

How Large is a Pull?

Problem:

- What is the standard MKS unit for force?
- How can force be measured?
- Can forces be combined?

Materials:

- Five identical rubber bands
- Meter stick
- Spring scale (2, 5 or 10 N maximum reading)

Optional: if you have force probes and appropriate software you can use the probe to determine force measurements

Procedure:

Part A: How Large is a Pull?

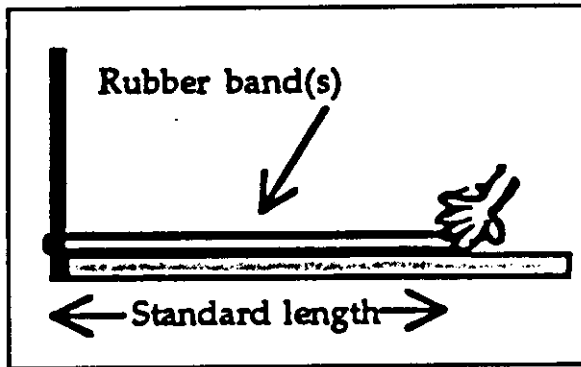
If you pull on a rubber band attached at one end, you know it will stretch. The more you pull, the more it stretches. Try it.



1. Attach one end of the rubber band to something on the table that can't move. Also attached the meter stick to the table. Now stretch the rubber band so it is **several centimeters longer than its relaxed length**. Does it always seem to exert the *same* pull on you each time it is stretched to the *same* length? (Most people agree that this is obvious.)

2. Write down the length you have chosen in the space below. This will be your *standard length* for future measurements.

Standard length of rubber band = _____ cm



3. Attach the ends of two identical rubber bands in the same way as before, and stretch them both to the **standard length**.
4. Repeat this comparison of how strong the forces feel with three, four and five rubber bands stretched in the same way to the same standard length.

Summing Up Part A:

1. How does the combined force of two rubber bands compare to what you felt when only one rubber band was used?
2. Suppose you stretched a rubber band by pulling on it to your standard length. Now you want to create a force ten times as large. How could you assure that you are being pulled with such a force?
3. Suppose you applied a force with a stretched rubber band one day, and several days later you wanted to feel the same force or apply it to something. How could you assure that the forces were the same? Explain.
4. Do rubber bands provide a convenient way of accurately reproducing forces of many different sizes? Explain.

Extension:

Repeat the above procedure and use a force probe to take all measurements.

Summing Up for Extension:

1. How are force probe readings related to the size of the pull exerted by the force probe hook on the rubber bands? Write down the equation you found and describe the mathematical relationship in words.
2. Based on your graph, what force probe reading corresponds to the pull of one rubber band when stretched to your standard length? How did you determine this?