# Hooke's Law Lab

SPH-4UI - Tristan Simpson

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## Purpose

The purpose of this lab was to determine the spring constant between different masses. This was done by utilizing the formula $F_s = \frac{x}{k}$

## Materials

1. **One of Each** 100g, 150g, 200g, 500g, 700g, 1000g Weights.
2. **One** Wooden Apparatus.
3. **One** Spring.
4. **One** Meter-stick.
5. **One** Clamp.

## Procedure

1. The wooden apparatus was clamped to the table such that the nail on it's end was facing downwards.
2. The spring was hooked to the nail on the wooden apparatus.
3. The initial stretch of the spring was measured and documented.
4. The smallest weight was attached to the bottom of the hanging spring.
5. As the weight comes to a rest, measure the distance from the top of the spring to it's bottom and document the result.
6. Repeat the above steps for the remaining weights.

# Observations

*Data provided by Ibrahim Khan*
The initial height of the spring was 52.3cm ($h$). This is used in finding $x$ with $h - h\prime$. The below table exhibits the groups observations during the experiment. Using this data we can calculate the spring constant between the different masses.

| Masses ($g$) | $height\prime$ ($cm$) | $F_s$ (N) | $x$ ($cm$) |
|---|---|---|---|
| 100g | 52.2cm | 0.9810 N | 0.1cm |
| 150g | 52.1cm | 1.4715 N | 0.2cm |
| 200g | 47.5cm | 1.9620 N | 0.5cm |
| 500g | 51.8m | 4.9050 N | 4.8cm |
| 700g | 42.7m | 6.8670 N | 9.6cm |
| 1000g | 37.8m | 9.810 N | 14.5cm |

# Calculations

To solve for the spring constant of this experiment a random row of data from the observations table was substituted into the formula: $F_s = \frac{x}{k}$

**Result:**

$$F_s = \frac{x}{k}$$

$$\therefore k = \frac{F_s}{x} = \frac{4.9050}{0.04800} \approx 102\frac{N}{m}$$

# Sources of Error

## Errors

1. The spring was overstretched and worn out.
2. The spring swayed, giving it components.
3. The spring was rusty.

## Solutions

1. This problem could be resolved by using a new spring.
2. This problem could be resolved by having an object hold the spring inplace.
3. This problem could be resolved by using a new spring.

## Conclusion

By the conclusion of this lab it was determined that the spring constant was approximately $102\frac{N}{m}$. The accuracy of this lab could have been improved by using multiple rows of data for determining the spring constant instead of just one.

## Synthesis

The learnings from this lab can be applied to numerous real-world scenarios. First, having a direct application to the experiment is the force exterted on a stapler's spring. Inside each stapler lies a spring that compressed and decompresses when it's user pushes on it. Secondly, similar to the stapler is a trampoline. Unlike the stapler the springs in a trampoline are far stronger and do not compress/decompress as easily. This is to compensate for the jumpers mass. Finally, also similar to the above implications are the springs inside a keyboard.