

Significant Digits

Most numbers involved in technical and scientific work are approximate, having been arrived at through some process of measurement. However, certain other numbers are exact, having been arrived at through some definition or counting process.

Significant Digits

- All nonzero digits are significant.
- Zeros used as placeholders for proper positioning of the decimal point are not significant.
 - Leading zeros (after the decimal point) are not significant.
 - Trailing zeros before the decimal point are not significant.
- All other zeros are significant.

Number	Number of Significant Digits	Comment
87 000	2	The trailing zeros are placeholders and are not counted as significant digits
408 000	3	The zero farthest to the left is not a placeholder, but the other three zeros are placeholders and are not counted as significant digits
4.0005	5	Any zeros between nonzero digits are always significant
0.004	1	The leading zeros are placeholders and are not significant
4.000	4	The zeros are not required as placeholders. They are there to show the precision of the measurement, and are therefore significant
0.000 503	3	The leading zeros (farthest left) are placeholders and are not significant. The last three digits are significant

Calculating with Significant Figures

An answer cannot be more precise than the least precise measurement.

Rounding after the last significant digit

- < 5 - round off
- > 5 - round up
- = 5 - round to the even number

Reason: 0.34 has only 2 significant digits, therefore the answer can have only 2 significant digits.

Examples: round the numbers below to 3 significant figures

- 2.344 → 2.34 → < 5 - round off
- 2.346 → 2.35 → > 5 - round up
- 2.345 → 2.34 → = 5
- round to the even number
- 2.345 001 → 2.35 → > 5 - round up

Addition and Subtraction with Significant Digits

According to the placement of the digits in the least precise measurement.

Example:

$$\begin{array}{r} 12.521 \\ 349.0 \\ + 8.24 \\ \hline 369.761 \end{array} \rightarrow 369.8$$

Multiplication and Division with Significant Figures

The answer has the same number of digits as the least significant figure (regardless of placement).

Example: $7.55 \times 0.34 = 2.567 \rightarrow 2.6$

Reason: 349.0 is significant to only 1 place past the decimal, this is the least precise measurement, therefore, it determines the number of decimal places in the answer.