THEORY

Consider a hanging (H) mass \( m \) attached to a sliding (S) mass \( M > m \) by means of a massless string and a massless pulley (as shown in the Figure below).

Provided there is no friction between the sliding mass and the horizontal surface on which it rests, the system acceleration is simply given as \( a = g \cdot \frac{m}{(m + M)} = g \cdot \mu \), where \( g_{th} = 9.806 \ldots \text{m/s}^2 \) denotes the near-Earth gravitational acceleration. Hence, by measuring the system acceleration \( a \) for various mass ratios \( \mu \), one can obtain an experimental value \( g_{exp} = \overline{g} \pm \sigma_g \) for the gravitational acceleration.

MATERIAL & PROCEDURE

- **Material**: air table set-up, sliding mass and various hanging masses, ruler
- **Procedure**
  - Record sliding mass \( M \) and time interval \( \Delta t \).
  - Suspend hanging mass \( m \) and record mass ratio \( \mu = m/(m + M) \).
  - Obtain record of position of a sliding mass versus time (raw data).

DATA ANALYSIS

- Using Excel, analyse raw data to obtain system acceleration.
- Combine system accelerations \( a \) and associated mass ratios \( \mu \) from the entire lab section.
- Plot acceleration \( a \) versus mass ratio \( \mu = m/(m + M) \).
- Calculate the experimental value for \( g_{exp} \).