Edukado Hub
DPP-4
Errors in measurement

ERRORS IN MEASUREMENT
Suppose we have to measure the length of a rod

(a) Lets use a cm scale: (a scale on which only cm marks are there) We will measure length = 5 cm Although the length will be a bit more than 5, but we cannot say its length to be 5.1 cm or 5.2 cm, as the scale can measure upto cm only. not closer than that.
so we'll say that its least count is 1 cm

b. Let's use a mm scale
C. Let's use a vernier calliper
D. Let's use a screw gauge.
E. Let's use a microscope.

Significant figures:

From the above example, we can conclude that in a measured quantity

Significant figures are= figures, which are absolutely correct + the first uncertain figure

Common rules of counting significant figures:

Rule 1: all non-zero digits are significant ie 123.56 has 5 SF
Rule. 2: all zeros occurring between two non-zeros digits are significant (obviously) ie 1230.05 has 6 SF
Rule 3: trailing zeros after decimal place a significant(shows the further accuracy).

Number of S.F. is always conserved, change of units cannot change S.F.
Suppose measurement was done using mm scale, and we get L = 85 mm (Two S. F)
If we want to display it in other units.
85 mm - > 8.5 cm

All should have two S.F.
The following rules support the conservation of S.F

Rule 4: From the previous example, we have seen that,
0.000085 km Not significant also should have two S.F.; 8 and 5, So leading Zeros are not significant.
In the number less than one, all zeros after decimal point and to the left of first non-zero digit are insignificant (arises only due to change of unit)

0.000305 has three S.F. = 3.05 x 104 has three S.F

Rule 5: From the previous example, we have also seen that 85000 um should also has two S.F., 8 and 5. So the trailing zeros are also not significant

154 m = 15400 cm = 154000 mm = 154 × 109 nm all has only three S.F. all trailing zeros are insignificant

Rule 6 : There are certain measurement, which are exact i.e.

Let's say number of students in a class is equal to 350

Q: 1

Count total number of S.F. in 3.0800

Count total number of S.F. in 0.00418.

Count total number of S.F. in 3500

Count total number of S.F. in 300.00

Count total number of S.F. in 5.003020

Count total number of S.F. in 6.020 × 1023

Count total number of S.F. in 1.60 x 10-19

Q2: The respective number of significant figures for the numbers 23.023, 0.0003 and 2.1 × 10-3 are [AIEEE-2010]

(1)5.1,2

(2) 5, 1, 5

(3) 5, 5, 2

(4) 4,4,2