Investigating Springs (Static and Dynamic)

As you work through the steps in the lab procedure, record your experimental values and the results on this worksheet. Use the exact values you record for your data to make later calculations.

Method I: Static Measurements

Record the position of the bottom of the mass holder on the ruler.

Complete the table for the measured values of y and Δl for each ΔM in Table 1.

Table 1

Trial	**ΔM (g)**	**y (cm)**	**Δl (cm)**
1	20		
2	30		
3	40		
4	50		
5	60		
6	70		

Convert your values of ΔM to kg and your Δl to meters and record in Table 2.

Table 2

Trial	ΔM **(g)**	Δl **(cm)**
1		
2		
3		
4		
5		
6		

Record the numerical value of the slope of the line in your Excel graph.

Calculate k_{I}, the force constant of the spring.

Method II: Dynamic Measurements

Record the mass of the mass holder.

Complete the table.

Table 3

Slotted Mass (g)	$\boldsymbol{M}$ **(g)**	$\boldsymbol{M}$ **(kg)**	$\boldsymbol{t_{10(1)}}$ **(s)**	$\boldsymbol{t_{10(2)}}$ **(s)**	$\boldsymbol{T}$ **(s)**
40					
50					
60					
70					
80					
90					

Open Excel and plot T (in seconds) versus M (in kg). Does your data fall close to a straight line?

Calculate the slope of the straight line that is the best fit to your data on the T^2 (in s^2) versus M (in kg) graph.

Calculate k_{II}, the force constant of the spring.

Record the percentage difference for your two values of k. (Do not enter units for this answer.)

Determining the Effect of Using a *Real* Spring

For your T^2 vs. M graph from Method II, record the y-intercept of the straight line that best fits your data.

From the value of the y-intercept and the value of the force constant k from Method II, calculate m_{eff} (the effective mass of the spring).

Use the value of m_{spring} you measured with the balance to calculate $\frac{m_{\text{spring}}}{3}$.

Calculate the percentage difference between your results for m_{eff} and $\frac{m_{\text{spring}}}{3}$. (Do not enter units for this answer.)