§10-4 Collisions + Explosions

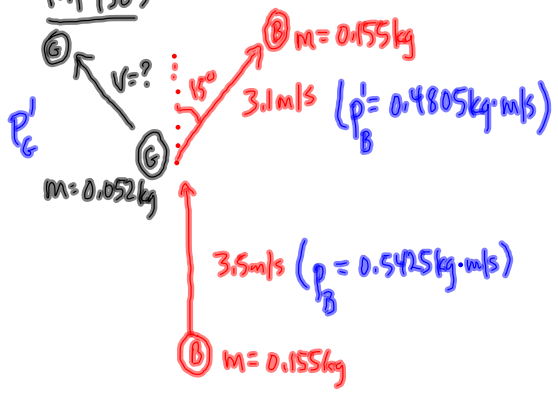
RECALL: Law of Conservation of Momentum

$$\vec{P}_{total} = \vec{P}'_{total}$$ (neglecting any external forces during the collision i.e. isolated system)

$$\vec{P}_{x\,total} = \vec{P}'_{x\,total}$$

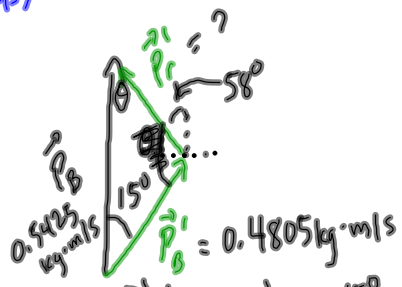
$$\vec{P}_{y\,total} = \vec{P}'_{y\,total}$$

MP1505



$$\vec{P}_{total} = \vec{P}'_{total}$$

$$\vec{P}_B = \vec{P}'_B + \vec{P}'_G$$



Law of Cosines

$$c^2 = a^2 + b^2 - 2ab\cos C$$

$$c^2 = (0.5425)^2 + (0.4805)^2 - 2(0.5425)(0.4805)\cos 15^\circ$$

$$c = 0.147\ \text{kg·m/s}$$

Law of Sines

$$\frac{0.4805}{\sin\theta} = \frac{0.147}{\sin 15^\circ}$$

$$\sin\theta = \frac{(0.4805)\sin 15^\circ}{0.147}$$

$$\theta = 58^\circ$$

The momentum of the golf ball after the collision is 0.147 kg·m/s [58° CCW from the original direction of the bill. ball]

$$\vec{v} = \frac{0.147\ \text{kg·m/s}}{0.052\ \text{kg}}\ [58^\circ \text{CCW} \ldots]$$

$$\vec{v} = 2.8\ \text{m/s}\ [58^\circ \text{CCW} \ldots]$$

MP|511

$m_1 = 6.0\,g$ 35° CCW to +x-axis 42 m/s ($p = 252\ g\cdot m/s$)

$m_2 = 11\,g$ 21° CW to −x axis 33 m/s ($p = 363\ g\cdot m/s$)

$m_3 = 8\,g$ ($p = ?$)

$25\,g$

$\vec{p}_2 = 363\ g\cdot m/s$ $\vec{p}_1 = 252\ g\cdot m/s$ $\vec{p}_3 = ?$

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

$0 = \vec{p}_1' + \vec{p}_2' + \vec{p}_3'$

OR use components this time:

BEFORE: $P_{x\,total} = 0$, $P_{y\,total} = 0$

AFTER:

	x	y
p_1	$252\cos 35^\circ$ 206.4	$252\sin 35^\circ$ 144.54
p_2	$-363\cos 21^\circ$ −339.9	$363\sin 21^\circ$ 130.09
p_3	x 132.5	y −274.63
P_{total}	0	0

$\vec{p}_1'$, $\vec{p}_2'$, $\vec{p}_3'$ could solve using vector addition

132.5, 274.6, θ, $\vec{p}_3'$

θ = ?? find

$c^2 = a^2 + b^2$

$c^2 = 132.5^2 + 274.6^2$

$c = 304.9\ g\cdot m/s$

$v = \frac{304.9\ g\cdot m/s}{8\ g}$

$v = 38\ m/s$

then state $\vec{v} = 38\ m/s$ [??]

TODO: PP|506

PP|513

Nov 4-2:40 PM