

Significant figures

Significant Figures

0.00003400

Zeros are not significant after decimal before non-zero numbers

All nonzero numbers are significant

Zeros after nonzero numbers in a decimal are significant

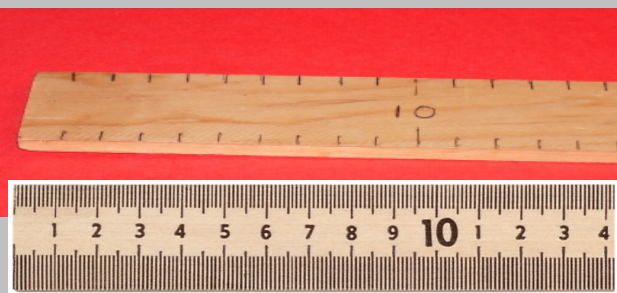
Significant digits

- Why do we have to know about significant digits?
 - > A number is only as good as the tool used to measure it. So we want to be aware of the accuracy of a number.
 - > If you are calculating a number you want to know where to cut off the number.

- Significant Digit
 - > Must have a value
 - > That value must be known

Measured Values

- Always contain error
- A number is only as good as the tool used to measure it.



7.99 millimeters

Never exact 7.99??



numbers the tool could not measure.

Exact values:

- No error
- Whole number

Examples

10 people

5 cows



No Decimal = exact (infinite)

- Infinite significant figures

5 cows

5.00000 cows

5.0000000000..... Cont.



Decimal Rule

Decimal rule is a rule that is not followed that closely.

If a number does not have a decimal then it is considered exact.

Check units to verify.

25 cows? Is this number exact?

No decimal and the unit is a whole value --this is an exact number.

25 meters? Exact? A meter is a measured value so it can not be exact.

The decimal was left off. So lets put it back on.

Measurements are never exact.

Sig Sigs and Zeros

Non Zero numbers

- 1-9 are significant digits

always significant

Trapped Zero

A trapped zero is actually means zero -

505. = 3 significant digits

always significant

Trailing Zeros

50,000. people are at a packer game.

Do the zero's really mean zero? (This is an estimate with 1 sig fig.)

↑
1 sig fig

if estimate -not significant

2000. and 2000.0 Is there a difference?

2000 could be an estimate whereas 2000.0 is not.

2000.0 ← This zero didn't have to be here so this means the tool measured all the way down to the tenths spot.

Trailing zeros on the right of the decimal

0.12000 5 sig figs

always significant

Leading Zeros

0.00055

Leading zeros are NOT Significant.

These are simply place holders showing where the decimal place is.

.00055 = 2 significant figures (2 sig figs)

leading 0 - not significant

Conversions

Convert to meters. .00055 m

How many significant figures?

Convert to Micrometers 55000.

How many significant digits?

keep sig fig during a conversion

(keep 2 sig figs after conversion)

Determine sig figs:

250.

250.0

0.0250

0.002500

0.00200500

Determine sig figs:

2 250.

4 250.0

3 0.0250

4 0.002500

6 0.00200500

The Base unit: Shows only significant digits

Convert 5000. to scientific notation.

Determine sig figs:

2.5E-4

0.0005051

1000 pencils

1000.

The Base unit: Shows only significant digits
3 sigfigs

Convert 5000. to scientific notation.

5 E3

Determine sig figs:

2.5E-4

2

0.0005051

4

1000 pencils

infinite

1000.

1

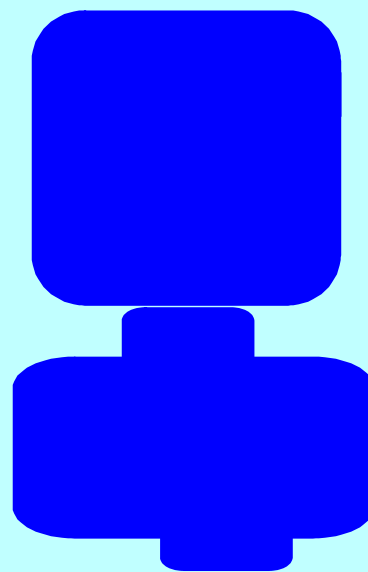
When 2 numbers are **multiplied or divided**, the answer can contain no more significant figures than the least number of sig fig used in the operation.

$$\begin{array}{c} 52 \\ \uparrow \\ 2\text{sf} \end{array} \times \begin{array}{c} 343 \\ \uparrow \\ 3\text{sf} \end{array} = 17,836$$

18,000
round to 2sf

$$\begin{array}{c} 0.0510 \\ \uparrow \\ 3\text{sf} \end{array} \div \begin{array}{c} 0.003400 \\ \uparrow \\ 4\text{sf} \end{array} = 15 \rightarrow 15.0$$

need 3 sf



When 2 numbers are added or subtracted:

the position of the first doubtful digit dictates the last digit retained in the answer

(line up decimal)

$$\begin{array}{r}
 543.7 \\
 + 2.0514 \\
 \hline
 545.7514 \\
 \uparrow \\
 \text{round} \\
 545.8
 \end{array}$$

$$\begin{array}{r}
 32.81 \\
 - 0.001 \\
 \hline
 32.809 \\
 \uparrow \\
 \text{round} \\
 32.81
 \end{array}$$