Main differences between vernier scale and main scale.

A vernier scale is an additional indicating scale on a measuring device that lets the user read distance or angle measurement more accurately than could be done by reading a uniformly-divided straight or circular measurement scale. In some languages, this device is called a nonius. It is a sliding secondary scale that indicates where the measurement lies in between two of the marks on the main scale.

To measure using a vernier scale, the user first reads the finely marked "fixed" scale. This measure is typically between two of the scale's smallest graduations. The user then reads the finer vernier scale, which measures between the smallest graduations on the fixed scale—providing much greater accuracy.

Vernier scales work because the human eye can detect that two line segments are aligned. Vernier acuity is the ability by a person to detect the proper alignment of two line segments. In most people, Vernier acuity is particularly high, enabling accurate differentiation between aligned and misaligned marks on a vernier scale.

The vernier scale is constructed so that when its zero point is coincident with the start of the data scale, its graduations are at a slightly smaller spacing than those on the data scale and so none but the last graduation coincide with any graduations on the data scale. N graduations of the indicating scale cover N-1 graduations of the data scale.

On decimal measuring instruments, the vernier scale has 10 graduations that cover the same length as 9 on the data scale. The vernier's 10th graduation is 0, not 10.

So, the difference between scales is that the 10 graduations of the vernier scale are the same length as only 9 on the main data scale.