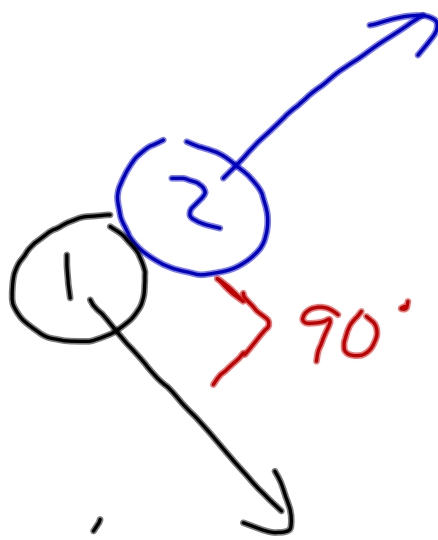


''' (1)

(2)



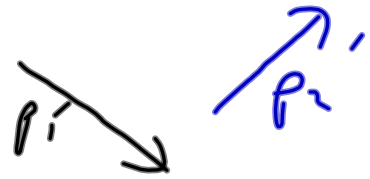
$$P = P'$$
$$m v_1 + m v_2 = m v_1' + m v_2'$$

$$p = m v$$

$$m v_1 + m v_2 = m v_1' + m v_2'$$

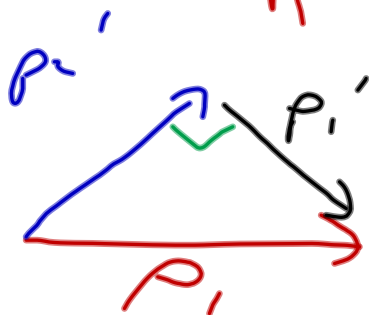
O

$$m v_1 = m v_1' + m v_2'$$



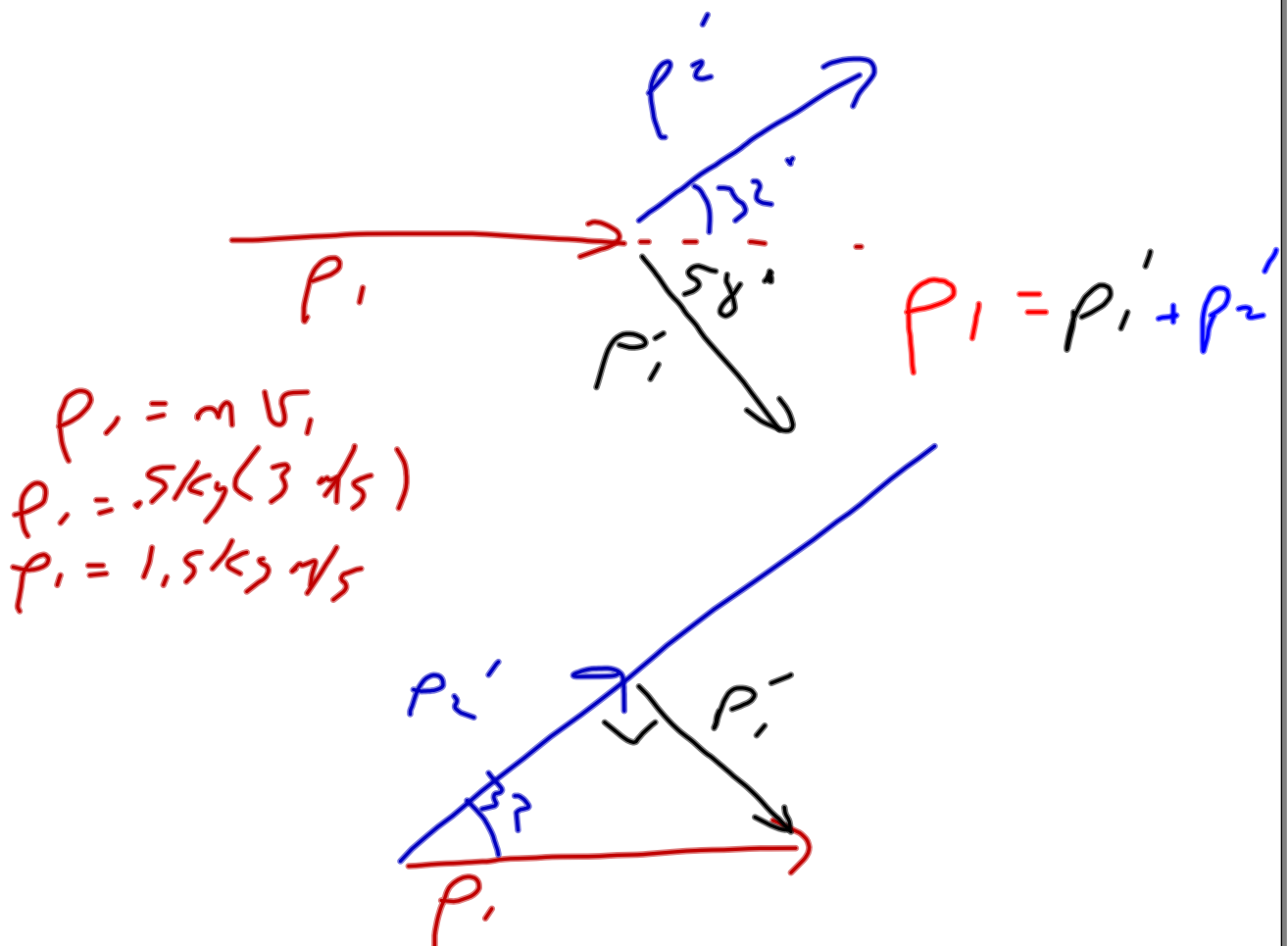
$$m v_1 = m v_1' + m v_2'$$

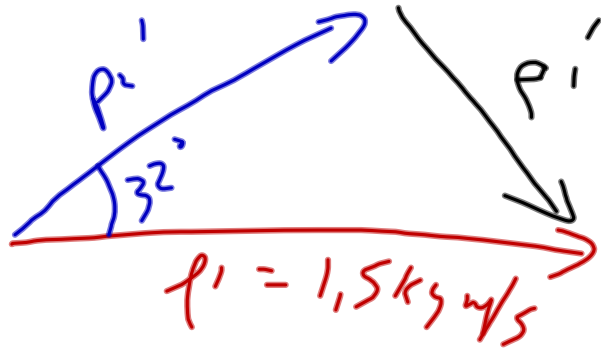
$$p = c_1 + c_2$$



ex |

A 500 g cue ball traveling at 3.0 m/s strikes a 500 g stationary #2 ball. After the collision the #2 ball takes off at 32 degrees above its original position.





$$\cos 32 = \frac{p_2'}{1.5 \text{ kg m/s}}$$

$$p_2' = \cos 32 (1.5 \text{ kg m/s})$$

$$p_2' = 1.27 \text{ kg m/s}$$

$$p_2' = m v_2'$$

$$v_2' = \frac{p_2'}{m_2} = \frac{1.27 \text{ kg m/s}}{.5 \text{ kg}}$$

$$v_2' = 2.54 \text{ m/s}$$

$$\sin 32 = \frac{p_1'}{1.5 \text{ kg m/s}}$$

$$p_1' = \sin 32 (1.5 \text{ kg m/s})$$

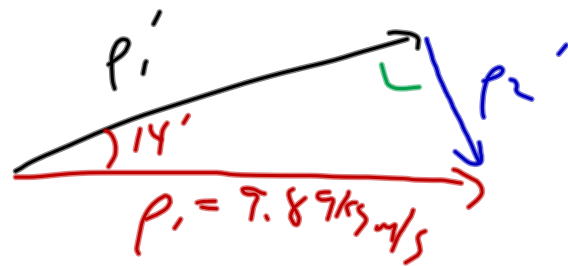
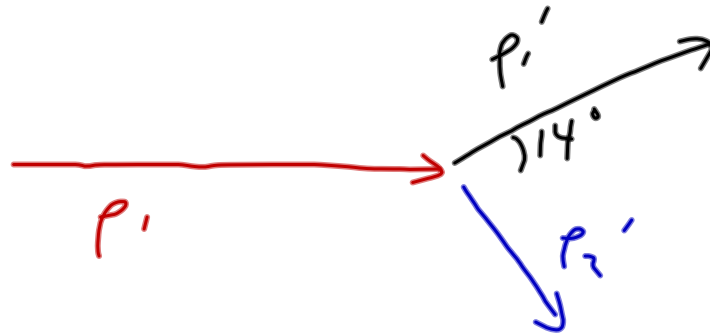
$$p_1' = .79 \text{ kg m/s}$$

$$p_1' = m v_1'$$

$$v_1' = \frac{p_1'}{m} = \frac{.79 \text{ kg m/s}}{.5 \text{ kg}}$$

$$v_1' = 1.58 \text{ m/s}$$

A 2.3 kg ball traveling at 4.3 m/s strikes a stationary ball of 2.9 kg. What are the respective velocities of each ball if the 1st ball takes off at a 14 degree angle after they strike?



$$p_1 = m v_1$$

$$p_1 = 2.3 \text{ kg} (4.3 \text{ m/s})$$

$$p_1 = 9.89 \text{ kg} \cdot \text{m/s}$$

$$p_1' = \cos 14 (9.89 \text{ kg} \cdot \text{m/s})$$

$$p_1' = 9.60 \text{ kg} \cdot \text{m/s}$$

$$v_1' = \frac{p_1'}{m} = \frac{9.60 \text{ kg} \cdot \text{m/s}}{2.3 \text{ kg}} = \underline{4.2 \text{ m/s}}$$

$$p_2' = \sin 14 (9.89 \text{ kg} \cdot \text{m/s})$$

$$p_2' = 2.39 \text{ kg} \cdot \text{m/s}$$

$$v_2' = \frac{p_2'}{m_2} = \frac{2.39 \text{ kg} \cdot \text{m/s}}{2.9 \text{ kg}}$$

$$v_2' = \underline{0.83 \text{ m/s}}$$

What force is applied to a 6.2 kg head traveling at 78 km/hr if it stops in 0.083 s?

$$m = 6.2 \text{ kg}$$

$$v = 78 \text{ km/hr}$$

$$22 \text{ m/s}$$

$$t = 0.083 \text{ s}$$

$$F = ?$$

$$a = ?$$

$$d = ?$$

$$Ft = mv$$

$$F = mv/t = 6.2 \text{ kg}(22 \text{ m/s})/0.083 \text{ s}$$

$$Fv = 1600 \text{ N}$$

$$a = \frac{F}{m} = \frac{-1600 \text{ N}}{6.2 \text{ kg}}$$

$$a = -260 \text{ m/s}^2$$

$$a = \frac{\Delta v}{t} = \frac{0 - 22 \text{ m/s}}{0.083 \text{ s}}$$

$$a = -260 \text{ m/s}^2$$

$$d = \bar{v} t$$

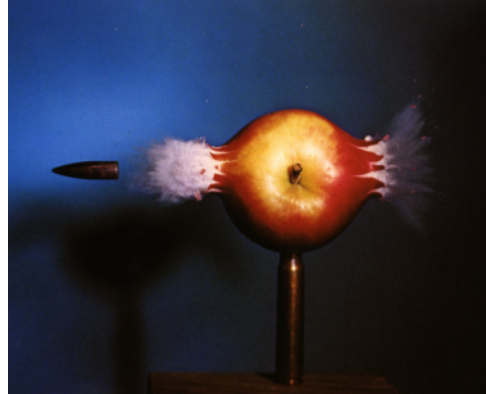
$$d = 11 \text{ m/s} (0.083) = \underline{.91 \text{ m}}$$

$$d = \frac{1}{2} a t^2 = \frac{1}{2} (260 \text{ m/s}^2) (0.083 \text{ s})^2 = \underline{.90 \text{ m}}$$

$$d = \frac{v_2^2 - v_1^2}{2a} = \frac{0 - (22 \text{ m/s})^2}{2(260 \text{ m/s}^2)} = \underline{.93 \text{ m}}$$

What impulse does an apple give a 45 g bullet traveling at 424 m/s if it slows it to 380 m/s as hits and exits the unfortunate apple?

$m = 45 \text{ g}$   
 $v_1 = 424 \text{ m/s}$   
 $v_2 = 380 \text{ m/s}$   
 $Ft = ?$   
 dia. of apple is 11.0 cm  
 $F = ?$



$$Ft = \Delta m v$$

$$Ft = .045 \text{ kg} (380 \text{ m/s} - 424 \text{ m/s})$$

$$Ft = -1.98 \text{ kg} \cdot \text{m/s}$$



$$d = \bar{v} t$$

$$t = \frac{d}{\bar{v}} = \frac{.11 \text{ m}}{\left( \frac{424 \text{ m/s} + 380 \text{ m/s}}{2} \right)}$$

$$t = .000272$$

$$Ft = m \Delta v$$

$$F = \frac{m \Delta v}{t} = \frac{1.98 \text{ kg} \cdot \text{m/s}}{.000272 \text{ s}}$$

$$\underline{F = 7300 \text{ N}}$$