Jack Parham
Partner- Nick St. Pierre
Bungee Lab 1

Experiment Summary- In our lab, we attempted to find out whether or not the K value of the bungee cord was constant. This was very important to us because if the K value of the bungee cord is constant, we can therefore treat the bungee cord as an ideal spring. Of course, it seems to the average person using common sense alone that at longer cord lengths, the restoring force of a bungee cord seems lower. We decided to test to see if we could get an equation for how the K value changes with respect to the cord length. In our procedure, we used the same 100g mass and attached the mass to 9 different cord lengths. At each length, we measured the initial and final x position of the mass by hanging a tape measurer from the top of the apparatus. We then took this change in X and used it to get the K value of a spring. For an ideal spring $k\Delta x = mg$ to get k you therefore do the calculation $k = mg/\Delta x$. We did this for each cord length which meant we were able to find 9 different points each with their own K value. After graphing these results, we saw a parabolic curve representing how the K value changes with time. In figure #3 we see the equation of this line using a power fit trend line. ($y = 2.0339x^{-.923}$) This equation, in effect, is our experimental value of interest. It shows that the K value of a bungee cord decreases as the cord length increases. The equation of this inverse function can then be used to determine the K value at any given cord length. All you need to do is plug in a cord length for your X and the equation will give you the K value of the cord at that length. In the next part of our experiment, we can therefore choose any cord length that will work for the height of the drop and then find the K value at this cord length. We can then use the equations for the ideal spring at this given cord length making acceleration of the egg as well as the force exerted on the egg at the bottom of its trajectory easily accessible.

Experiment Design-

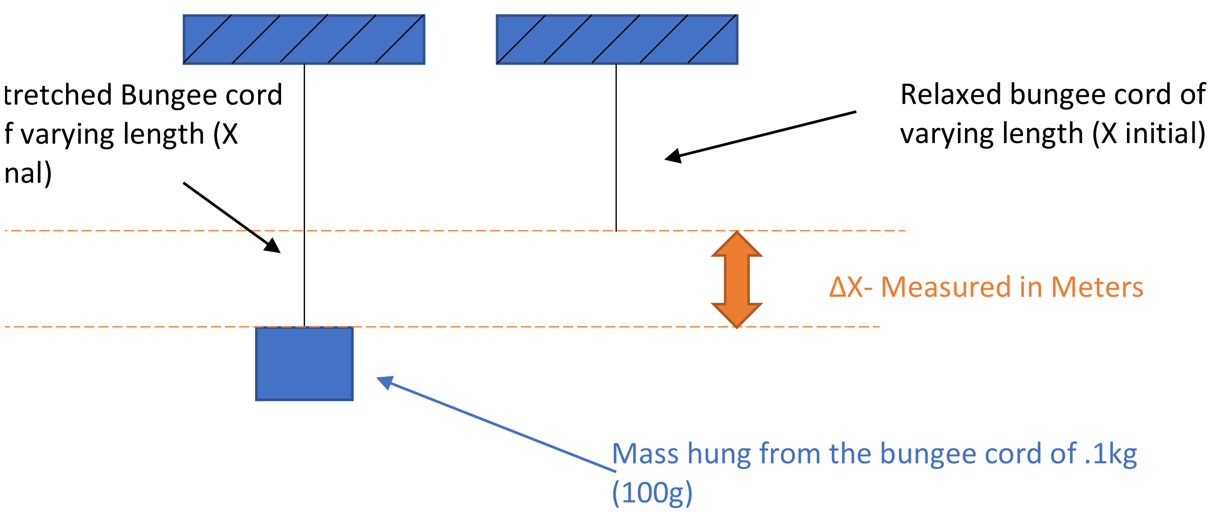

Fig #1- Lab set up. Depicted is everything that was measured for the calculations.

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Data Table-

Cord Length (m)	Mass (kg)	X Initial (m)	X Final (m)	ΔX (m)	Calculated K
0.37	0.1	0.37	0.56	0.19	5.16
0.56	0.1	0.56	0.77	0.21	4.64
0.78	0.1	0.78	1.18	0.40	2.44
1.14	0.1	1.14	1.71	0.57	1.72
0.13	0.1	0.13	0.21	0.076	12.89
0.89	0.1	0.89	1.35	0.46	2.14
1.21	0.1	1.21	1.84	0.63	1.56
0.23	0.1	0.23	0.35	0.12	8.38
0.057	0.1	0.057	0.094	0.037	26.49

Figure #2- Above is our data table for the lab. We have all measurements of ΔX. K was calculated using the values of ΔX which have an uncertainty of ±.02meters due to human error. The mass of the system and the gravity used to calculate K are certain. Our K value then only shares the uncertainty of the measurements in finding ΔX.

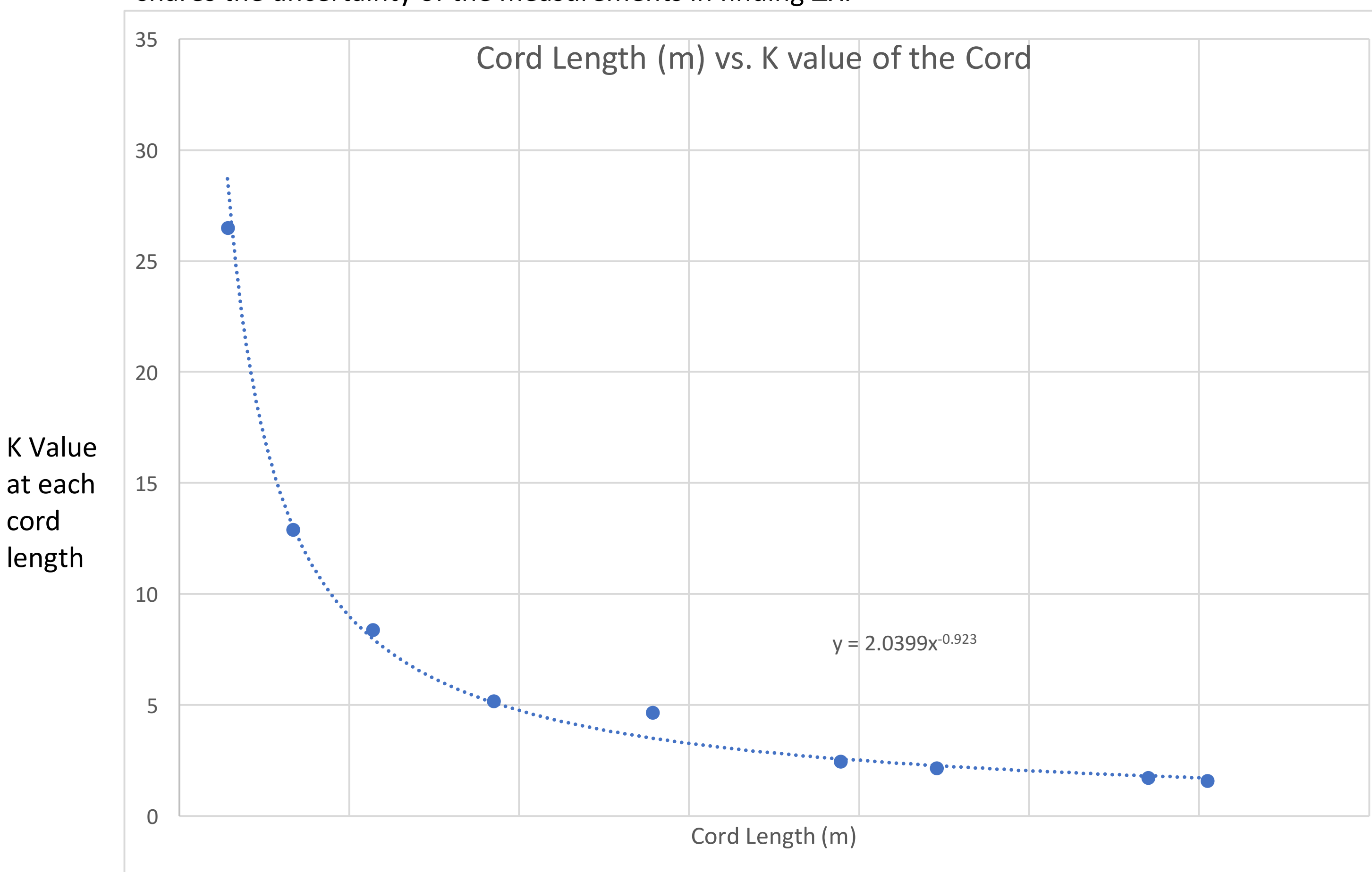

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Fig #3- The graph above shows how our K value varied with the cord length when the same mass (.1kg) was suspended from it. The equation on the graph is what we will use to find the K value at any cord length we deem useful. We can then use this K value and treat the cord as an ideal spring at that length.