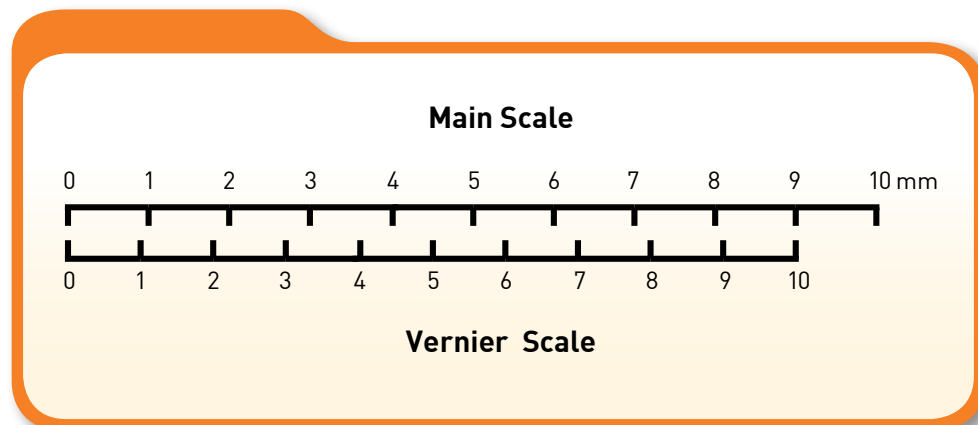


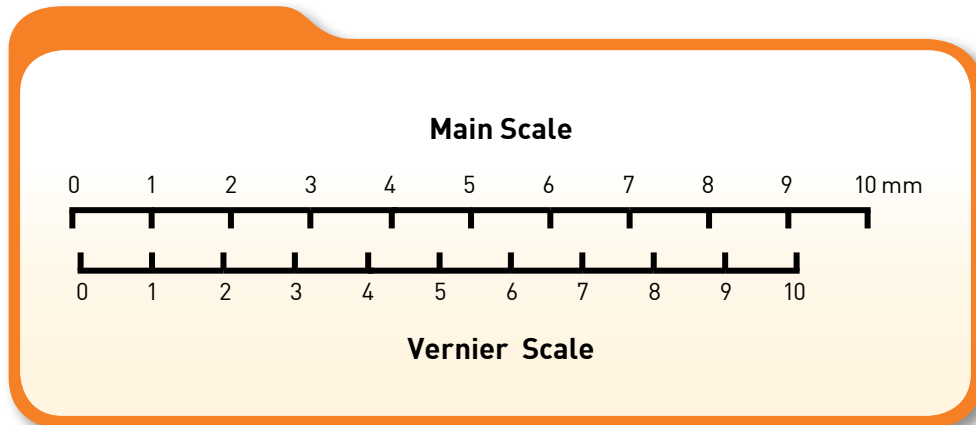
The Vernier Scale

The Vernier scale is a simple device that enables you to make measurements, for example, of lengths or angles, to a higher degree of precision. Vernier scales are used in Vernier calipers, micrometer screw gauges, and in the angular scale of a spectrometer.

The main scale is graduated in intervals of, for example, millimetres or degrees. Normally you would read such a scale to the nearest millimetre or degree and maybe estimate the next half degree. The Vernier scale enables you to read tenths of millimetres (or degrees) with certainty. The Vernier scale is graduated in intervals of 0.9 mm (or degrees) – as shown below. In other words, each interval of the Vernier scale is 0.1 mm shorter than an interval on the main scale.

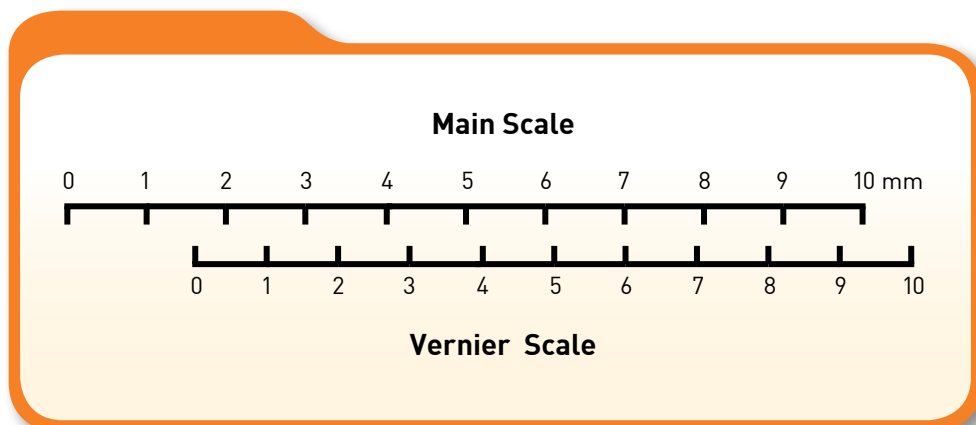


If the zero of the Vernier scale is just 0.1 mm past the zero of the main scale, then the first Vernier graduation will line up with the first main scale graduation – as below. Notice that none of the other Vernier graduations line up with the main scale graduations.



If you now move the zero of the Vernier by another 0.1 mm, so it is now 0.2 mm beyond the zero of the main scale, then the second graduation lines up. And so on. The vernier division that lines up with a main scale division will always give you the tenths of millimetres, you need to add onto the main scale reading.

Try this one:



Here the zero of the Vernier scale is between 1 and 2 on the main scale – so your reading is somewhere between 1 and 2 mm. Now the 6 of the Vernier scale lines up with a main scale division, so you have an additional $6/10$ (0.6) mm. Your reading is therefore 1.6 mm.