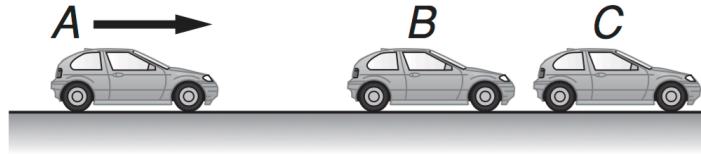# Tutorial 1

Problem 1. K. & K., Ex. 6.6.
Cars B and C are at rest with their brakes off. Car A plows into B at high speed, pushing B into C. If the collisions are completely inelastic, what fraction of the initial kinetic energy is dissipated when C is struck. The cars are identical initially.

Problem 2. A smooth sphere A (mass m) collides with a smooth sphere B (mass $2m$). The initial velocity of sphere A is $\vec{v}_A$, while sphere B is initially at rest. The collision is inelastic, and the line connecting the centers of the spheres makes an angle $\theta = 0.5$ rad with $\vec{v}_A$ at the moment of collision. The velocity of sphere B after the collision, $\vec{v}'_B$, has magnitude $0.3\,v_A$, and makes (of course) an angle $\theta = 0.5$ rad with $\vec{v}_A$.

1. Determine the center of mass velocity $\vec{V}$ expressed in $\vec{v}_A$.

2. Determine the initial velocity $\vec{v}_{Bc}$ of B in the center of mass coordinate system.

3. Determine the magnitude of the final velocity $\vec{v}'_{Bc}$ of B in the center of mass coordinate system.

4. Determine the magnitude of the final velocity $\vec{v}'_A$ of A.