

Addition and Subtraction Rule

$$A \pm \Delta A \quad B \pm \Delta B$$

$$R = A + B \quad R = A - B$$

$$\Delta R = \Delta A + \Delta B \quad \Delta R = \Delta A + \Delta B$$

Product and Quotient Rule

$$R = A \times B \quad R = A/B$$

$$\frac{\Delta R}{R} = \frac{\Delta A}{A} + \frac{\Delta B}{B} \quad \frac{\Delta R}{R} = \frac{\Delta A}{A} + \frac{\Delta B}{B}$$

Vernier Caliper

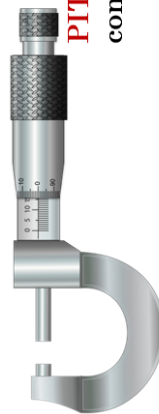


1 Vernier Scale Division (VSD) = 0.9 mm

Length = MS Reading + Least Count of Vernier $\times$ VS division Coinciding with MS

Least Count of Vernier Calipers = 1 MSD – 1 VSD = 0.1 mm

Zero Error is subtracted from the reading to get the corrected value.



Screw Gauge

PITCH: Distance between two consecutive threads of the screw.

$$\text{Least Count} = \frac{\text{Pitch}}{\text{No. of division on circular Scale}}$$

Reading = Main Scale Reading + Circular Scale Count

Corrected Value = Reading – Zero Error

MIND MAP

Error In Measurement

Power Rule

$$R = \frac{A^p B^q}{C^s D^t}$$

$$\frac{\Delta R}{R} = p \frac{\Delta A}{A} + q \frac{\Delta B}{B} + s \frac{\Delta C}{C} + t \frac{\Delta D}{D}$$

Errors

Systematic Errors

Random Errors

Error Measurement contains some Uncertainty which is called Error

Accuracy is a measure of how close the measured value to the true value of the quantity.

Precision is to what resolution or limit the quantity is measured.

Absolute Error - The magnitude of the difference between the individual measurement and the true value of the quantity.

Least Count :- The smallest value that can be measured by the measuring instrument

$$\text{Relative Error} = \frac{\text{Absolute error in a measurement}}{\text{Size of the measurement}} \quad (\text{or Fractional Error})$$

Scientific Notation ($a \times 10^b$) 'a' is a number between 1 and 10

$$\text{Percentage Error} = \frac{\text{Absolute error in a measurement}}{\text{Size of the measurement}} \times 100$$

Rules for Determining the Number of Significant Digits

For numbers with no indicated decimal

1. All nonzero digits (1-9) are to be counted as significant.
2. The terminal or trailing zero(s) are not significant.

For numbers with indicated decimal

1. All nonzero digits (1-9) are to be counted as significant.
2. Zeros that have any nonzero digits anywhere to the left of them are considered significant zeros.
3. All other zeros not covered in rule (2) above are NOT considered significant zeros.