Accuracy

The ability of an instrument to measure the accurate value is known as accuracy. In other words, it is the closeness of the measured value to a standard or true value. Accuracy is obtained by taking small readings. The small reading reduces the error of the calculation. The accuracy of the system is classified into three types as follows:

- Point Accuracy
- Accuracy as Percentage of Scale Range
- Accuracy as Percentage of True Value

- Point Accuracy
  The accuracy of the instrument only at a particular point on its scale is known as point accuracy. It is important to note that this accuracy does not give any information about the general accuracy of the instrument.
- Accuracy as Percentage of Scale Range
  The uniform scale range determines the accuracy of a measurement. This can be better understood with the help of the following example: *Consider a thermometer having the scale range up to 500^{oC}. The thermometer has an accuracy of ±0.5 percent of scale range i.e. 0.005 x 500 = ± 2.5 ºC. Therefore, the reading will have a maximum error of ± 2.5 ºC.*
- Accuracy as Percentage of True Value
  Such type of accuracy of the instruments is determined by identifying the measured value regarding their true value. The accuracy of the instruments is neglected up to ±0.5 percent from the true value.

Precision

The closeness of two or more measurements to each other is known as the precision of a substance. If you weigh a given substance five times and get 3.2 kg each time, then your measurement is very precise but not necessarily accurate. Precision is independent of accuracy. The below examples will tell you about how you can be precise but not accurate and vice versa. Precision is sometimes separated into:

- Repeatability
- Reproducibility

- Repeatability
  The variation arising when the conditions are *kept identical and repeated measurements are taken during a short time period.*

- Reproducibility
  The variation arises using the same measurement process among *different instruments and operators, and over longer time periods*.

Conclusion

Accuracy is the degree of closeness between a measurement and its true value. Precision is the degree to which repeated measurements under the same conditions show the same results.

Difference between Accuracy and Precision

In the previous few sections having discussed what each term means, let us now look at their differences.

Accuracy	Precision
Accuracy refers to the level of agreement between the actual measurement and the absolute measurement.	Precision implies the level of variation that lies in the values of several measurements of the same factor.
Represents how closely the results agree with the standard value.	Represents how closely results agree with one another.
Single-factor or measurement are needed.	Multiple measurements or factors are needed to comment about precision.
It is possible for a measurement to be accurate on occasion as a fluke. For a measurement to be consistently accurate, it should also be precise.	Results can be precise without being accurate. Alternatively, the results can be precise and accurate.