

Momentum
Student - Class Practice

1. A 10 kg block is sliding down a frictionless surface and hits a 10 kg stationary block sticking together and moving as one.

a. What type of collision is this? (elastic/inelastic/explosive)

b. What is the new velocity after the collision?

$$P_B = P_A \quad m_1 v_1 + m_2 v_2 = m_{12} v$$

$$m_1 v_1 = m_{12} v$$

$$\frac{m_1 v_1}{m_{12}} = \frac{10 \cdot 5}{30} = 1.6 \text{ m/s}$$

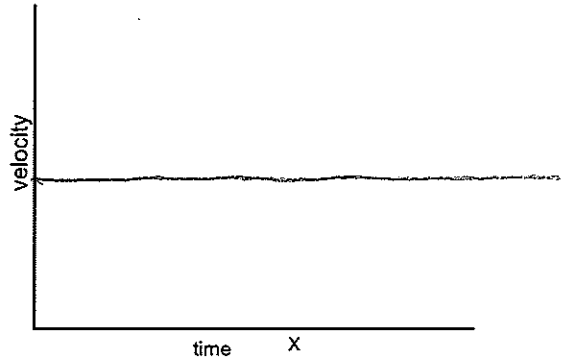
c. Calculate the change in momentum of the system? = 200

d. Calculate the change in kinetic energy of the system?

KE_f - KE_i

$$\frac{1}{2}(30)(1.6)^2 - \frac{1}{2}(10)(5)^2 = -86 \text{ J}$$

e. On the following graph track the "center of mass speed" of the system.



Note: What does this mean?

2. A stationary 5kg block explodes into 2 pieces. 3/5 of the mass travels to the right at 3m/s.

a. How fast is the piece traveling to the left?

$$P_B = P_A$$

$$2/5 \cdot 5 \cdot v = 3/5 \cdot 5 \cdot 3$$

$$2 \cdot v = 9$$

$$v = 4.5 \text{ m/s}$$

b. How much energy was released in this explosion?

KE → add

$$\frac{1}{2} 2 (4.5)^2 + \frac{1}{2} 3 (3)^2 = 33.75 \text{ J}$$

3. A 25kg block slides at 10m/s colliding into a stationary block 50kg block.

a. If the larger block is only moving at 7m/s forward, what is the velocity of the smaller block?

$$P_B = P_A$$

$$m_1 v_1 + m_2 v_2 = M v + M V$$

$$25 \cdot 10 + 50(0) = 25v + 50 \cdot 7$$

b. Is the collision above elastic?

$$250 = 25 \cdot v + 350$$

$$-100 = 25 \cdot v$$

$$v = -4$$

Explosive

b) KE_f - KE_i

$$\text{Before} = \frac{1}{2} (25) 10^2 = 1250$$

After:

$$\frac{1}{2} (25) (4)^2 = 200$$

$$\frac{1}{2} 50 (8)^2 = 1600$$