Scientific Notation on your calculator

Graphing Calc: EE   (2nd   ,)

Sci Calc: EXP   EE

$$\frac{6.6 \times 10^{-8}}{3.3 \times 10^{-4}} \longrightarrow 6.6 \, EE \, {-8} \div 3.3 \, EE \, {-4}$$

+/-

$$33 \times 10^{-4}$$

$$0.0002$$

$$2 \, E{-4} \qquad 2^{-4}$$

Significant Digits

A significant digit (figure) is one that has been measured with <u>certainty</u> or has been properly <u>estimated</u>

Think of using a 30 cm ruler with mm divisions and recording a measurement as:

7.9~~567321597~~ cm

↑↑ guess (or estimate)
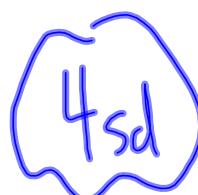
mm marking (least count)

3 sd ⟶

Should be written as:

7.96 cm or 7.95 cm

Certain digits

uncertain (guessed)

Examples

203.4 cm   least count → 1 cm, estimated 0.1 cm

certain digits   uncertain digit

(4 sd)

4.07 cm   least count → 1 mm | estimated 0.1 mm

certain ↑uncertain

(3 sd)

What about zeros?

14.00<u>2</u> cm → 5sd   A zero is always significant if it is between non-zero digits

60.<u>2</u> cm → 3sd

29.2<u>0</u> cm → 4sd   A zero is significant if it is to the right of the decimal and a non-zero digit

7.0<u>2</u><u>0</u> cm → 4sd

(0.00)<u>517</u> cm → 3sd   Leading zeros never count as significant digits

leading zeros don't count

5.17×10^{-3} cm

2<u>5</u>000 m ← ambiguous, we need to know more about the least count of the measuring instrument

we say that trailing zeros are not significant ← 2sd

writing this in scientific notation would <u>clearly</u> show the significant digits.

2.5<u>000</u> × 10^4 → 5sd

2.5<u>0</u> × 10^4 ⇒ 3sd

2.<u>5</u> × 10^4 ⇒ 2sd

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.