1. Measure and record the mass of the golf ball.  \( m_{\text{ball}} = \) _________kg

2. Measure and record the height, \( h \), of the yardstick.  \( h = \) _________m

3. Run several trials of the ball rolling down the track and into the cup. Record the average value of how far the cup slides.  \( d = \) _________m

4. What was the potential energy of the ball at height \( h \)?  
   \[ PE = \left( m_{\text{ball}} \times g \times h \right) \text{ J} \]

5. What was the kinetic energy of the ball right before it hit the cup?  
   \[ KE = (\text{same as } #4) \text{ J} \]

6. What was the velocity of the ball right before it hit the cup?  
   \[ V = \sqrt{\frac{2 \cdot KE}{m_{\text{ball}}}} \text{ m/s} \]

7. What was the ball’s momentum right before it hit the cup?  
   \[ \text{Momentum} = \left( m_{\text{ball}} \times V \right) \text{ kg m/s} \]

8. How much work did friction do to stop the cup?  
   \[ \text{Work from friction} = (\text{negative of } #4 \text{ and } #5) \text{ J} \]
   
   *Hint: The kinetic energy of the ball + the work done by friction should equal zero.*

9. Using the distance the cup slid, \( d \), and the work done by friction, what was the frictional force on the cup?  
   \[ \text{Force} = \left( \frac{#8}{d} \right) \text{ N} \]

### Energy of Motion Equations

**Potential Energy**  
\[ PE = m \times g \times h \]

**Kinetic Energy**  
\[ KE = \frac{1}{2} \times m \times V^2 \]
\[ V = \sqrt{\frac{2 \times KE}{m}} \]

**Momentum**  
\[ \text{Momentum} = m \times V \]

**Work and Force**  
\[ W = F \times d \]
\[ F = \frac{W}{d} \]

Where:
- \( m \) = mass
- \( g \) = gravity (9.81 meters/sec\(^2\))
- \( h \) = height
- \( V \) = velocity
- \( F \) = force
- \( d \) = distance