

What is a significant digit? or also known as a significant figure?

All measurements done with a tool or device (like a thermometer, ruler, gram scale) have uncertainty associated with the measurement. The more digits a number possesses the less uncertain it is. ‘

5 grams

5.26 grams

5.2618 grams

The last digit recorded is always estimated and therefore uncertain.

Each of the above has an assumed uncertainty of +/- 1 of the last significant digit recorded.

5 ± 1 gram

5.26 ± 0.01 grams

5.2618 ± 0.0001 grams

How can you tell the number of significant digits (or sig figs) a measurement has?

Rule #1 All digits (non zero #s) between 1-9 have significance

Rule #2 Zeroes that are sandwiched between two digits have significance

Rule #3 Leading zeroes are never significant.

Rule #4 Trailing zeroes are only significant if the number has a decimal point.

1239	4 significant digits	Rule #1	
3400	2 significant digits	Rule #4	
10089	5 significant digits	Rule #2	
0.00024	2 sig figs	Rule #3	
45100	3 sig figs	Rule #4	
0.012	2 sig figs	Rule #3	
12.190	5 sig figs	Rule #4	
0.00309	3 sig figs	Rule #2 and Rule #4	

Adding or subtracting with sig figs.

Round your numbers to the least precise measurement.

In practical terms that means rounding the answer to the measurement that has the least number of decimal places. I call it the “chop” rule.

$$\begin{array}{r} 142.0 \\ + 11.21987 \text{ grams} \\ \hline 153.2 \end{array}$$

$$\begin{array}{r} 0.363 \\ + 0.12 \text{ L} \\ \hline 0.48 \end{array}$$

$$\begin{array}{r} 5602 \\ - 125.59 \text{ m} \\ \hline 5476 \end{array}$$

$$\begin{array}{r} 15.3382 \\ - 1.113 \text{ sec} \\ \hline 14.225 \end{array}$$

The sum or the difference can't communicate a better precision than the least precise measurement in the group.

Multiplying and Dividing numbers with sig figs

Round the number to the least number of sig figs regardless of how many decimal places each number has.

Examples: $52 \times 2.3 =$ Answer should have 2 digits

Calculator _____ Correct Rounding _____

$1.236 \times 1.36 =$ Answer should have 3 digits

$13 / 2.66 =$ Answer should have 2 digits

$45325 / 125.2 =$ Answer should have 4 digits.

Practice

Add or subtract the following numbers. Record the answer to the correct number of significant digits. (Think-how many decimal places should the answer have?)

1. 125.663 grams + 12.52 grams + 38.11 grams =
2. 1.25 L + 12.36 L + 6.1 L =
3. 0.30263 Km + 0.0251 Km =
4. 15.2 mls + 3 mls + 2.33 mls =
5. 66.21 Kg - 4.5 Kg =
6. 1452 L - 1.6 L
7. 5.2316 sec - 1.118 sec
8. 12,230.55 nm - 2,202.541 nm

Challenge

9 $1.25 \times 10^3 + 5.6 \times 10^3$

Multiply or divide the following numbers recording the answer to the correct number of significant digits.

10. $9.114 \times 42.56 =$
11. $62 / 8.91 =$
12. $89.365 \times 3.65 =$
14. $8745 / 12.63 =$

Challenge

15. $(3.42 + 8.2) / (123 - 2.11)$