Significant Digits

When recording a measurement you should usually try to record 1 digit past the least count digit.

You have to make a guess as to what that digit is. → this last digit that you record is called an uncertain digit

A significant digit (figure) is one that has been measured with certainty or properly estimated.

Consider a 30 cm ruler with (mm) markings and ← least count

you record the following measurement:

least count ↓

15.27897851 29 cm

↑

this measurement is not reasonable given the least count being 1mm

A more reasonable measurement would be:

15.27 cm
15.28 cm
15.26 cm

Certain — least count — guessed or estimated "uncertain"

So if we look at 15.26 cm (least count) → 4 signi digits

certain — uncertain

When counting significant digits in a measurem you count all certain digits and the ONE uncer ta

Examples

203.4 cm → 4 sd
(certain; uncertain digit)

4.07 cm → 3 sd
(certain; uncertain)

What about zeroes?

14.002 cm → 5 sd
60.2 cm → 3 sd
A zero is always significant if it is between two non-zero digits

29.20 cm → 4 sd
(least count; uncertain)
7.020 cm → 4 sd
(uncertain; least count)
A zero is significant if it is to the right of the decimal and after a non-zero digit.

0.08517 cm → 4 sd
(leading zeroes; certain; uncertain)
8.517×10^{-2} cm → 4 sd
leading zeroes are never significant.

25000 m ← writing a measurement like this is confusing.... this could be 2, 3, 4 or 5 sd depending on what the least count is. As a general rule, we don't count "trailing zeroes" so we would call this 2 sd.

Using scientific notation is a better way to communicate the intended number of significant digits.

2.5×10^4 m → 2 sd (uncertain)
2.50×10^4 m → 3 sd (uncertain)
2.500×10^4 m → 4 sd (uncertain)
2.5000×10^4 m → 5 sd

In some older books:
25000̄ → 5 sd
25000. → 5 sd

25000 m
↑ don't know the s.d. because you don't know the precision of the measuring instrument (least count)

Rules For Significant Digits

Digits from 1-9 are always significant.
Zeros between two other significant digits are always significant
One or more additional zeros to the right of both the decimal place and another significant digit are significant.
Zeros used solely for spacing the decimal point (placeholders) are not significant.