

# WHAT IS A "SIGNIFICANT FIGURE"?

The number of significant figures in a result is simply the number of figures that are known with some degree of reliability. The number 13.2 is said to have 3 significant figures. The number 13.20 is said to have 4 significant figures.

**Rules for deciding the number of significant figures in a measured quantity:**

**(1) All nonzero digits are significant:**

1.234 g has 4 significant figures,  
1.2 g has 2 significant figures.

**(2) Zeros between nonzero digits are significant:**

1002 kg has 4 significant figures,  
3.07 mL has 3 significant figures.

**(3) Leading zeros to the left of the first nonzero digits are not significant; such zeroes merely indicate the position of the decimal point:**

0.001 °C has only 1 significant figure,  
0.012 g has 2 significant figures.

**(4) Trailing zeroes that are to the right of a decimal point in a number are significant:**

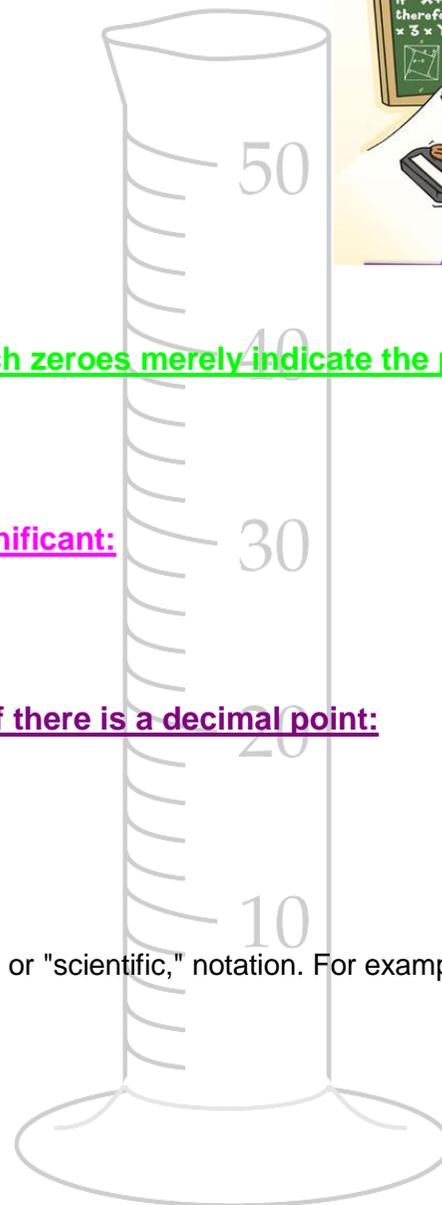
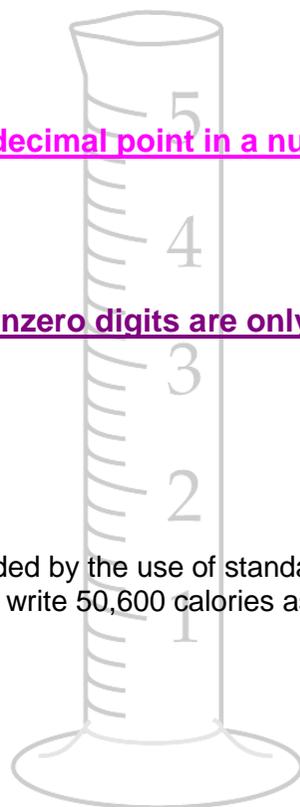
0.0230 mL has 3 significant figures,  
0.20 g has 2 significant figures.

**(5) Trailing zeroes that are to the right of nonzero digits are only significant if there is a decimal point:**

190 miles is 2 significant figures,  
190. miles is 3 significant figures,  
190.0 miles is 4 significant figures

The potential ambiguity in the last rule can be avoided by the use of standard exponential, or "scientific," notation. For example, depending on whether the number of significant figures is 3, 4, or 5, we would write 50,600 calories as:

$5.06 \times 10^4$  calories (3 significant figures)  
 $5.060 \times 10^4$  calories (4 significant figures), or  
 $5.0600 \times 10^4$  calories (5 significant figures).



## **Rules for calculations using significant figures:**

### **(1) Rules for addition/subtraction problems**

Your calculated value cannot be more precise than the *least precise quantity* used in the calculation. The *least precise quantity* has the fewest digits to the right of the decimal point.

***Your calculated value will have the same number of digits to the right of the decimal point as that of the least precise quantity.***

In practice, find the quantity with the fewest digits to the right of the decimal point.

In the example below, this would be 11.1 (this is the *least precise quantity*).

$7.939 + 6.26 + 11.1 = 25.299$  (this is what your calculator spits out)

In this case, your final answer is limited to one sig fig to the right of the decimal or 25.3 (rounded up).

### **(2) Rules for multiplication/division problems**

***The number of sig figs in the final calculated value will be the same as that of the quantity with the fewest number of sig figs used in the calculation.***

In practice, find the quantity with the fewest number of sig figs.

In the example below, the quantity with the fewest number of sig figs is 27.2 (three sig figs).

Your final answer is therefore limited to three sig figs.

$(27.2 \times 15.63) \div 1.846 = 230.3011918$  (this is what your calculator spits out)

In this case, since your final answer is limited to three sig figs, the answer is 230. (rounded down) N.B. See where the decimal point is located.

### **(3) Rules for combined addition/subtraction and multiplication/division problems**

First apply the rules for addition/subtraction (determine the number of sig figs for that step), then apply the rules for multiplication/division.