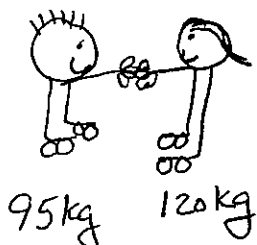


Formula's: See formula sheet.

Directions: **Show your work – Neatly** - in the space provided or attach additional paper to this sheet upon completion. Circle or identify final answers!!!

1. Max, who has a mass of 95 kg and his girlfriend, Allison, who has a mass of 120 kg are wearing skates and are standing together on a frozen lake. If they push apart and Max has a velocity of 0.72 m/s in the opposite direction of Allison, then what is the velocity of Allison? (Neglect friction) 5pts.



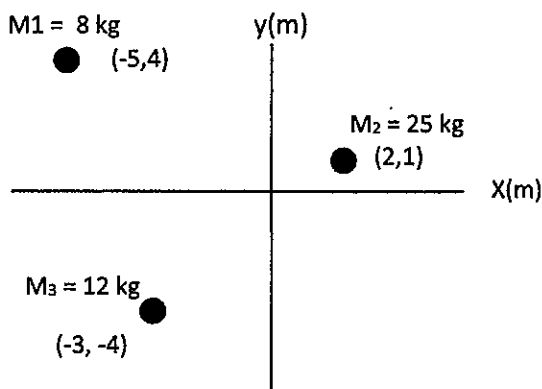
$$m_1 v_1 = m_2 v_2$$

$$95 \text{ kg} (0.72 \text{ m/s}) = 120 \text{ kg} v_2$$

$$\frac{95 (0.72 \text{ m/s})}{120 \text{ kg}} = v_2$$

$$v_2 = 0.57 \text{ m/s}$$

2. Where is the center of mass of the three-particle system shown below using the origin as the reference point? 10 pts



$$COM = (-0.58, 0.20)$$

$$C_{m_x} = \frac{m_1 x_1 + m_2 x_2 + m_3 x_3 + \dots}{m_1 + m_2 + m_3}$$

$$C_{m_y} = \frac{m_1 y_1 + m_2 y_2 + m_3 y_3 + \dots}{m_1 + m_2 + m_3}$$

$$C_{m_x} = \frac{8(-5) + 25(2) + 12(-3)}{8 + 25 + 12}$$

$$C_{m_y} = \frac{8(4) + 25(1) + 12(-4)}{8 + 25 + 12}$$

$$C_{m_x} = -0.58 \text{ m}$$

$$C_{m_y} = 0.20 \text{ m}$$

5. A 2600kg car (A) heading west collides with a 3500kg car (B) heading north. The 2600 kg car, after collision moves at 15 degrees east of North @ 5 m/s and the 3500 kg car bounces off with a velocity of 18 m/s @ 25° W of N. What was the original speed of the 3500 kg and 2600 kg cars? 15 pts.

$$\sin 25^\circ = \frac{P_{xB}}{63,000 \text{ N}\cdot\text{s}}$$

$$P_{xB} = 26,625 \text{ N}\cdot\text{s}$$

$$\cos 25^\circ = \frac{P_{yB}}{63,000 \text{ N}\cdot\text{s}}$$

$$P_{yB} = 57,097 \text{ N}\cdot\text{s}$$

$$P_y = P_{yA} + P_{yB}$$

CAR B

$$P_y = 12,557 \text{ N}\cdot\text{s} + 57,097 \text{ N}\cdot\text{s}$$

$$P_y = 69,654 \text{ N}\cdot\text{s}$$

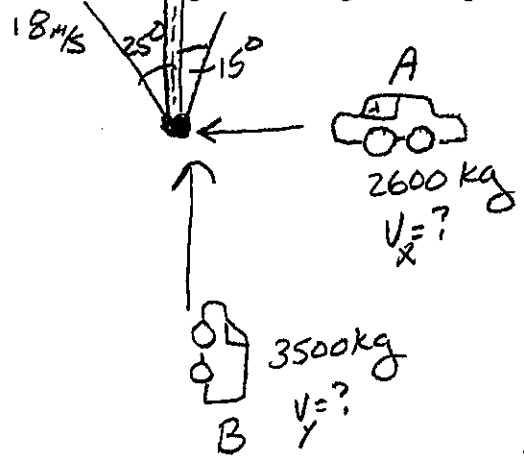
$$m_y \cdot v_y = 69,654 \text{ N}\cdot\text{s}$$

$$3500 \text{ kg} \cdot v_y = 69,654 \text{ N}\cdot\text{s}$$

$$v_y = 19.90 \text{ m/s}$$

of CAR B
(3500kg) North

$$P = 2600 \text{ kg} \cdot 5 \text{ m/s} = 13,000 \text{ N}\cdot\text{s}$$



$$\sin 15^\circ = \frac{P_{xA}}{13,000 \text{ N}\cdot\text{s}}$$

$$P_{xA} = 3365 \text{ N}\cdot\text{s}$$

$$\cos 15^\circ = \frac{P_{yA}}{13,000 \text{ N}\cdot\text{s}}$$

$$P_{yA} = 12,557 \text{ N}\cdot\text{s}$$

$$P_x = P_{xA} - P_{xB}$$

CAR A

$$P_x = P_{xA} - P_{xB}$$

$$P_x = 3365 \text{ N}\cdot\text{s} - 26,625 \text{ N}\cdot\text{s}$$

$$P_x = -23,260 \text{ N}\cdot\text{s}$$

$$m_x \cdot v_x = -23,260 \text{ N}\cdot\text{s}$$

$$2600 \text{ kg} \cdot v_x = -23,260 \text{ N}\cdot\text{s}$$

$$v_x = \frac{-23,260 \text{ N}\cdot\text{s}}{2600 \text{ kg}}$$

$$v_x = -8.95 \text{ m/s}$$

CAR "A" moves
Backward @ 8.95 m/s