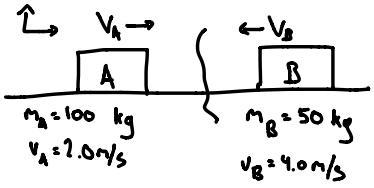


Momentum +200 −200

0

Energy $E_i \neq E_f$

$\frac{1}{2}m_a v_a^2 + \frac{1}{2}m_b v_b^2 = 0$

$200 + 400 \neq 0$

$600 \neq 0$

$\Delta KE = 0 - 600 = -600J$

Collision

Inelastic — Momentum conservation (Energy not cons.)

- perfectly inelastic (stick together)

Elastic — Momentum cons. (K. Energy cons.)

Elastic
① $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$
② $\frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2 = \frac{1}{2}m_1v_1'^2 + \frac{1}{2}m_2v_2'^2$
X ③ $v_1 - v_2 = -(v_1' - v_2')$ Relative Velocity Equation

Given $v_1 = 15$ m/s $v_2 = -15$ m/s $m_1 = 1800$kg $m_2 = 900$kg

Find a) v_f b) ΔKE

Solve a) $m_1v_1 + m_2v_2 = (m_1+m_2)v_f$

$v_f = \frac{(1800)(15)+(900)(-15)}{(900+1800)}$

$v_f = \boxed{5.0 \text{ m/s}}$

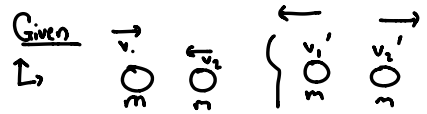
b) $KE_i = \frac{1}{2}m_1v_1^2 + \frac{1}{2}m_2v_2^2$ $KE_f = \frac{1}{2}v_f^2(m_1+m_2)$

$= (900)(15)^2 + (450)(15)^2$ $= \frac{1}{2}(5)^2(2700)$

$= 303750J$ $= 33750J$

$\Delta KE = 33750 - 303750 = \boxed{-270000J}$

Given $v_1 = 30$ cm/s $v_2 = 20$ cm/s



Find a) v_1', v_2'

Solve a) $m_1v_1 + m_2v_2 = m_1v_1' + m_2v_2'$

$30 + (-20) = v_1' + v_2'$

$10 = v_1' + v_2'$ ⟷

$60 = 2v_2'$

$\boxed{v_2' = 30 \text{ m/s}}$

$v_1 - v_2 = -(v_1' - v_2')$

$30 - (-20) = v_2' - v_1'$

$50 = v_2' - v_1'$

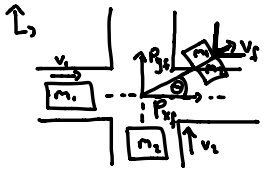
$50 = (30) - v_1'$

$\boxed{v_1' = -20 \text{ m/s}}$

Given $m_1 = 1500kg$ $m_2 = 2500kg$
$v_1 = 25m/s$ $v_2 = 20m/s$

Solve a) $m_1v_1 = (m_1+m_2)\cos\theta v_f$

x P_{xi} P_{xf}



y P_{yi}

$m_2v_2 = (m_1+m_2)v_f\sin\theta$

$\frac{m_1v_1}{\cos\theta} = \frac{m_2v_2}{\sin\theta}$

$\tan\theta = \frac{m_2v_2}{m_1v_1}$

$\theta = \tan^{-1}\left(\frac{2500\cdot 20}{1500\cdot 25}\right)$

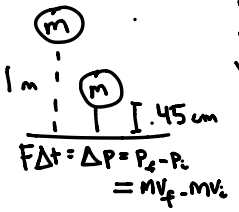
$\theta = 53.1°$

$v_f = \frac{m_1v_1}{(m_1+m_2)\cos\theta}$

$= \frac{1500\cdot 25}{(4000)\cos(53.1)}$

$v_f = 15.6m/s$

Find a) v_f, θ



$V = \sqrt{2gh}$

$V_i = \sqrt{2(9.8)(1)}$

$V_f = \sqrt{2(9.8)(.45)}$

$F\Delta t = \Delta P = P_f - P_i$

$= mV_f - mV_i$