Forces in Free-Fall

\[ \Sigma F_x = 0 = ma_x \quad (a_x = 0) \]

\[ \Sigma F_y = ma_y \quad \text{Newton's 2nd law.} \]

\[ \frac{\Sigma F_y - F_g}{m} = -\frac{mg}{m} = \frac{ma_y}{m} \]

\[ a_y = -g \]

\[ -g = a_y \]
BALL NOT MOVING ON GROUND

\[ \sum F_x = \max \]
\begin{align*}
\text{Forces in x?} & \quad \text{accel. in x?} \\
\text{n.o.} & \quad \text{n.o.} \\
0 & = 0
\end{align*}

\[ \sum F_y = \max \]
\begin{align*}
\text{Forces in y?} & \quad \text{accelerations in y?} \\
\text{n.o.} & \quad \text{n.o.} \\
n + F_g & = 0 \\
n - mg & = 0
\end{align*}

Solve!

\[ n = mg \]
In equilibrium conditions, \( \Sigma F_x = 0 \)

\[ \Sigma F_y = m a_y = 0 \]

\[ n + T - mg = 0 \]

\[ n = mg - T \]
\[ F_g = -w = -9.8 \times 1.2 \approx 12 \text{N}. \]