Spring Force Activity

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1 Setup

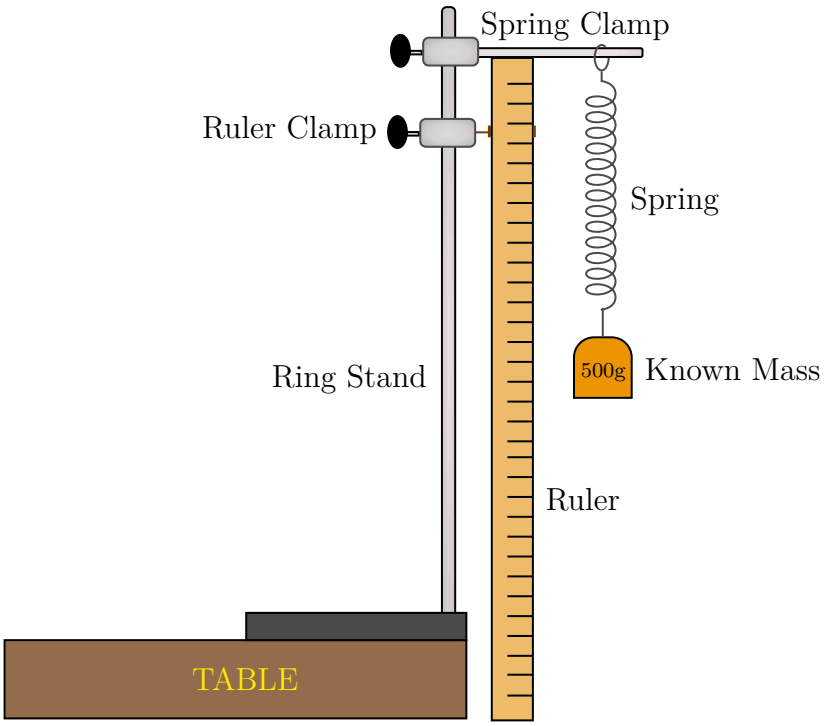


Figure 1: Setup Diagram

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

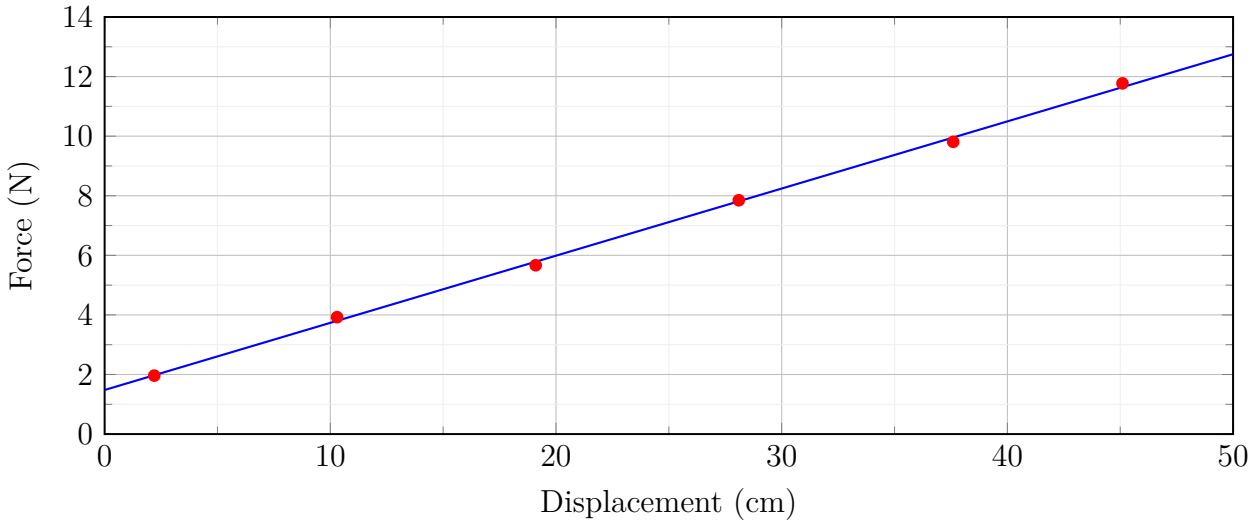
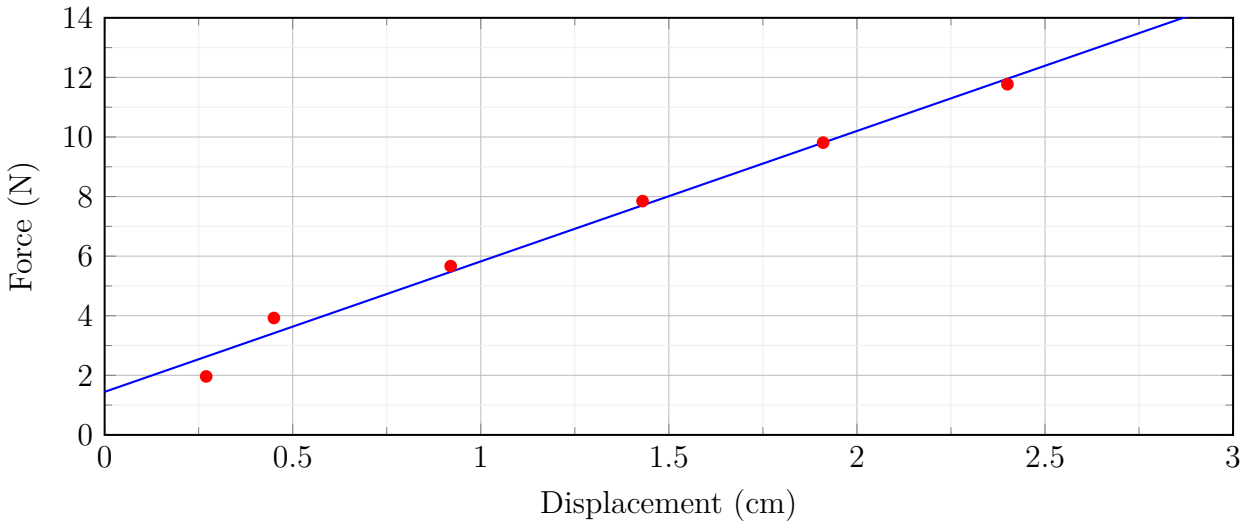


Figure 3: Force Vs. Displacement for Spring B



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

   (a) Spring A

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

   $\therefore$ The slope of the trendline is 0.225.

   (b) Spring B

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

   $\therefore$ 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 ($F \propto \Delta d$).

3. **Physical Quantity the Slope Represents:**

   The slope represents the spring constant, which physically determines the stiffness of the spring. The two springs have different slope 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.

   Let x represent the displacement (Δd) of the spring from equilibrium.

   $\boldsymbol{F = kx}$

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

   The properties of an ideal spring are that it is frictionless and massless. Additionally, an ideal spring should obey Hooke's Law which states that the force exerted by the spring is proportional to the displacement of the spring from its relaxed position.