§10-4 Collisions + Explosions

Recall: momentum $\vec{p} = m\vec{v}$

Conservation of Momentum $\vec{P}_{total} = \vec{P}'_{total}$

(total momentum before) (total momentum after)

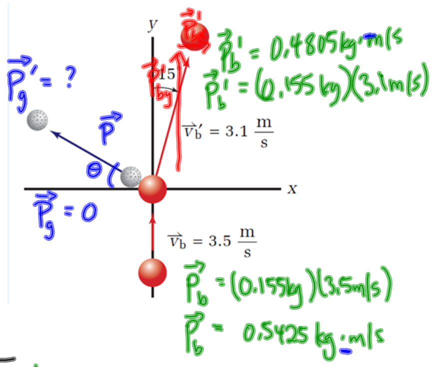
* In an isolated system (no friction)

MP | 505

$m_b = 0.155 kg$

$m_g = 0.052 kg$

Set up an x-y chart for before + after:



BEFORE

	x	y
P_b	0	+0.5425 kg·m/s
P_g	0	0
P_{total}	0	+0.5425 kg·m/s

AFTER

	x	y
P_b'	+0.4805 sin 15° kg·m/s	+0.4805 cos 15° kg·m/s
P_g'	x	y
P_{total}'	0	+0.5425 kg·m/s

Along the x-axis:

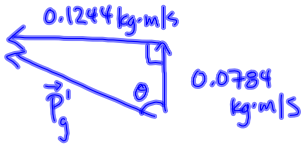
$(0.4805 kg\cdot m/s)\sin 15° + x = 0$

$x = -0.1244 kg\cdot m/s$

Along the y-axis:

$0.4805 \cos 15° + y = 0.5425 kg\cdot m/s$

$y = 0.0784 kg\cdot m/s$



$\tan\theta = \frac{0.1244}{0.0784}$

$\theta \doteq 57.8°$

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

$c^2 = (0.0784)^2 + (0.1244)^2$

$c = 0.147 kg\cdot m/s$

The momentum of the golf ball after the collision is:

0.147 kg·m/s [57.8° CCW from +y-axis]

$\vec{v} = \frac{0.147 kg\cdot m/s}{0.052 kg}$ [57.8° ccw from +y-axis]

$\vec{v} \doteq 2.8 m/s$ [58° CCW from +y-axis]

Alternative Solution (use a Momentum Vector Addition Di…

* USE ONLY IF one of the objects is at rest (do not use with more than 3 momentum vectors)

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

$\vec{P}_b = \vec{P}_b{}' + \vec{P}_g{}'$ ← draw a diagra… show additi…