Round Off to Significant Figures

For Students of Board Examination

What Affects Accuracy of Physical Quantities?

The following things affect the accuracy of a physical quantity.

Tools for Measurement

e.g., the least count of tools that measure length: a ruler (0.1 cm), a Vernier callipers (0.01 cm), a screw gauge (0.001 cm) etc.

Observer Skill Level or Measuring Technique

e.g., chances of a professional to make mistake during measurement is lesser than the novice or a person with lesser experience.

Number of Observation

e.g., multiple readings of a measurement and taking average ensure that we are getting right value of the measured value.

Measurement Techniques

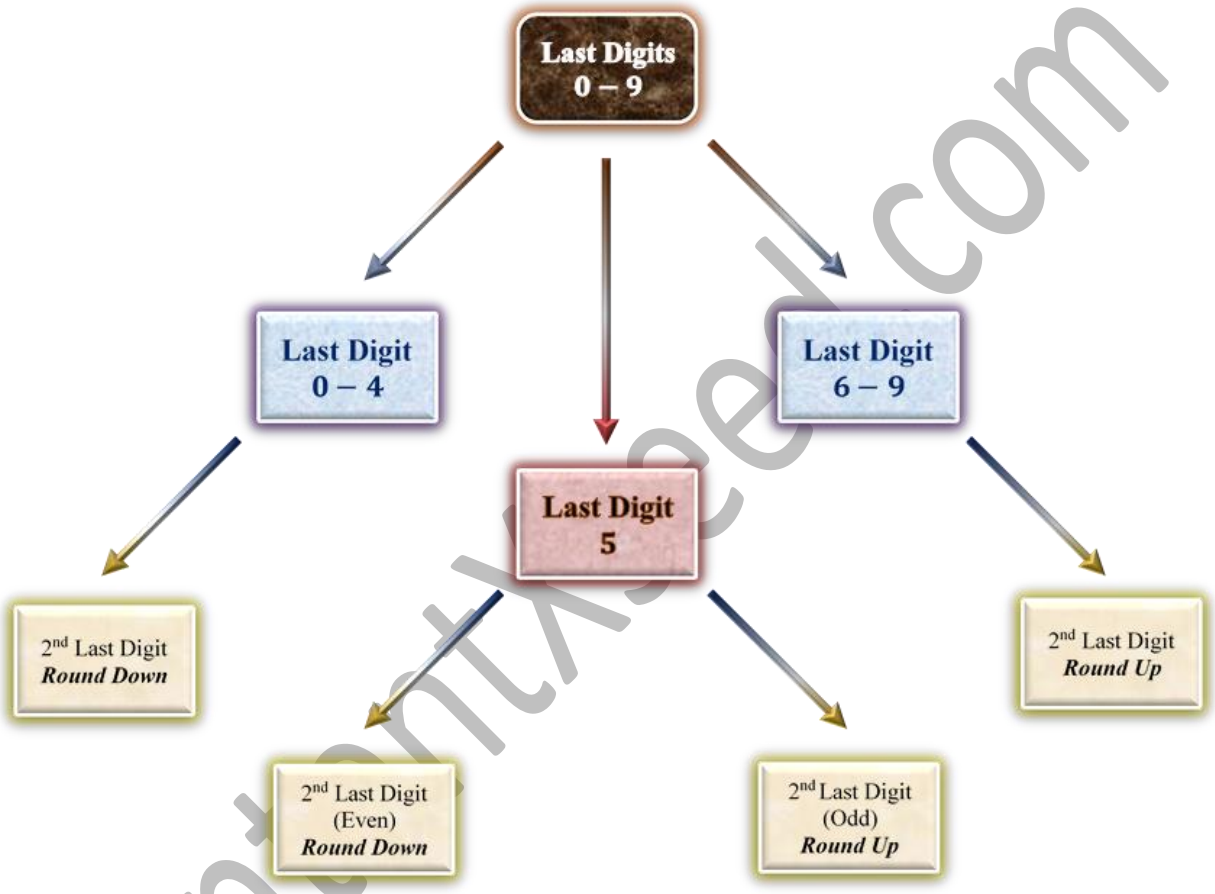
e.g., techniques such as estimation, rounding off, and significant figures make too long or complicated measurement shorter and simpler.

Rounding Off

Rounding off can be defined as:

"*the process of approaching a number to a desired place value by reducing the number of significant*."

Apply the Rounding Rule



Note that, for integers (numbers containing negative values), we need to *round off the numbers to the* ***closest 10***.

Practice Exercise

Rounding Off to Decimal Places

Rounding can also be applied to decimal places (dp):

- **Upto 1 dp**: 3.76 rounds to 3.8, while 3.24 rounds to 3.2.
- **Upto 2 dp**: 5.678 rounds to 5.68, while 5.432 rounds to 5.43.

- **Upto 3 dp**: 2.3456 rounds to 2.346, while 2.3443 rounds to 2.344.

Rounding Off to the Nearest 10, 100, and 1000

Rounding can be applied to a stated place value, for instance:

- **Nearest 10**: 47 rounds to 50, while 43 rounds to 40.
- **Nearest 100**: 234 rounds to 200, but 267 rounds to 300.
- **Nearest 1000**: 1543 rounds to 2000, while 847 rounds to 1000.

What are significant figures?

They are defined as,

> "all the known digits plus one estimated or doubtful digit in a measured quantity."

They are also known (and found in literature) as significant digits, sig figs, or simply s.f.

Why Significant Figures Matter?

- They contribute to the precision of measured value.
- They indicate the reliability of a measurement.

Significant Figures and Accuracy of a Measurement

- A better instrument yields more number of significant and hence, more precise measurement.
- A poor instrument yields less number of significant figures and hence less precision.

Rules for Determining Significant Figures

Significant figures rules are as follows:

1. **Non–Zero Digits**

   All non–zero digits (1, 2, 3, 4, 5, 6, 7, 8, 9) are significant.

2. **Zero Digit**

   Zero may or may not be significant.

   i. **Leading Zeroes**

      Leading zeroes (zeroes at the start) are non–significant.

   ii. **Captive Zeroes**

      Captive zeroes (zeroes in the middles) are significant.

   iii. **Trailing Zeroes**

      Trailing zeroes (zeroes at the end) may or may not be significant.

      a. **Decimal Numeral**

         Trailing Zeroes in a decimal numeral is significant.

b. Integers

Trailing zeroes for an integer may or may not be significant.

- **Known Least Count**

  For the known least count, trailing zeroes for an integer is significant.

- **Unknown Least Count**

  For the unknown least count, trailing zeroes for an integer is non–significant.

3. Scientific (or Standard) Notation

In standard form all digits are significant, except 10^n.

Examples