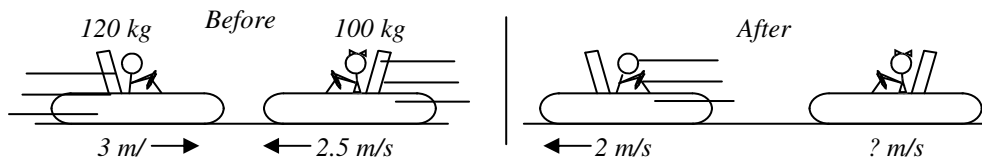
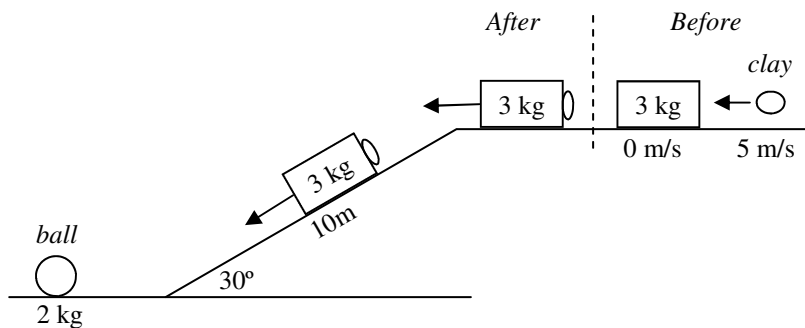


2011 PreAP Momentum 7

1. Slim Jim and Slim Kim are in the bumper cars at the amusement park. Jim and Kim collide face to face as shown.



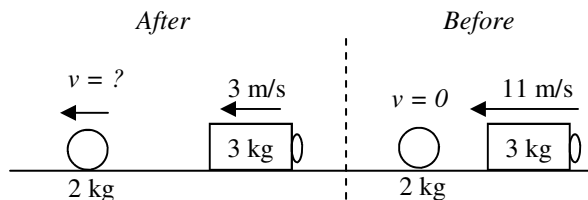
- A. Calculate Kim's final v.
 B. Decide what kind of collision it was (give proof).



2. A 3 kg block of wood is at rest at the top of a ramp. The block is struck by a 1 kg piece of clay going 5 m/s. The clay sticks to the block.
 A. What kind of collision is this?
 B. * Calculate the velocity of the block/clay combo after the collision.

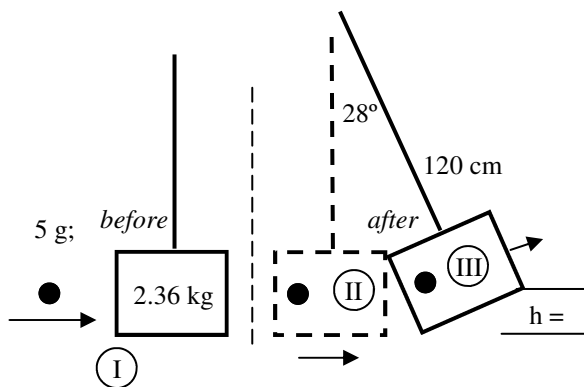
The block/clay combo then slides down the 10 m long, frictionless ramp, which is inclined at 30°.

- C. * How much **height** does the combo lose as it slides down?
 D. How fast is the box/clay moving at the bottom of the ramp?

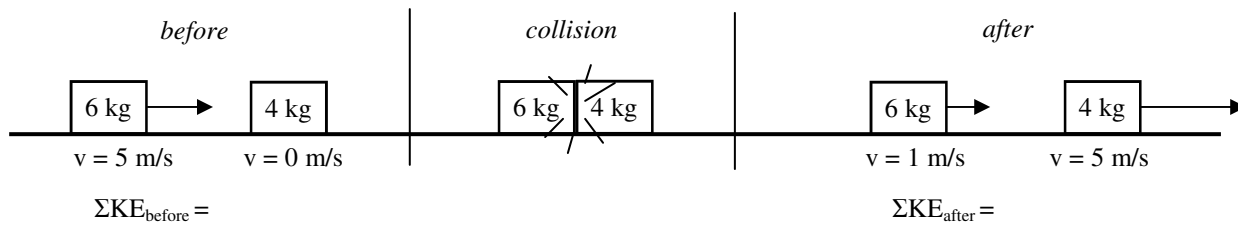


Reset: In case you made a mistake, let's pretend the box/clay object is moving 11 m/s at the bottom. The block/clay combo then strikes a 2 kg ball. After the collision the block is still going 3 m/s to the left.

- E. How fast is the ball going after the collision with the block?



3. A ballistic pendulum is used by forensic scientists to determine the speed of bullets. Let me walk you thru how.
 A. Convert all numbers to standard units.
 B. * After the bullet is lodged in the pendulum, the block rises until it makes an angle of 28° with the vertical. Calculate h.
 C. * From this height of position III, calculate the velocity of the block and bullet at the bottom, just after the collision (pos II).
 D. (*Reset: pretend the velocity was 1.8 m/s at position II, just after the collision.*) Now calculate the velocity of the bullet before the collision (position I).



4. Two objects collide, as shown above. All of the initial and final velocities are given.
 - A. * Under the diagram, calculate the net kinetic energy before and after the collision.
 - B. What kind of collision was it?
 - C. How much mechanical energy was lost during the collision?

Q2B: -1.25 m/s . Be sure to add the clay's mass to the block on the after side.

Q2C: h is always the vertical distance from the ground. It gives you the angle and length of ramp. (5m)

Q3C: 1.67 m/s

Q3B: remember that $h = L - (L\cos\theta) = .14 \text{ m}$

Q4A: $\Sigma KE_{\text{after}} = 53 \text{ J}$