

Building Physical Intuition – Measurement 3 and Graphing

Groups: form groups of three

Equipment: each group should have a one meter stick, meter stick caliper jaws, Vernier caliper and several wooden cylinders.

Measurements

1. Use the meter stick and meter stick caliper jaws to measure the **length** of each cylinder. Record your measurements in the table below to the nearest 0.1 cm.
2. Use the vernier caliper to measure the **diameter** of each cylinder. Record your measurements in the table below to the nearest 0.01 cm.
3. Use a balance to measure the **mass** of each cylinder. Record your measurement in the table below to the nearest 0.01 g.

| Length (cm) | Diameter (cm) | Mass (g) |
|-------------|---------------|----------|
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Calculations

1. Plot a graph showing the mass and length of the cylinders which have the same diameter (or approximately the same diameter).
Looking at the plotted points, what type of smooth curve will fit the plotted points?

Does this make physical sense? How should the mass of two cylinders compare, if both have the same diameter and one is twice as long as the other?

2. Plot a second graph showing the mass and diameter of the cylinders that have the same length (or approximately the same length).

Looking at the plotted points, will the same type of curve as the previous graph fit the plotted points?

Does this make physical sense? How should the mass of two cylinders compare, if they have equal length and one has twice the diameter of the other?

3. Plot a third graph showing the mass and diameter squared of the cylinders that have the same length (or approximately the same length).

Looking at the plotted points, what type of smooth curve will fit the plotted points?

Does this make physical sense? How should the mass of two cylinders compare, if they have equal length and one has twice the diameter of the other?

4. Can you make a graph using data from all of your cylinders and obtain a straight line? Think about what quantity you might graph along with mass that should give a straight line.

Make a graph and see if you get a straight line.

Your instructor may ask you to do some calculations after checking your graphs.