Assignment #3: Conduct an experiment to determine the mathematical relationship, if any, between friction force and the weight of an objective. Report the results of the experiment using the format discussed previously.

[Based on our experience, we know that friction force is proportional to the weight of an objective whose motion it is opposing -- it is more difficult to push a full-size car like a cadillac off the road than a Volkswagan Beetle.]

Tools

You will have the following tools for your experiment:

- A 2” x 4” x 8” wooden block with a hook attached to one end
- A spring scale, 0-2 kg in increments of 50 g
- Various steel pieces of known weights
- EXCEL program
The proportionality constant between friction force and mass is the coefficient of static/kinetic friction, \( F = \mu_s W \) or \( F = \mu_k W \)

Coefficient of friction, \( \mu = \frac{F}{W} = \frac{F_1}{W_1} = \frac{F_2}{W_2} = \frac{F_3}{W_3} = \frac{F_4}{W_4} \ldots \) etc

A graph of \( F \) (y-axis) versus \( W \) (x-axis) will give a straight line with a slope equal to the coefficient of friction.
Due to the inherent nature of conducting an experiment, your data \([(F_1, W_1), (F_2, W_2), (F_3, W_3), (F_4, W_4), \ldots (F_n, W_n)]\) will not lie on a perfect straight line. It should, however, resemble a straight line with scatter in the data.

Perform linear regression to fit the best straight line through data points; slope = $\mu$. 

![Graph with data points and regression line with Force on y-axis and Weight on x-axis.](image-url)
Use EXCEL to Perform Linear Regression

1. Create EXCEL table for Force and Weight data;

2. Highlight data set;

3. Go to pull-down manual Tool, select Data Analysis and select Regression;

4. In “Input Y Range” give cell numbers depicting range separated by : of dependent variable, i.e., F, e.g., “b2:b6” if force data is listed in column b beginning in row 2 and ending in row 6;

5. In “Input X Range” give cell numbers depicting range separated by : of dependent variable, i.e., W, e.g., “a2:a6” if weight data is listed in column a beginning in row 2 and ending in row 6;

6. In Output Option” select “output range” and enter cell number where you wish EXCEL to place results of regression analysis, e.g., a7, if you want EXCEL to write results of regression beginning in cell a7;

7. Select “OK” to executive.