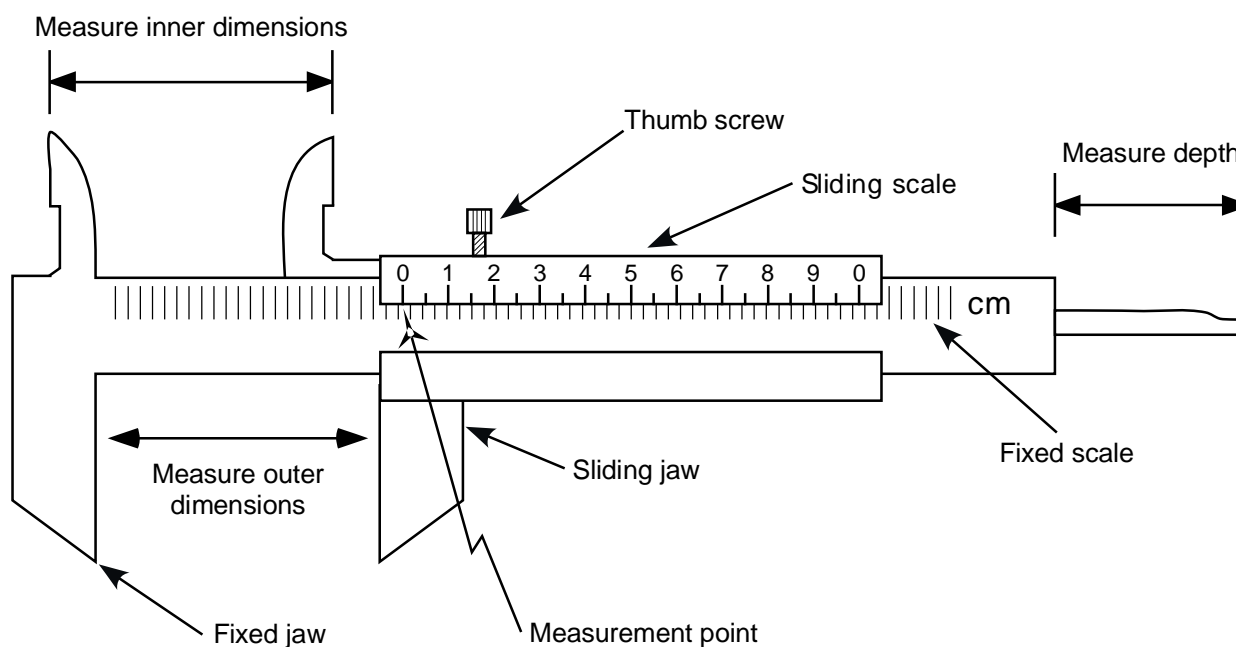


Reading a Vernier Caliper

A *vernier caliper* is used to precisely measure dimensions to within *thousandths* of a centimeter. We will use the vernier caliper frequently throughout the year, so it's important that you learn to read it properly – a small error in measurement may have a great effect on subsequent calculations.

Below is a sketch of a typical vernier caliper, similar to the type you will be using this year. You will usually be using the larger “jaws” to measure outer dimensions, but note that the caliper can also be used to measure the inner dimensions of objects, as well as the depth of a hole.

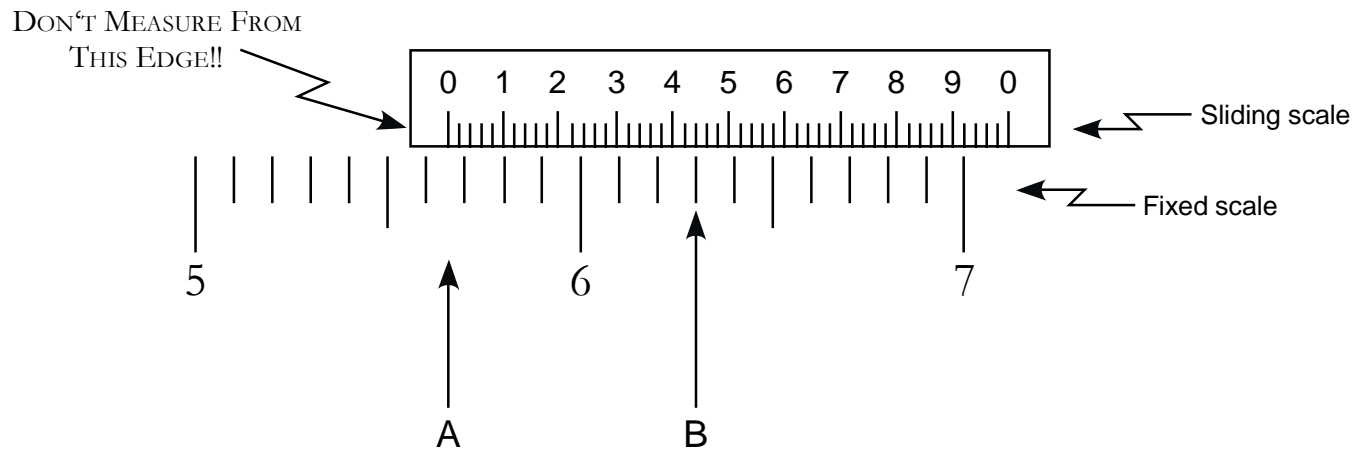


Most vernier calipers have both metric and English scales; make sure that you read the correct scale. The fixed portion of the scale is marked in increments of 0.1 cm ; the sliding scale has numbers marking 0.01 cm increments, and small lines marked in 0.002 cm increments (a detailed view appears on the next page).

Measurements are taken as follows:

1. Loosen the thumb screw clamp (if necessary), and close the sliding jaw so that it fits snugly on the object to be measured. If the object is circular or spherical, make sure you're measuring at the widest point. When measuring inner dimensions, be sure to use the flat, outermost section of the caliper jaws.
2. Gently tighten the thumb screw clamp, and remove the caliper from the object; the clamp will allow you to move the caliper *without* changing the position of the sliding jaw. *Hint:* You can make a first approximation of the measurement – within 0.1 cm – by laying the caliper on top of a meterstick and measuring the distance between the jaws.

3. Now look at the scale on the sliding jaw, as shown in the magnified image of this region below:



The measurement up to the first digit after the decimal point is obtained by looking at the mark below the *first* zero that appears on the sliding scale, as indicated by point *A* in the sketch above. In this example you will note that this mark falls between the 5.6 and 5.7 *cm* mark on the fixed scale, so we know our measurement falls within this range. Therefore, we'll start our measurement with **5.6**. Note: A common mistake is to begin reading from the edge of the sliding scale; make sure your measurements are taken from point *A*, the line directly below the first zero on the sliding scale, or your reading will be short by several tenths of a centimeter!

4. The next two digits are read by *carefully* finding the mark on the sliding scale that best lines up with a mark on the fixed scale. Several may look as though they line up, but only one will match best (*Hint*: Hold the caliper at a slight angle away from you, and close one eye!). In our example, we can see that the second small mark to the right of 4 on the sliding scale lines up with a mark on the fixed scale (point *B*). Remember that the last two digits come from the sliding scale, *not* the fixed scale! Since the marks on the sliding scale are 0.002 *cm* apart, the mark at point *B* represents 0.044 *cm*. Adding our total measurement together, we get **5.644 *cm*** as our final reading.

It is important to note that the last digit of your measurement will always be an even number!

Practice using the vernier caliper by measuring several objects. Check your measurements with your lab partner; if there is disagreement, check the vernier scale again. Be sure to ask your instructor if you're still unsure as to the correct procedure!