

# Spring Force Activity

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# 1 Setup

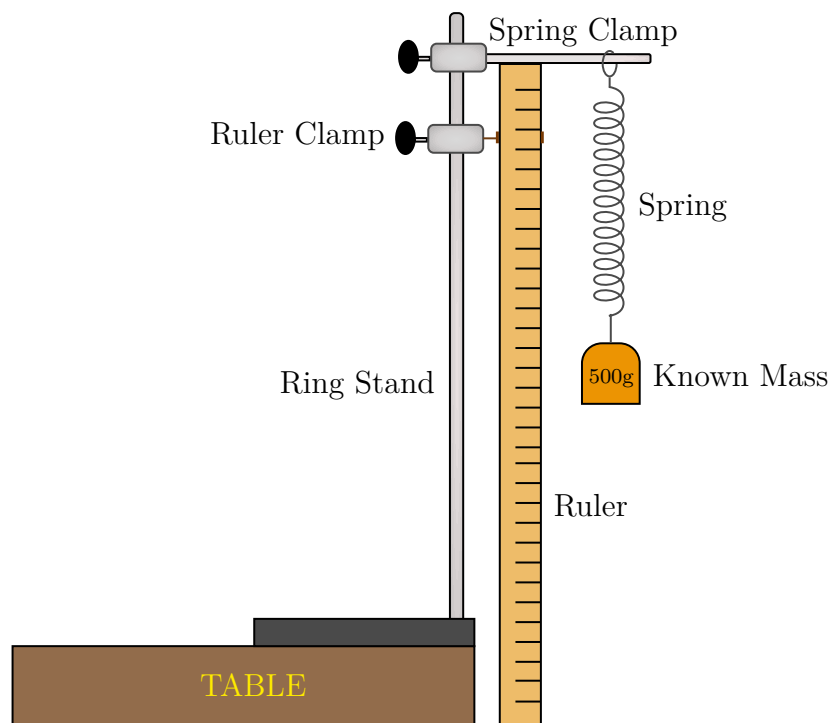


Figure 1: Setup Diagram

## 2 Observations

Table 1: Force and Displacement Data for Two Springs

Mass (kg)	Force (N)	Spring A Displacement (cm)	Spring B Displacement (cm)
0.20	1.96	2.20	0.270
0.40	3.92	10.3	0.450
0.60	5.67	19.1	0.920
0.80	7.85	28.1	1.43
1.0	9.81	37.6	1.91
1.2	11.8	45.1	2.40

### 3 Analysis

Figure 2: Force Vs. Displacement for Spring A

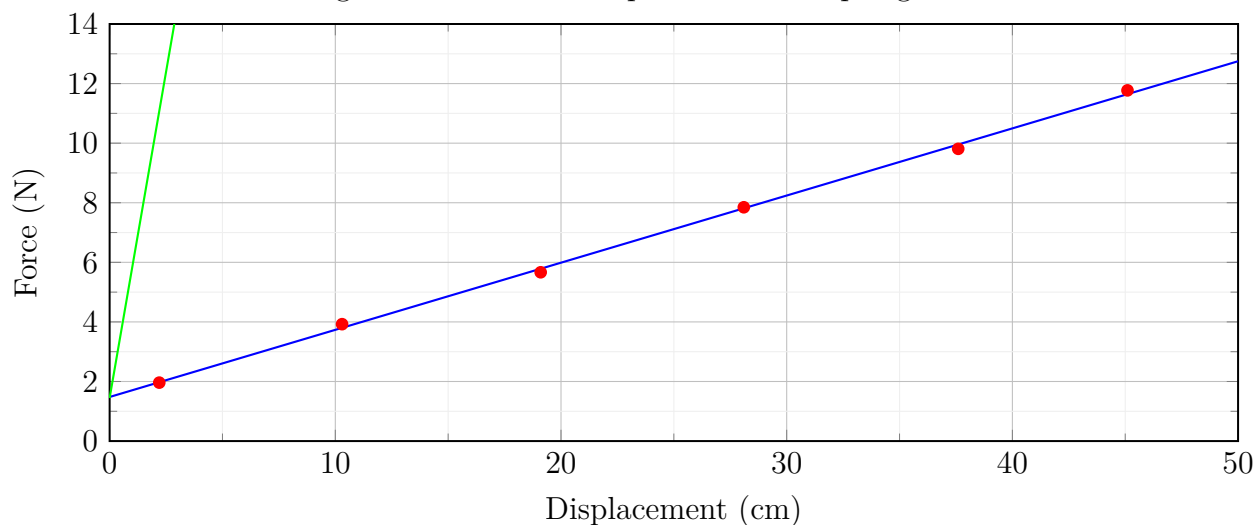
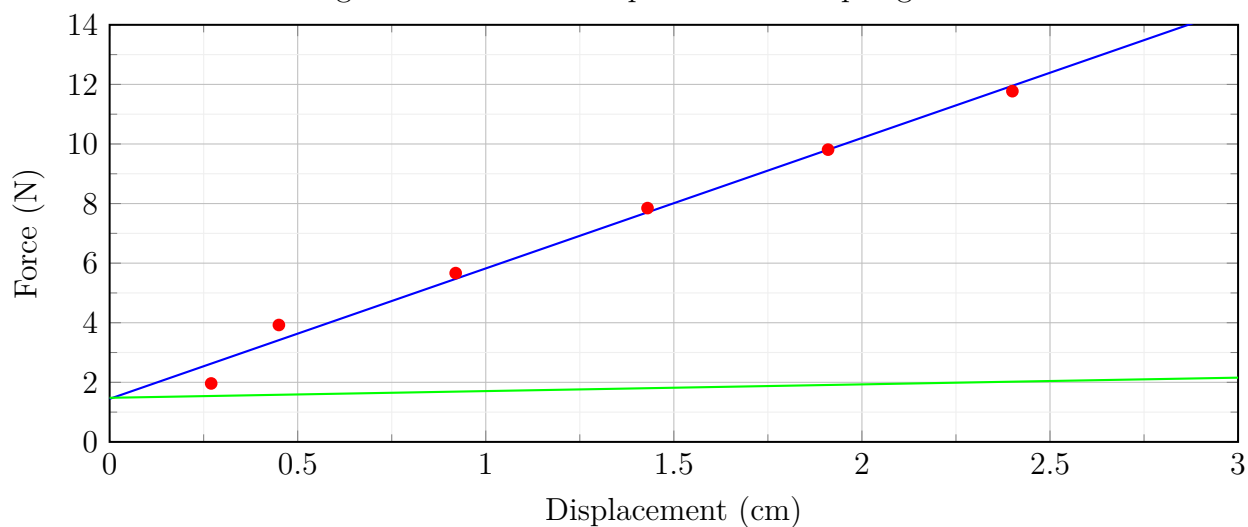


Figure 3: Force Vs. Displacement for Spring B



#### 1. Calculating Slope of Each Graph:

##### (a) Spring A

The trendline's equation for Spring A is:  $y = 0.225x + 1.48$

∴ The slope of the trendline is 0.225.

##### (b) Spring B

The trendline's equation for Spring B is:  $y = 4.38x + 1.44$

∴ The slope of the trendline is 4.38.

## 2. Relationship Between Force and Displacement:

There is a linear relationship between force and displacement, where force is directly proportional to displacement ( $\vec{F} \propto \vec{\Delta}d$ ).

## 3. Physical Quantity the Slope Represents:

The physical quantity the slope represents is the spring constant, which determines the stiffness of the spring. The two springs have different values because each spring has a different spring constant, where a higher slope value represents a stiffer spring. This holds true because Spring B has a larger slope than Spring A, meaning it is more stiff, evident through Spring B's smaller displacement values than Spring A.

## 4. Equation of Line from Proportionality Statement:

Let  $k$  represent the slope of the line.

$$\vec{F} = k\vec{\Delta}d$$

## 5. Properties of an "Ideal Spring":