

## Learning Intentions

- To learn the relationship between the force in an elastic band and the change in the length of the elastic band
- To learn how to graph data in Excel and plot the best-fit line

## Materials

1. Metal stand
2. 1 elastic band
3. 20 N spring scale
4. Ruler

## Procedures

1. Put the metal stand into the holder on the desk.
2. Put the elastic band around the metal stand.
3. Attach the spring scale, and pull it so that the elastic band is at its full, unstretched length.
4. Place the ruler so that it can measure the change in length of the elastic band.
5. Pull on the spring scale until the elastic band has increased in length to 3 cm. Record the measured force.  
Repeat for 5 data points, up to 15 cm.
6. Using Excel, graph the force of tension versus the change in length of the elastic.
7. Using Excel, add a best-fit line to the graph. The slope of this line represents  $k$ , the constant of elasticity.

## Data

Circle the type of elastic band #19 #24 #32 #64

| Change in Length of Elastic | Tension in Elastic |
|-----------------------------|--------------------|
| 0.0 cm                      | 0.0 N              |
| 3.0 cm                      |                    |
| 6.0 cm                      |                    |
| 9.0 cm                      |                    |
| 12.0 cm                     |                    |
| 15.0 cm                     |                    |

## Questions

1. Draw a free body diagram of the point where the elastic band touches the spring scale.
2. Using Excel, graph the spring force (in Newtons) vs. the change in length (in meters) for the elastic band.
3. Using Excel, find the equation of the best-fit line for this graph.
4. What is the spring constant for your elastic, in Newtons per meter?
5. If you had to re-do this lab, what would you change to improve the accuracy of your results?

## Assessment

<https://mrrenwick.ca/index.php/course-materials/physics-11/assessing-curricular-competencies/>

| Curricular Competency   | Insufficient Evidence | Emerging | Developing | Proficient | Extending |
|---|-----------------------|----------|------------|------------|-----------|
| <a href="#">Planning and conducting</a> (results)             |                       |          |            |            |           |
| <a href="#">Processing and analyzing data and information</a> |                       |          |            |            |           |
| <a href="#">Evaluating</a> (question 5)                       |                       |          |            |            |           |