**Spring Constant Graph - double check 4 and 5**

Some students collected data to measure the spring constant k of a spring. For a particular stretch distance of the spring, they recorded the restoring force. They measured the distance with a ruler whose smallest measure was 1 mm, or 0.001 m, so the uncertainty they took to be half that, or 0.0005 m, and the force they measured with a force scale whose smallest division was 1 N, so they took the uncertainty of that to be 0.5 N. They made such a good data table too! Notice all the organization, the units, the sig figs, and the uncertainties. Such a good good table indeed!

Graph the data with error bars:

|  |  |
| --- | --- |
| Stretch Distance  s / m  Δs = ±0.0005 m | Restoring Force  F / N  ΔF = ±0.5 N |
| 0.050 | 1.6 |
| 0.100 | 3.2 |
| 0.150 | 4.5 |
| 0.200 | 6.0 |
| 0.250 | 7.4 |
| 0.300 | 9.4 |

Here’s what to do.

1. Make a graph of the points, and add error bars that can reasonably be added. Indicate where the error bars are negligible.
2. Put a best fit line that goes as close as it can to the points. Note that they will not all fall on the line.
3. Find the slope of the best fit line. The slope of this line is the best guess of the spring constant.
4. Find the maximum and minimum slope possible using the error bars on the first and last points only. Notice that you can do this exactly using math.
5. Express the constant as a best guess ± an uncertainty. (it will be ± (Max-Min)/2) Uncertainties have only one sig fig, so keep this in mind when you write your answer. (e.g. 4.12237 ± .5 is ridiculous, 4.1 ± .5 would be appropriate)

Do this by hand on graph paper.