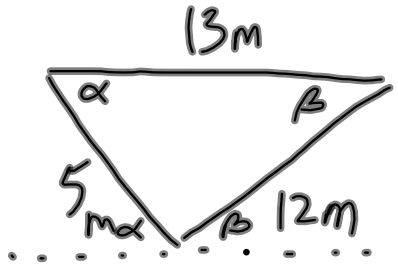

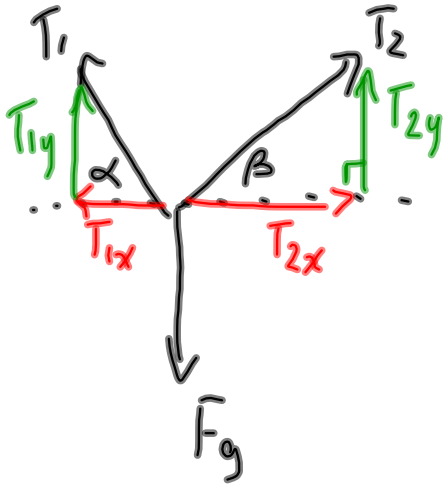

$c^2 = a^2 + b^2 - 2ab\cos C$

12^2 α

Horizontally: $T_{1x} = T_{2x}$

$$T_1 \cos\alpha = T_2 \cos\beta$$

Vertically: $T_{1y} + T_{2y} = F_g$

$$T_1 \sin\alpha + T_2 \sin\beta = F_g$$

Conservation of Momentum in 2D

- Recall that momentum was conserved in 1D (neglecting friction).
- Recall: $\vec{p} = m\vec{v}$

Law of Conservation of Momentum

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

total momentum before = total momentum after

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

$$P_{x\,total} = P_{x\,total}'$$

$$P_{y\,total} = P_{y\,total}'$$

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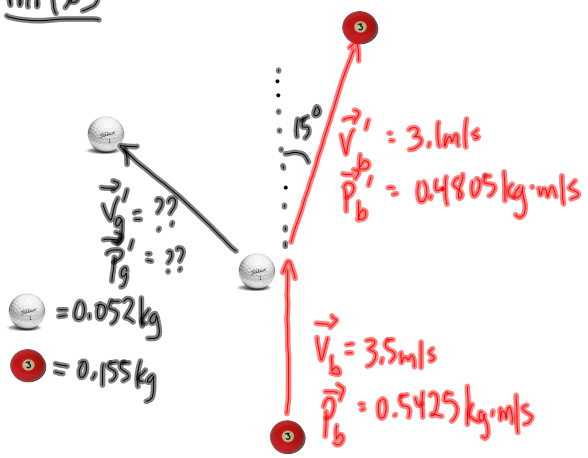


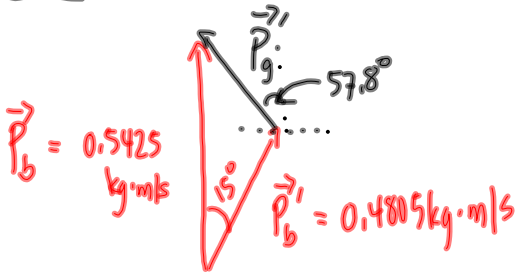
According to the Law of Conservation of Momentum:

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

$$\vec{P}_b + \vec{P}_g = \vec{P}_b' + \vec{P}_g'$$

$$\vec{P}_b = \vec{P}_b' + \vec{P}_g'$$

OPTION A - Draw a Vector Addition Diagram



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

$C^2 = (0.4805)^2 + (0.5425)^2 - 2(0.4805)(0.5425)\cos 15°$

$C = 0.147$ kg·m/s

$\frac{a}{\sin A} = \frac{b}{\sin B}$

$\vec{P}_g' = 0.147$ kg·m/s [57.8° CCW from original dir of bill. ball]

$\frac{0.147}{\sin 15°} = \frac{0.4805}{\sin\beta}$

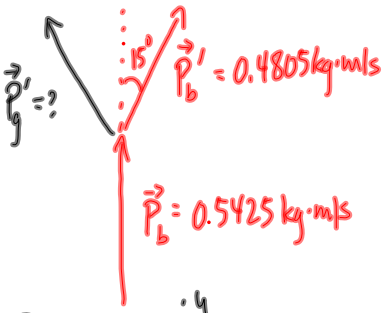
$\sin\beta = \frac{0.4805 \sin 15°}{0.147}$

$\beta = 57.8°$

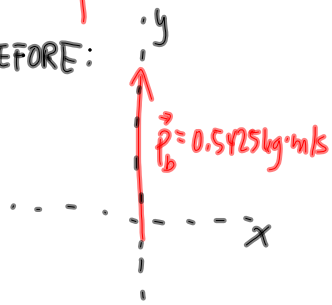
$\vec{V}_g' = \frac{0.147 \text{ kg·m/s}}{0.052 \text{ kg}}$ [57.8° ....]

$\vec{V}_g = 2.8$ m/s [58° ....]

OPTION B - use components (x-y chart BEFORE & AFTER)

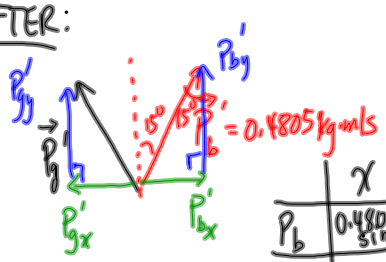


BEFORE:



	x	y
p_b	0	0.5425
p_g	0	0
p_{total}	0	0.5425

AFTER:



	x	y
p_b	$0.4805 \sin 15°$	$0.4805 \cos 15°$
p_g	x	y
p_{total}	0	0.5425

x-components:

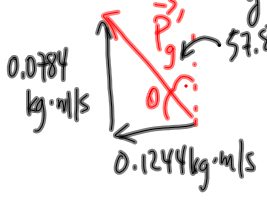
$0.4805 \sin 15° + x = 0$

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

y-components:

$0.4805 \cos 15° + y = 0.5425$

$y = 0.0784\ kg\cdot m/s$



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

$\vec{p}_g' = 0.147\ kg\cdot m/s$

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

$\theta = 32.2°$

Same answer as before.

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