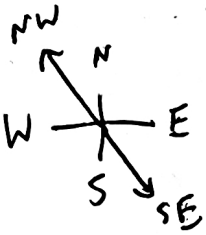
e. What type of collision is this? How do you know?

Explosion



3. Two barges full of salted toad guts have a collision. The red barge has a mass of 150,000 kg and is traveling Northwest at 0.25 m/s. The blue barge has a mass of 100,000 kg and is traveling Southeast at 0.1 m/s. After the collision the blue barge has a velocity of 0.32 m/s to the Northwest.

a. What is the final velocity of the red barge?

North west positive

South east Negative

0.03 m/s South east

b. Is this collision elastic?

Yes KE stayed the same

4. A firework is shot up in the air and comes to rest at the top of its arc before it begins falling back down. It explodes at this point and separates, with Piece 1 (1.5 kg) flying upwards and Piece 2 (4 kg) flying downwards. Piece 2 moves at -18 m/s after the collision.

a. What is the initial momentum of the system?

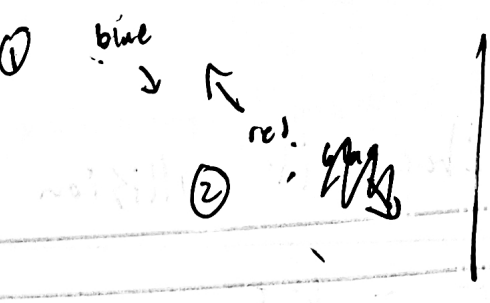
$p_0 = 0$

b. What is the final momentum of the system?

$p_f = 0$

Conservation of momentum

3]



$p_0 = p_f$ (initial, final)

$m_1 v_{01} + m_2 v_{02} = m_1 v_{f1} + m_2 v_{f2}$

m_{red} $v_{initial\ red}$

(knowns)

① blue
$m_1 = 100{,}000$ kg
$v_{01} = -0.1$ m/s
$v_{f1} = 0.32$ m/s

② red
$m_2 = 150{,}000$ kg
$v_{02} = 0.25$ m/s
$v_{f2} = ?$

Find v_{f2} final velocity red barge

$m_1 v_{01} + m_2 v_{02} = m_1 v_{f1} + m_2 v_{f2}$

$(100{,}000\text{ kg})(-0.1) + (150{,}000)(0.25) = (100{,}000)(0.32) + (150{,}000)\, v_{f2}$

$-10{,}000\ \text{kg m/s} + 37{,}500\ \text{kg m/s} = 32{,}000\ \text{kg m/s} + (150{,}000)\, v_{f2}$

$-4{,}500\ \text{kg m/s} = (150{,}000)\, v_{f2}$

$v_{f2} = -0.03$ m/s

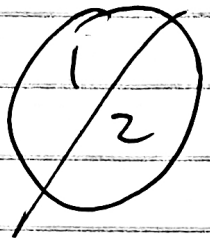
0.03 m/s Southeast

b) elastic bounce - momentum conserved
kinetic energy also conserved

Elastic

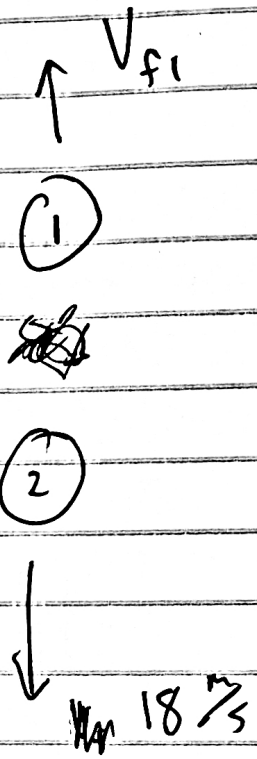
energy

4)



$V_0 = 0$

$p_0 = 0$



$p_0 = p_f$ $\quad m_1 V_{01} + m_2 V_{02} = m_1 V_{f1} + m_2 V_{f2}$

knowns

$m_1 = 1.5$ kg $\quad$ f

$V_{01} = 0$

$V_{f1} = ?$

$m_2 = 4$ kg

$V_{02} = 0$

$V_{f1} = -18$ m/s

a) $p_0 = 0$ kgm/s $\quad$ not moving $V = 0$

b) $p_f = 0$ $\quad$ conservation of momentum

Name: _____

to check if collision is elastic

$KE_0 = KE_f$ Calulate KE_0 Calulate KE_f

$KE_0 = \frac{1}{2}M_1V_{0_1}^2 + \frac{1}{2}M_2V_{0_2}^2$

$= \frac{1}{2}(100{,}000)(-0.1\%)^2 + \frac{1}{2}(150{,}000)(0.25)^2$

$500\ J + 4687.5\ J$

$= 5187.5\ J$

$KE_f = \frac{1}{2}M_1V_{f1}^2 + \frac{1}{2}M_2V_{f2}^2$

$= \frac{1}{2}(100{,}000)(0.32)^2 + \frac{1}{2}(150{,}000)(-0.03)^2$

$5120 + 67.5$

$= 5187.5\ J$

yes! KE conserved