CONCEPT: COMPLETELY INELASTIC COLLISIONS

- In some problems, 2 objects collide and "stick" together. Some keywords: "lodged", "embedded", "sticks to"…
  - We call this a *Completely Inelastic Collision*.
  - After the collision, both objects move with the same _____.
  - Because ____ = ____, the **Conservation of Momentum** EQ simplifies: $m_1 v_{1i} + m_2 v_{2i} =$ _____

EXAMPLE: A 1kg block moving at 20m/s collides with a 9kg block initially at rest. If the 1kg block sticks to the 9kg block, find the final speed of the system.

CONSERVATION OF MOMENTUM

1) Draw Diagrams for Before & After
2) Write **Conservation of Momentum** EQ
3) Plug in values & solve

PROBLEM: A 70-kg hockey player skates on frictionless ice at 5m/s. An opposing player of mass 110kg collides head-on with him at 4m/s. The two players become entangled after the collision and move together. Determine their final velocity.

CONSERVATION OF MOMENTUM

1) Draw Diagrams for Before & After
2) Write **Conservation of Momentum** EQ
3) Plug in values & solve

PROBLEM: A 10.0-g bullet is fired into a 5kg stationary block of wood. The bullet embeds into the block. The speed of the bullet-wood system immediately after the collision is 0.6 m/s. **a)** What was the original speed of the bullet? **b)** How much kinetic energy was lost in the collision?

CONSERVATION OF MOMENTUM

1) Draw Diagrams for Before & After
2) Write **Conservation of Momentum** EQ
3) Plug in values & solve

PROBLEM: A 1000 kg car travelling east at 20m/s slams into a 3000 kg truck heading north at 10m/s. Luckily both drivers are unharmed! The two vehicles become locked together during the collision. What is the magnitude & direction of the two vehicles' final velocity after colliding?

CONSERVATION OF MOMENTUM

1) Draw Diagrams for Before & After
2) Write **Conservation of Momentum** EQ
3) Plug in values & solve

- For 2D Collisions, write Conservation of Momentum Equations in the X & Y axes!

PROBLEM: Two 500 g blocks of wood are 2.0 m apart on a frictionless table. A 10 g bullet is fired at 430 m/s toward the blocks. It passes all the way through the first block, and continues on until it embeds itself in the second block. The speed of the first block immediately afterward is 5.6 m/s. What is the speed of the second block after the bullet stops?

CONSERVATION OF MOMENTUM
1) Draw Diagrams for Before & After **2)** Write **Conservation of Momentum** EQ **3)** Plug in values & solve