

## Significant Digits:

Rule 1) 1, 2, 3, 4, 5, 6, 7, 8, 9 are always significant digits

Rule 2) 0 is significant if it is between two of the above digits

Rule 3) 0 is significant at the end of a decimal number

Examples:

123 has 3 significant digits

1230000 has 3 significant digits

0.123 has 3 significant digits

1.230 has 4 significant digits

1.0123 has 5 significant digits

When multiplying or dividing two, your final answer should have the same number of significant digits as the multiplicand with the least significant digits. For example if you did the calculation  $1.23 * 5.0 / 3.14159$  your answer would be rounded to two significant digits because 5.0 has two significant digits.

When adding or subtracting you round your answer to the accuracy of the least accurate number. For example,  $527.3 + 19.071 = 546.371$ , which you round to 546.4 since 527.3 is accurate only to 0.1.

NOTE! Only round your final answers, not intermediate steps! If you round too much in your intermediate steps you can end up with large rounding errors.

## Scientific Notation:

Scientific notation is a short way to write very large and very small numbers. A number is split into two parts, a number between 1 and 9.999...; and the number's associated power of ten.

Examples:

$$2000 = 2 \times 10^3$$

$$123.45 = 1.2345 \times 10^2$$

$$0.000123 = 1.23 \times 10^{-4}$$

To find how many powers of ten a number has, move the decimal to the left for numbers greater than 1 (to the right for numbers between 0 and 1) until the decimal is to the right of the first significant digit. If you moved the decimal 3 places to the left, then you have 3 powers of ten (a thousand) in that number. If you moved it 3 places to the right then you have -3 powers of ten (one thousandth) in that number.

## Conversions:

It is often necessary to convert a number from one unit system to another. For example it is cumbersome to tell someone that your house is 63360 inches away, but it's easy to say that your house is one mile away; and it's also easier to understand.

Now let's say your house is 1.5 miles from school and just for kicks you'd like to know how many centimeters that is. This involves doing a number of conversions, I'll start by listing what you need to know.

$$1 \text{ mile} = 5280 \text{ feet}$$

$$1 \text{ foot} = 12 \text{ inches}$$

$$1 \text{ inch} = 2.54 \text{ centimeters}$$

It's easiest to do this in steps, start by converting miles to feet:

$$(1.5 \text{ miles}) \left( \frac{5280 \text{ feet}}{1 \text{ mile}} \right) = 7920 \text{ feet}$$

Then feet to inches:

$$(7920 \text{ feet}) \left( \frac{12 \text{ inches}}{1 \text{ foot}} \right) = 95040 \text{ inches}$$

Then finally inches to centimeters:

$$(95040 \text{ inches}) \left( \frac{2.54 \text{ cm}}{1 \text{ inch}} \right) = 241401.6 \text{ cm}$$

But remember that I started with 1.5 miles so my final answer should only have two significant digits so I would round it to  $2.4 \times 10^5$  centimeters. The trick of unit conversions is to make the units you want to get rid of cancel, ie, have a miles on the top that cancels the miles on the bottom. Note that I am not changing the actual distance, they are all equal to 1.5 miles, I am just changing how I describe that 1.5 miles.