

# Inelastic Collisions

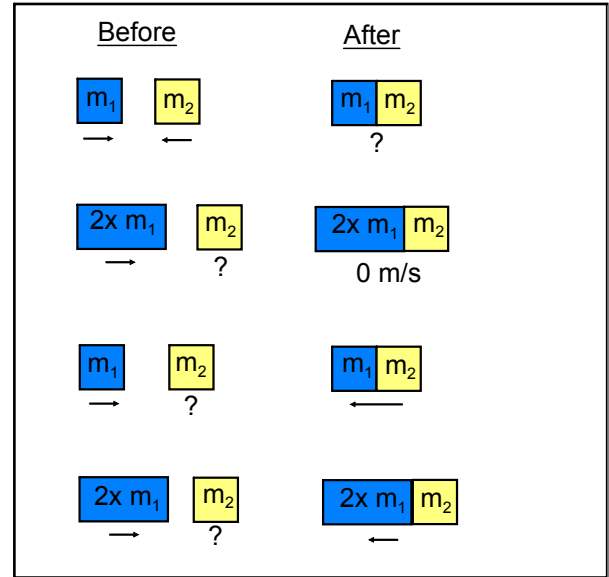
## Conservation of Momentum

### Objective:

Introduce conservation of momentum.

Identify characteristics of perfectly **inelastic collisions**.

Calculate final momentum or velocity of objects in a perfectly inelastic collision.



## Conservation of Momentum

- total momentum is constant in a system
- ONLY for an isolated system  
(no outside forces - no friction)
- applies to inelastic & elastic collisions

$$\Sigma P_b = P_a$$

## Perfectly Inelastic Collisions

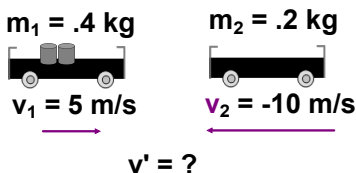
- objects collide & stick together
- two masses combine

$$\Sigma P_b = P_a$$

total p before = total p after

$$m_1 \cdot v_1 + m_2 \cdot v_2 = (m_1 + m_2) \cdot v'$$

## Inelastic Collision Problem

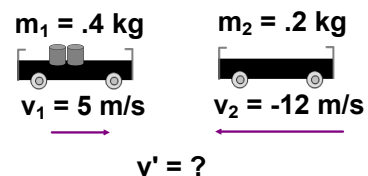


$$m_1 \cdot v_1 + m_2 \cdot v_2 = (m_1 + m_2) \cdot v'$$

$$2 \text{ kg} \cdot \frac{5}{s} + 2 \text{ kg} \cdot \frac{-10}{s} = (.6) v'$$

$$0 = v'$$

## Inelastic Collision Problem



$$m_1 \cdot v_1 + m_2 \cdot v_2 = (m_1 + m_2) \cdot v'$$

$$2 \text{ kg} \cdot \frac{5}{s} + 2 \cdot 4 \text{ kg} \cdot \frac{-12}{s} = (.6) v'$$

$$-4 \text{ kg} \cdot \frac{5}{s} = (.6) v'$$

$$v = -6.7$$

# Inelastic Collisions

## Assignments . . .



- Ch 6 Homework # 6 - 10



## Homework Question # 6

$$m_1 = 4.5 \times 10^5 \text{ kg}$$

$$v = 1.4 \text{ m/s}$$

$$m_2 = 1800 \text{ kg}$$

$$v = 0$$

$v' = ?$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v'$$

$$(4.5 \times 10^5)(1.4) + (1800)(0) = (4.5 \times 10^5 + 1800) v'$$

$$630,000 \text{ kg} \cdot \frac{\text{m}}{\text{s}} = (451,800 \text{ kg}) v'$$

$$v' = 1.39 \text{ m/s}$$

## Homework Question # 7

$$m_1 = 60 \text{ kg}$$

$$v = 5 \text{ m/s}$$

$$m_2 = 75 \text{ kg}$$

$$v = -3 \text{ m/s}$$

$$P_{\text{before}} = P$$

$$m_1 v_1 + m_2 v_2 = (m_1 + m_2) v'$$

$$(60)(5) + (75)(-3)$$

$$P_{\text{before}} = 75 \text{ kg} \cdot \frac{\text{m}}{\text{s}} = (135 \text{ kg}) v'$$

$$v' = .56 \text{ m/s}$$

Inelastic  
because their  
together