# UNIT 10 EXERCISES

1) In Unit 5 Section **5.4**, you worked the problem below. Work the problem again using impulse and momentum concepts:

Two students of different masses sit on kinesthetic carts. They push off from one another. Shortly after the push, both of their velocities are measured at the same time. One cart plus student has a mass of 60kg and a velocity after the push of 1.2m/s. The other cart has a velocity of 0.8m/s. Determine the mass of the other student-cart.

2) A 25.0g bullet is fired at 400m/s into a 5 kg wooden block hanging from a string, as in the picture below. The block is at rest before the bullet hits it. The bullet becomes embedded in the wooden block.
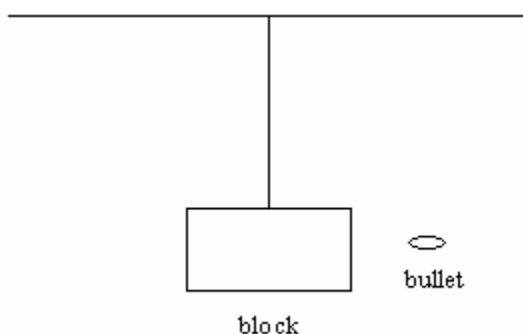
a) What is the speed of the combined bullet + block? Show your work.

b) How high will the block + bullet rise? Show your work.

c) Calculate the total kinetic energy before the collision and the total kinetic energy after the collision. Is it the same?

3) Suppose a 0.200kg Gumby slides on ice at a speed of 0.750m/s, running into 0.350kg Pokey, who was initially motionless. Both being made out of clay, they naturally stick together. What is their final velocity?

4) The moon's craters are remnants of meteor collisions occurring over the last 3 or 4 billion years and continuing today. Suppose a fairly large asteroid having a mass of 5.00×10^{12}kg (about a kilometer across) strikes the moon at a speed of 15.0km/s.

a) At what speed does the 7.36×10^{22}kg moon recoil after the perfectly inelastic collision?

b) How much kinetic energy is lost in the collision? Show your work.

5) A 0.300kg ball, moving with a speed of 2.50m/s, has a head-on collision with a 0.600kg ball initially moving away from it at a speed of 1.00m/s. Assuming a perfectly elastic collision, what is the speed and direction of each ball after the collision? Show your work.