

Rationale

The reason why I performed this experiment is to investigate my data on how an angle between two springs, and how the length of the springs change in length. The purpose of this experiment is to further my knowledge and understanding on Hooke's law. Hooke's law is the 'displacement or size of the deformation is directly proportional to the deforming force or load. Under these conditions the object returns to its original shape and size upon removal of the load.' What I am trying to improve? I am trying to prove if the increase of weight decrease the angle thus proving Hooke's law.

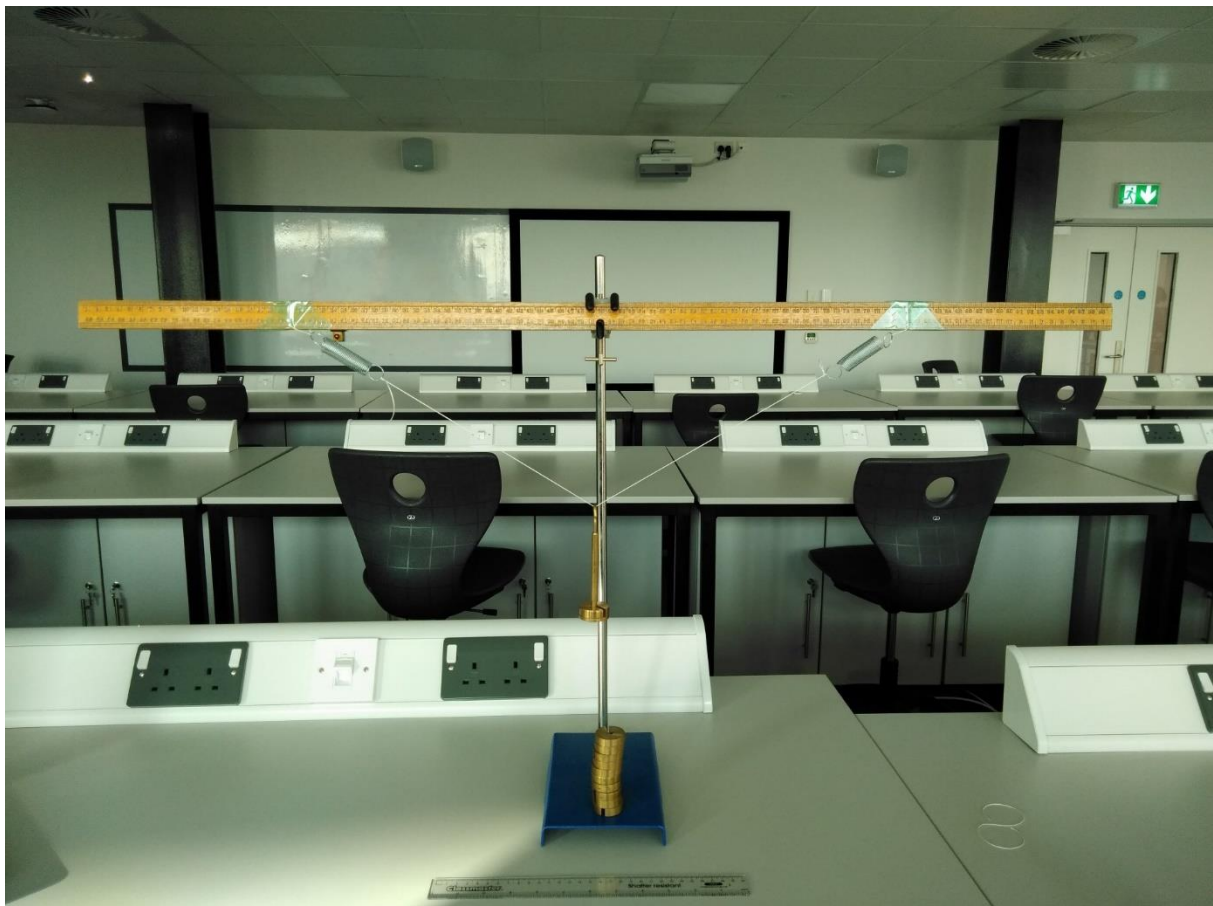
Apparatus set up and Method

In this experiment the equipment you'll need will be;

- 1m Ruler
- 2 Springs
- String
- 30cm Ruler
- Weights in 50g
- Clamp Stand
- Protractor
- Pen and Paper

Step 1

Set up the experiment as seen in the photo.



Step 2

You must write a table to record your readings. As shown in the example below.

									$\frac{M}{\cos\left(\frac{\theta_m}{2}\right)}$	
Mass(g)	Length 1 (cm)	Angle (°)	Length 2 (cm)	Length 1 (cm) ²	Angle (°) ²	Length 2 (cm) ²	LM(cm)	Θ Mean		
50										
100										
200										
300										
400										
500										
600										

Step 3

Place weight hanger on the string and measure first the length of the spring including the two loops and do the same with the other spring. Then measure the angle between the two strings. Repeat this process twice to get a more accurate result. Then record the results on the table. When measuring must make sure you measure from the same point every time.

Step 4

Place 50g weight on the weight hanger and repeat step 3. Measure in 100g and keep repeating this process until you reach 600g. When placing a new weight on the weight hanger it is crucial that the weight is static before measuring. Also when placing the weight hanger on the string it must be dead in the middle.

Results

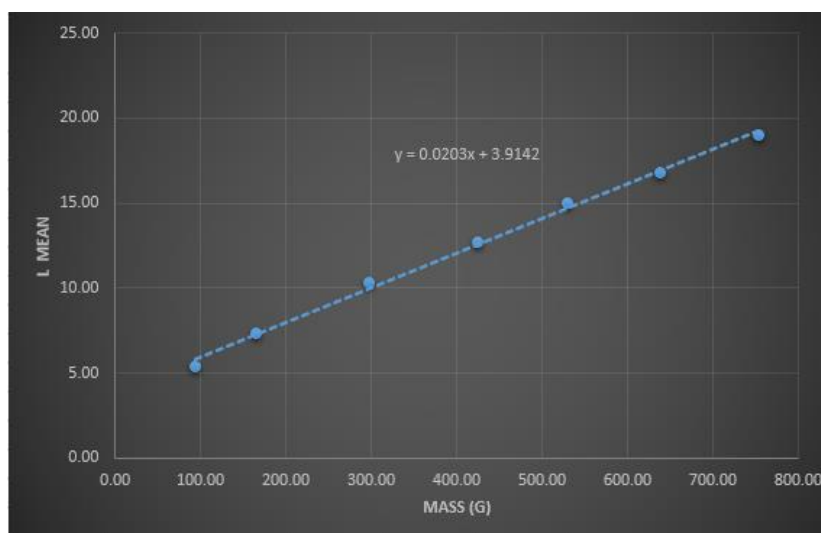
Once you've recorded all your data you must calculate L , the mean of your l_1 and l_2 values the mean value of θ . Once you've calculated out the means' you then must calculate each value of M therefore you must use the equation

$$\frac{M}{\cos\left(\frac{\theta_m}{2}\right)}$$

Mass(g)	Length	Angle (°)	Length	Length	Angle (°)	Length	LM(cm)	Θ Mea	$\frac{M}{\cos\left(\frac{\theta_m}{2}\right)}$
50	5.7	115	5.5	5.4	116	4.9	5.38	115.5	93.70
100	7.2	105	6.9	7.3	106	8	7.35	105.5	165.21
200	10.4	95	10.6	10	96	10.2	10.30	95.5	297.46
300	12.3	90	13.1	12.5	90	12.8	12.68	90	424.26
400	15	82	15.4	14.9	82	14.5	14.95	82	530.01
500	16.4	76	16.8	17.1	78	16.8	16.78	77	638.89
600	18.7	75	19.2	18.8	74	19.2	18.98	74.5	753.77

Once calculated the value of each M you must make a graph. Using L as the y axis and each value of M on the x axis. And draw a line of best fit.

I recommend using an excel spread sheet to calculate the means' to have accurate results and reduce the chance of any uncertainties.



Uncertainties

Uncertainties is the percentage of the weight, length and angle to be wrong. This helps the experimenter with his estimate value from the experimental quantity might be from the "true value."

weight	Length	Θ Angle
2	18.60465	0.865801
1	13.60544	0.947867
0.5	9.708738	1.04712
0.333333	7.889546	1.111111
0.25	6.688963	1.219512
0.2	5.961252	1.298701
0.166667	5.270092	1.342282

Conclusions

I believe that my results are accurate, this is proven by my graph. My line of best fit is straight and touches each dot therefore thus proving Hooke's law. The pattern from my data shows the increase in mass is proportional to the increase in length, as shown in my straight line graph. It shows the trend of the mass increased and the length of the springs increased at a similar rate. By using the equation $y=mx + c$, proves my line is straight,

$y = 0.0203x + 3.9142$. As my line of best fit touches every dot but does not go through the center of each dot, some are above the line and some are below, this is due systematic error when performing the experiment. If I could do this experiment again I would measure in 50g do have more data.