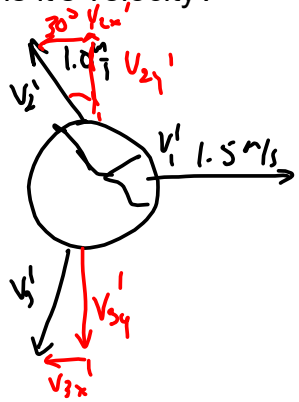
Homework:

A plate is dropped on the floor and shatters into three pieces. The first piece (m=50 g) slides to the right across the floor at 1.5 m/s. The second piece (m=150 g) slides at 120^0 to the first piece at 1.0 m/s. The third piece has a mass of 300 g - what is it's velocity?

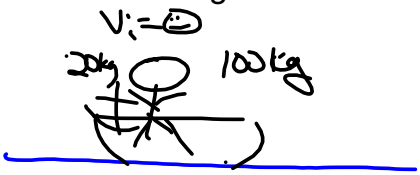


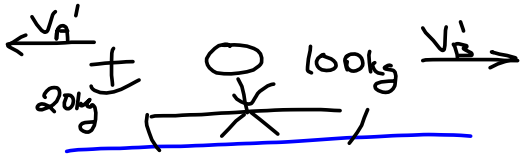
$\Sigma \vec{p} = \Sigma \vec{p}'$

Relative Velocities

- Frames of Reference

Let's assume a person can throw a 20 kg anchor at a speed of 5 m/s. If we put them in a boat (assume total mass of person and boat is 100 kg), how fast will the person and boat be travelling after the anchor is thrown?





$v_A' + v_B' = 5 \qquad |\vec{v}_A - \vec{v}_B| = 5\ \frac{m}{s}$

$v_A' = 5 - v_B'$

$\odot: \Sigma \vec{p} = \Sigma \vec{p}'$

$= m_B v_B' - m_A v_A'$

$20kg(5 - v_B') = 100kg(v_B')$

$100 = 120 v_B'$

$v_B' = 0.83\ \frac{m}{s}$ forward

$v_A' = 5 - 0.83 = 4.17\ \frac{m}{s}$ backwards

A person (m=60 kg) is stuck on ice (μ=0). If they have two boots (each with a mass of 2 kg) and can throw them at a speed of 10 m/s each, would they be better to throw them simultaneously or individually (which would result in a greater speed for the person)?

Both boots together

$v_B' = 10 - v_A'$

$$\Sigma p = \Sigma p'$$

$$0 = m_B v_B - m_A v_A$$

$$0 = 4(10 - v_A') - 60 v_A'$$

$$64 v_A' = 40$$

$$v_A' = 0.625 \text{ m/s}$$

One boot then the other

1st boot

$v_B' = 10 - v_A'$

$$\Sigma p = \Sigma p'$$

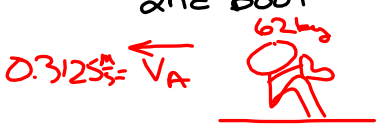
$$0 = m_B v_B' - m_A v_A'$$

$$0 = 2(10 - v_A') - 62 v_A'$$

$$64 v_A' = 20$$

$$v_A' = 0.3125 \text{ m/s}$$

2nd boot



$v_B' = 10 - v_A'$

$$\Sigma p = \Sigma p'$$

$$62(-0.3125) = m_B v_B' - m_A v_A'$$

$$-19.375 = 2(10 - v_A') - 60 v_A'$$

$$= 20 - 62 v_A'$$

$$62 v_A' = 39.375$$

$$v_A' = 0.635 \text{ m/s}$$

Homework: Sheet # 2,3 , Text p.513, # 38
Work on problem set: due TBA