Formula's: See formula sheet.

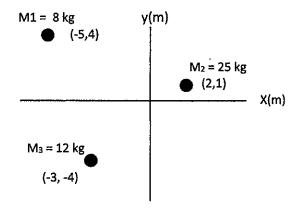
Directions: Show all your work - Neatly - in the space provided or attach additional paper to this sheet upon completion. Circle or identify final answers!!!

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.

$$m_1 V_1 = m_2 V_2$$

 $95 \text{ kg}(.72 \text{ m/s}) = 120 \text{ kg} V_2$ $V_2 = 0.57 \text{ m/s}$
 $95 (.72 \text{ m/s})$

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



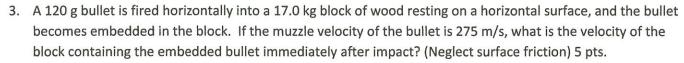
$$Cm_{\chi} = \frac{m_{1}\chi_{1} + m_{2}\chi_{2} + m_{3}\chi_{3} + \dots}{m_{1} + m_{2} + m_{3}}$$

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

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

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

$$Cm_{x} = -0.58m$$



$$m = 0.120 \text{ kg}$$

$$m_1 V_1 + m_2 V_2 = (m_1 + m_2) V'$$

 $a_1 Z_1 K_3 (275 m/s) + 17 K_3 (0 m/s) = (a_1 Z_1 K_3 + 17 K_3) V'$
 $33 K_3 m/s = 17.12 K_3 V'$
 $V' = 1.93 m/s$

4. Two bowling balls, A & B have a masses of 7.25 kg and 5.5 kg respectively, undergo a perfectly elastic headon collision. If the speed of ball "A" was initially 5 m/s, and the other was 3 m/s in the opposite direction, what will be their speeds after the collision?

10 pts.

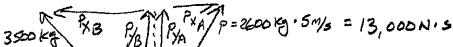
BEFORE

A Vi= 5m/s

$$V_1 = \frac{5m/s}{5m/s}$$
 $V_2 = \frac{2m_1}{m_1 + m_2} V_1 - \frac{m_1 - m_2}{m_1 + m_2} V_2$
 $V_2' = \frac{2(7.25 kg)}{7.25 kg + 5.5 kg} (5m/s) - \frac{7.25 kg + 5.5 kg}{7.25 kg + 5.5 kg} (-3m/s)$
 $V_2' = \frac{141.5 kg}{12.75 kg} (5m/s) - \frac{1.75}{12175} (-3m/s)$
 $V_2' = \frac{1.75 kg}{12.75 kg} (5m/s) + \frac{11 kg}{12.75 kg} (3m/s)$
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7,25kg
$$m_2 = 5.5 \text{ kg}$$

7. $V_2' = ?$
 $V_1' = \frac{m_1 - m_2}{m_1 + m_2} V_1 + \frac{2m_2}{m_1 + m_2} V_2$
 $V_1' = \frac{7,25 \text{ kg} - 5,5 \text{ kg}}{7,25 \text{ kg} + 5.5 \text{ kg}} (5 \frac{m}{5}) + \frac{2(5.5 \frac{kg}{5})}{7,25 + 5,5} (-3)$
 $V_1' = \frac{1.75 \text{ kg}}{12.75 \text{ kg}} (5 \frac{m}{5}) + \frac{11 \text{ kg}}{12.75 \text{ kg}} (-3 \frac{m}{5})$
 $V_1' = 0.686 \frac{m}{5} - 2.59 \frac{m}{5}$
 $V_1' = -1.904 \frac{m}{5}$



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.

$$5m25^{\circ} = \frac{P_{X3}}{63,000N^{\circ}5}$$
 $P_{X3} = 26,625N^{\circ}5$
 $Cos25^{\circ} = \frac{P_{X3}}{63,000N^{\circ}5}$
 $P_{X3} = 57,097N^{\circ}5$

$$7.5^{\circ}$$
 A $5.m$ $15^{\circ} = \frac{P_{XA}}{13,000}NIS$
 $7.A = 3365 NIS$
 $7.A = 12557 NIS$
 $7.A = 12557 NIS$
 $7.A = 7.B$

$$P_{X} = P_{XA} - P_{XB}$$

$$P_{X} = 3365 \text{ Nis} - 26625 \text{ Nis}$$

$$P_{X} = -23260 \text{ Nis}$$

$$P_{X} = -23260 \text{ Nis}$$

$$2600 \text{ kg} \cdot V_{X} = -23260 \text{ Nis}$$

$$V_{X} = \frac{-23260 \text{ Nis}}{2600 \text{ kg}}$$

$$V_{X} = -8.95 \text{ M/s}$$

$$CAR A mours$$

$$Buckwed @ 8.95 \text{ M/s}$$