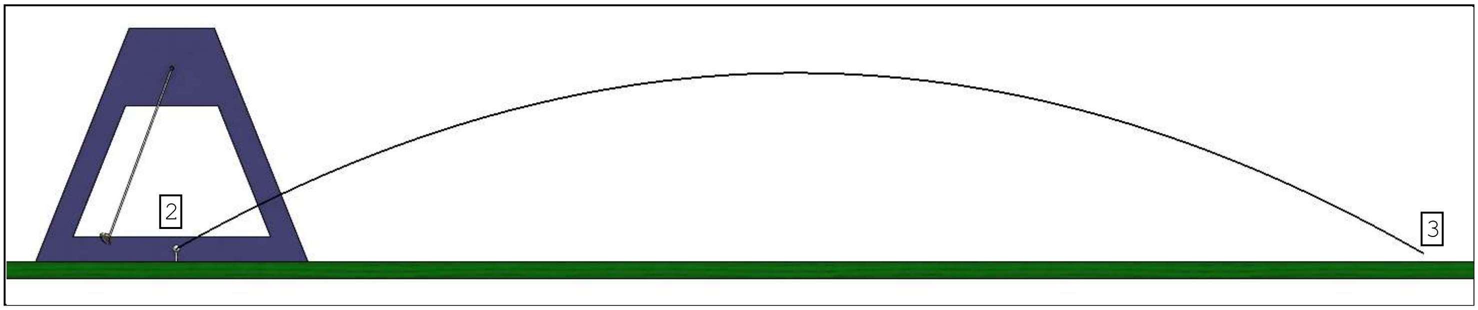
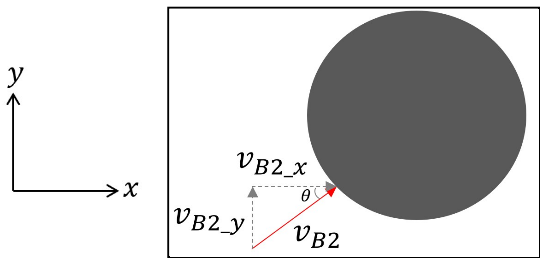
In order to ensure that the ball enters the hole, we have to perform kinematics calculations to determine the initial velocity of the ball. After this, we will perform momentum calculations similar to what is found in "Golf Problem.pdf" to find the RPM of the golf club.

1. Projectile Motion Problem:

First, we will find the initial velocity that the golf ball needs to launch at. Since we know the distance between the tee and the hole, as well as the angle of the line of impact, we can calculate the required velocity of the ball.

NOTE: In order to prevent confusion, the time right after impact is assigned the number '2', whereas the time at which the ball reaches the hole is assigned '3'. These numbers are seen within the subscript of the velocity variables.





Listed below, equations <1>,<2>, & <3> are the 3 main equations used for kinematics and projectile motion. Equation <4> is similar to equation <1>, but is taken in the x-direction. Equations <5> and <6> help us break down the velocity of the ball into its x and y components.

$$\boxed{\Delta y := v_{B2\_y} \cdot t + \frac{1}{2} \cdot g \cdot t^2} \quad \text{<1>}$$

$$\boxed{v_{B3\_y} := v_{B2\_y} + g \cdot t} \quad \text{<2>}$$

$$\boxed{v_{B3\_y} := \pm \sqrt{v_{B2\_y}^2 + 2 \cdot g \cdot y}} \quad \text{<3>}$$

$$\boxed{\Delta x := v_{B2\_x} \cdot t} \quad \text{<4>}$$

$$\boxed{v_{B2\_x} := v_{B2} \cdot \cos(\theta)} \quad \text{<5>}$$

$$\boxed{v_{B2\_y} := v_{B2} \cdot \sin(\theta)} \quad \text{<6>}$$

Known Variables:

$\Delta x := 9 \text{ m}$

$g := 9.81 \frac{\text{m}}{\text{s}^2}$

$\Delta y := 0 \text{ m}$

$\theta := 30 \text{ deg}$

Unknown Variables:

v_{B3_x}

v_{B3_y}

t

From equation <3> we can solve:

$$v_{B3\_y} := \pm v_{B2\_y} \quad \text{<3.1>}$$

However since we know that the ball is initially shot up and then falls downward we know:

$$v_{B3\_y} := - v_{B2\_y} \quad \text{<3.2>}$$

Rearranging equation <2> and substituting in <3.2>, we find:

$$t := \frac{2 \cdot v_{B2\_y}}{g}$$ <2.1>

From here we can substitute <2.1> into <4> to find:

$$\Delta x := \frac{v_{B2\_x} \cdot 2 \cdot v_{B2\_y}}{g}$$ <4.1>

Substituting equation <5> and <6> into <4.1>, we can now see:

$$\Delta x := \frac{{v_{B2}}^{2} \cdot 2 \cdot \sin(\theta) \cdot \cos(\theta)}{g}$$ <4.2>

Rearranging this, we now have the final equation for the launch velocity of the ball:

$$\boxed{v_{B2} := \sqrt{\frac{\Delta x \cdot g}{2 \cdot \sin(\theta) \cdot \cos(\theta)}}} \qquad \Delta x := 9 \text{ m} \qquad g := 9.81 \frac{\text{m}}{\text{s}^2} \qquad \theta := 30 \text{ deg}$$

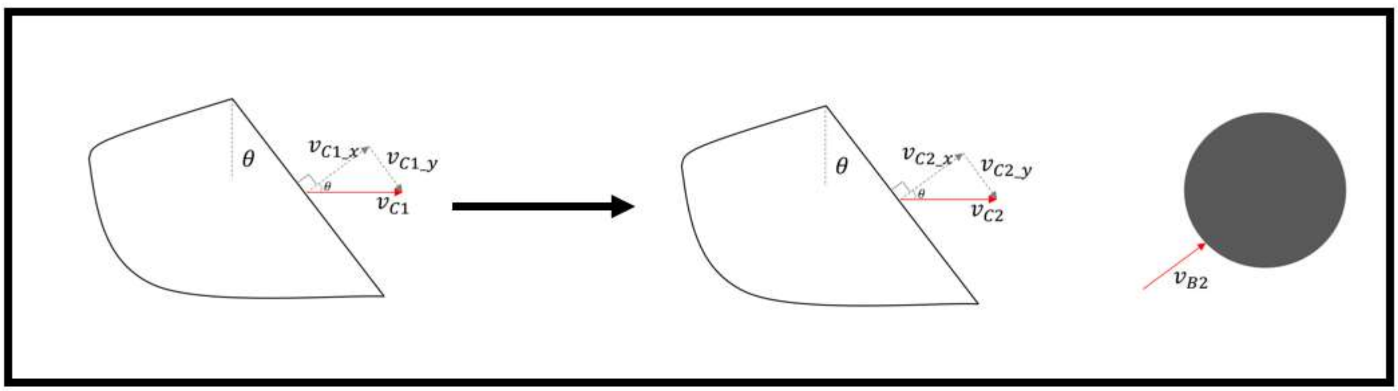
Solving this, we find the following solution:

$$v_{B2} = 10.097 \frac{\text{m}}{\text{s}}$$

2. Impact Problem:

Here, we will solve for the required RPM of the golf club to ensure the golf ball achieves the speed we just determined.

NOTE: In this problem, the x-direction is inclined by 30 degrees.



Using the equations previously derived on the "Golf_Problem.pdf", we have:

$$\boxed{e := \frac{v_{B2} - v_{C2\_x}}{v_{C1\_x} - v_{B1}}}$$ <1>

$$\boxed{m_C v_{C1\_x} + m_B v_{B1} = m_C v_{C2\_x} + m_B v_{B2}}$$ <2>

$$\boxed{v_{C1\_x} := v_{C1} \cdot \cos(\theta)}$$ <3>

Known Variables:

$e := 0.8$

$v_{b1} := 0 \frac{\text{m}}{\text{s}}$

$m_C := 1.49351 \text{ kg}$

$m_B := 0.04590 \text{ kg}$

$r := 1.088 \text{ m}$

Unknown Variables:

v_{C1_x}

v_{c2_x}

ω

Plugging in the known variables into <2>, we have:

$$(1.49351\,kg)\cdot(v_{C1\_x})+(0.04590\,kg)\cdot(0\,m/s)=(1.49351kg)\cdot(v_{C2\_x})+(0.04590\,kg)\cdot(10.097\,m/s)$$

Solving and Rearranging this equation, we get:

$$v_{C1\_x} := v_{C2\_x} + 0.31031 \qquad \text{<2.1>}$$

Plugging in the known values into equation <1> we find:

$$v_{C1\_x} := \frac{10.097\ \frac{m}{s} - v_{C2\_x}}{0.8} \qquad \text{<1.1>}$$

Solving <2.1> and <1.1> we can solve for the clubs velocity in the x-direction before and after impact:

$$v_{C1\_x} := 5.782\ \frac{m}{s}$$

$$v_{C2\_x} := 5.472\ \frac{m}{s}$$

Converting the initial velocity of the club in the x-direction into linear velocity in the horizontal direction using <3>:

$$v_{C1} := \frac{v_{C1\_x}}{\cos(\theta)}$$

$$v_{C1} = 6.6765\ \frac{m}{s}$$

Since we have the velocity of the club before the impact we can turn this into the angular velocity:

$$\omega := \frac{v_{C1}}{r} = 6.1365\ \frac{rad}{s}$$

Finally, we can convert the angular velocity into the required RPM:

$$RPM := \omega\ \frac{60\ s}{1\ min}\ \frac{1\ rotation}{2\cdot\pi\ rad} = 58.599\ \frac{rotation}{min}$$