

## Momentum

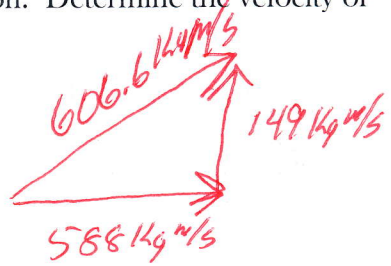
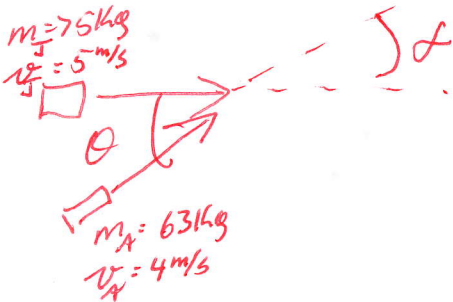
### AT Momentum(12)

Solve the following problems showing ALL work and CIRCLING your answers. Each is worth 5 points.

- 1) Determine the momentum of a person (mass 65kg) running at 8 m/s.

$$p = mv = 520 \text{ kg m/s}$$

- 2) Two kids, James and Amy, are playing on ice. James has a mass of 75 kg and Amy has a mass of 63kg. James runs and slides at a speed of 5 m/s. Amy runs and slides on the ice at a speed of 4 m/s and at an angle of 35 degrees from the path of James. The two will collide in a totally inelastic collision. Determine the velocity of the two after the collision.



$$P_{Jx} + P_{Ax} = P_{JAx}$$

$$m_J v_{Jx} + m_A v_{Ax} = m_{JA} v_{JAx}$$

$$m_J v_{Jx} + m_A v_{Ax} \cos \theta = (m_A + m_J) v_{JAx} \cos \alpha$$

$$(75 \text{ kg})(5 \text{ m/s}) + (63 \text{ kg})(4 \text{ m/s}) \cos(35) = 588 \text{ kg m/s}$$

$$P_y / m_A v_{Ay} \sin \theta = (m_A + m_J) v_{JAy} \sin \alpha$$

$$(63 \text{ kg})(4 \text{ m/s}) \sin(35) =$$

$$p = mv$$

$$606 \text{ kg m/s} = (138 \text{ kg}) v$$

$$4.39 \text{ m/s} = v$$

@ 14° From James Path

# Level I Key Pd 1

(Use the information below to respond to problems 3-6)

Two Pasco carts are pushed toward each other. One cart is red, has a mass of 0.5 kg, and is initially moving to the right at 3 m/s. The other cart is blue, has a mass of 1.5 kg, and is initially moving to the left at 2 m/s. The collision between the two carts lasts of 0.2 seconds.

- 3) Determine the final velocity of the red car after the collision

$$-4.5 \text{ m/s}$$

- 4) Determine the final velocity of the blue car after the collision

$$1.5 \text{ m/s}$$

- 5) Determine the force that acts on the red car.

$$-18.75 \text{ N}$$

- 6) Determine the force that acts on the blue car.

$$18.75 \text{ N}$$

Level I Key Pd 1

- 7) A Tennis ball of mass 0.057kg (I checked this!!! It's right!!) is struck by a tennis racket. The ball approached the racket with a realistic speed of 8 m/s and left the racket with a speed of 17 m/s. The collision between the racket and the ball lasted for 0.08 seconds. Determine the change in momentum of the ball.

$$\Delta p = p - p_0$$

$$(0.057 \text{ kg})(17 \text{ m/s} + 8 \text{ m/s})$$

$$\Delta p = 1.425 \text{ kg m/s}$$

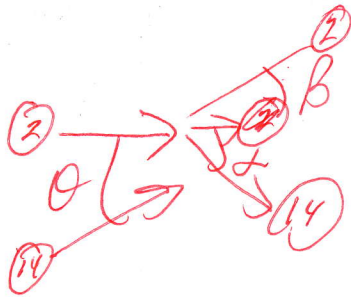
$$Ft = \Delta p$$

$$Ft = mv - mv_0$$

$$\Delta p = m(v - v_0)$$

Level I Key Pd 1

- 8) On a billiard table, the 2 ball and the 14 ball are both in motion. The two balls are moving at an angle of  $\theta$  with respect to each other. The two balls collide in a 2 D elastic collision. Draw a diagram and write equations involving energy and momentum (Including trig functions) to describe the collision.



$$P_x / \cancel{m_2 v_{02} \cos \theta} +$$

$$P_x \quad m_2 v_{02} + m_{14} v_{014} \cos \theta = m_2 v_2 \cos \beta + m_{14} v_{14} \cos \delta$$

$$P_y / \quad m_{14} v_{014} \sin \theta = m_2 v_2 \sin \beta + m_{14} v_{14} \sin \delta$$

$$\frac{1}{2} m_2 v_{02}^2 + \frac{1}{2} m_{14} v_{014}^2 = \frac{1}{2} m_2 v_2^2 + \frac{1}{2} m_{14} v_{14}^2$$