_{Ai} of puck A before the collision?
 - Calculate ΔK , the change in the total kinetic energy of the system that occurs during the collision.