

Static Equilibrium - Hanging [NOTEBOOK LAB]

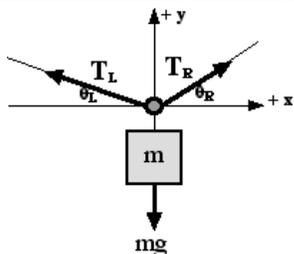
Objective:

Using the techniques discussed in class, the student will analyze 2 systems in static equilibrium and in doing so experimentally proving Newton's Second Law.

Background Information:

In any statics problem, we know that the sum of all forces is zero. In equation form, $\sum F = 0$. This includes all spatial directions as well ($\sum F_x = 0$ and $\sum F_y = 0$). In this experiment, two different systems in static equilibrium will be analyzed

System: Mass Suspended by two strings, angles unequal.



In the second system, a known mass will be suspended between 2 strings at unequal angles. The other ends of the strings will be attached to spring scales. Experimental tension values for each string will be measured from the spring scales. Accepted tension values of each string will be calculated from statics equations you will develop with your team.

These statics equations will be similar in structure to the various statics problems that have been worked on in class. These values (accepted and experimental) will then be compared in a percent of error approach.

n	Given mass (kg)	θ_L ($^\circ$)	θ_R ($^\circ$)	<u>measured</u> T_L (N)	<u>measured</u> T_R (N)	<u>calculated</u> T_L (N)	<u>calculated</u> T_R (N)	% error in T_L	% error in T_R
1	0.500								
2	0.500								
3	0.500								
4	1.00								
5	1.00								
6	1.00								

Calculation 1: a) Draw a free body diagram of the system in the space provided below.
b) Using the techniques discussed in class, derive 2 algebraic expressions, 1 each to calculate the right-sided tension T_R and the left-sided tension T_L . T_R and T_L are both functions of m , θ_R , θ_L , and g .

Calculation 2: Using the expressions derived in Calculation 1, complete Table 2

Calculation 3: Calculate the percent of error between the experimental values (spring scale) and the accepted values (your values from your algebraic expressions).

$$\% \text{ Error} = \frac{|\text{accepted value} - \text{experimental value}|}{\text{accepted value}}$$

Questions/Things you need to do individually:

Purpose (5pt)

Include

Data (10pt)

Print and attach the data tables into your notebook.

Calculations (10pt)

Show an example of how to calculate the tension and error

Results (5pt)

Explain the result. Make sure you include how they relate to the purpose of this lab.

Conclusions (5pt)

A normal conclusion.