VESP Vision

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Program Code:-Common to all 1st semester

Course Name:-Basic Science(Physics)

Course Code : - 22102

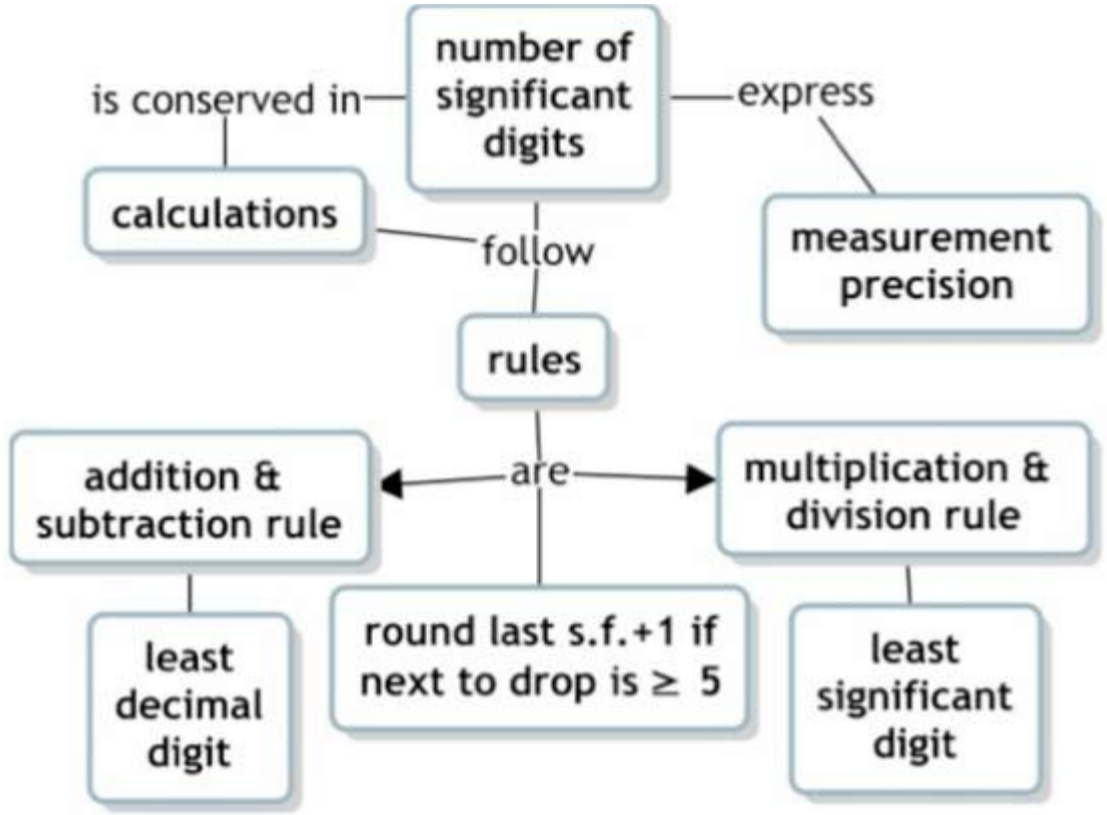
Course coordinator: Mrs. Deepa Gupte

Date: 12/07/2020

Unit No:1
Unit Name: Units and Measurements

Unit Outcomes (UO1c): State with justification the error in the given measurement quantity.
Learning Outcome (LO4) : Students will be able to determine significant figures in the given number.
Contents: Significant Figures

Concept Map


number of significant digits
is conserved in
express
calculations
follow
measurement precision
rules
addition & subtraction rule
are
multiplication & division rule
least decimal digit
round last s.f.+1 if next to drop is ≥ 5
least significant digit

Learning Objective/ Key learning

- Students will be able to determine significant figures in the given number.
- Students will be able to round off the number

Significant Figure

- Significant figure is defined as a figure in any place (in number) which is reasonably trustworthy or meaningful.
- The significant figures in the measurement indicate the number of digits in which we have confidence in respect to its accuracy.
- The greater the number of significant features, the more accurate is the measurement.
- If the length of an object measured by a meter scale is 25.8 cm. The corresponding significant figure is 3.
- In the case the first two digits are reliable and accurate but the last digit 8 is uncertain.

Rules and identification of S.F

- All non-zero digits are considered significant.
  - For example, 91 has two significant figures (9 and 1), while 123.45 has five significant figures (1, 2, 3, 4 and 5).
- Zeros between any two non-zero digits are significant.
  - Example: 101.1203 has seven significant figures: 1, 0, 1, 1, 2, 0 and 3.
- Zeros before non-zero digits are not significant.
  - For example, 0.00052 has two significant figures: 5 and 2.
- Zeros behind non-zero digit in a number with decimal point are significant.
  - For example, 12.2300 has six significant figures: 1, 2, 2, 3, 0 and 0. The number 0.000122300 still has only six significant figures (the zeros before the 1 are not significant).

When Zeros are Significant?

- Trailing zeros without a decimal point are NEVER counted as significant figures.
- These zeros trailing behind at the end of a number are merely place holders to give you information about the size of a very rough number. Those places are not measured accurately and so are not significant.

ie. 850 — 2 sig figs 15,000 — 2 sig figs 1,000,000 — 1 sig fig 

When Zeros are Significant?

- The leading zeros in decimal numbers (<1) do not count as significant until the first actual digit.

ie. 0.0005 0.045 0.00006 

- Trailing zeros behind that digit are always counted as significant figures. You wouldn't add these zeros, if you weren't able to measure them.

ie. 0.000500 0.040500 0.0040 

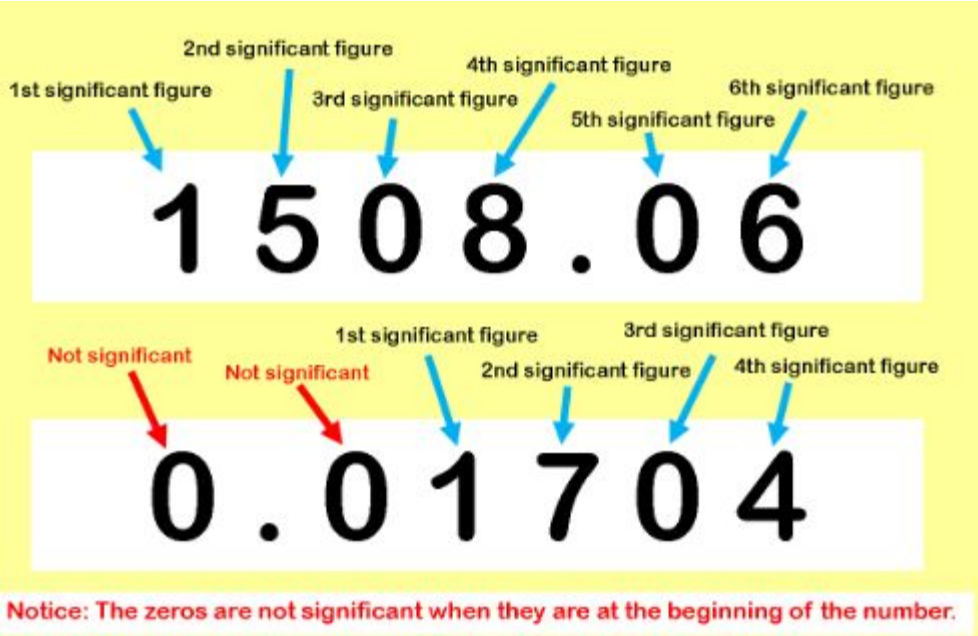
When Zeros are Significant?

- Embedded zeros or “zeros with digit neighbours” are always counted as significant figures. If you can measure the place before it and the place after it with accuracy then it must also represent an accurate number.

ie. 4067 101 20,506 

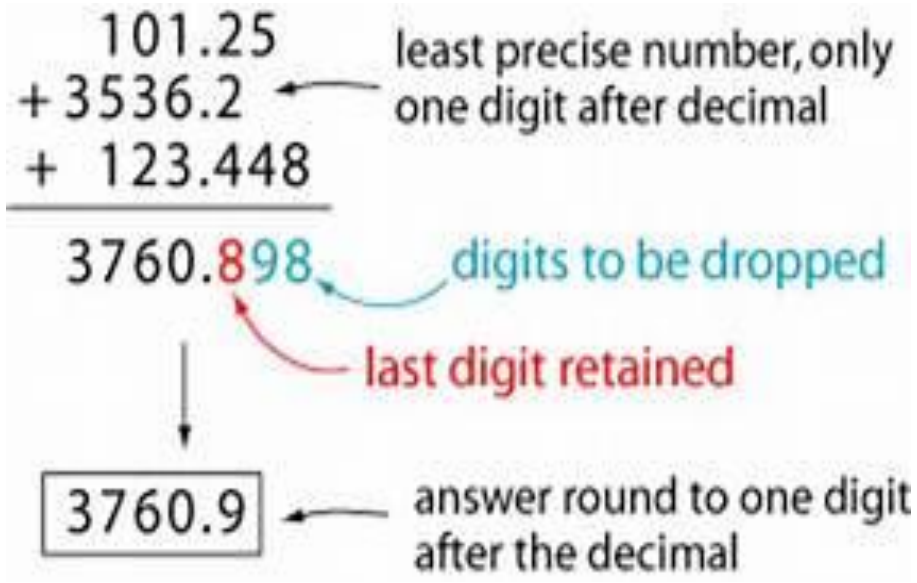
Significant Figure

- **Example**



Calculations with significant Figures

When measurements are added or subtracted, the answer can contain no more decimal places than the least accurate measurement.



Calculations with significant Figures

If you multiply or divide two numbers, the answer is rounded off to the number of significant figures in the least precise term used in the calculation (i.e. the number with the fewest sig figs).

$$4.51 \times 3.6666 = 16.536366 = 16.5$$

3 sig figs — round to 3 sig figs

$$6.8 \div 112.04 = 0.0606926 = 0.061$$

2 sig figs — round to 2 sig figs

Rules for Rounding off the uncertain digits

Rounding off is necessary to reduce the number of insignificant figures to adhere to the rules of arithmetic operation with significant figures.

Rule Number	Insignificant Digit	Preceding Digit	Example (rounding off to two decimal places)
1	Insignificant digit to be dropped is more than 5	Preceding digit is raised by 1.	Number – 3.137 Result – 3.14
2	Insignificant digit to be dropped is less than 5	Preceding digit is left unchanged.	Number – 3.132 Result – 3.13
3	Insignificant digit to be dropped is equal to 5	If preceding digit is even, it is left unchanged.	Number – 3.125 Result – 3.12
4	Insignificant digit to be dropped is equal to 5	If preceding digit is odd, it is raised by 1.	Number – 3.135 Result – 3.14

Application of Concept/ Examples in real life:

- Significant figures are the correct number of digits for reporting a measurement or calculation.
- The need for accuracy in timing athletic events makes significant figures important.
- The times of world-class athletes like Michael Phelps may be measured to the hundredths of a second. That's important because the times are often very close. A new world record may be set by just a split-second difference in time.
- Significant figures or digits are used in the science to ensure appropriate degrees of precision when dealing with decimals.
- Decimals are very common in shopping. Price tags, food labels, and receipts all contain decimals.
- At gas pumps, decimals are used to show how much gas is pumped and much it costs per gallon.

Attempt Set 2 MCQs

Set 2: Question No 1	Set 2: Question No 2	Set 2: Question No 3
Addition of measurement 15.225 cm, 7.21cm and 3.0 cm in significant figure is	If the length of the rod A is (235 ± 0.01) cm and that of B is (5.68 ± 0.01) cm then the rod B is longer than rod A by _____ .	The area of a rectangle os size 1.25 x 2.245 cm in significant figure is _____
Recall/ Remembering	Understanding	Application
a) 25.43	a) (243 ± 0.00) cm	a) 2.80625 cm^2
b) 25.4	b) (3.33 ± 0.02) cm	b) 2.81 cm^2
c) 25.435	c) (243 ± 0.01) cm	c) 2.806 cm^2
d) 25.4350	d) (3.33 ± 0.00) cm	d) 2.8062 cm^2
Ans: <b>	**Ans: <b>**	**Ans: <b>**

0:20