Quick Introduction to Scientific Notation

What is it?
Scientific notation is a quick way to write really big numbers by expressing them as the product of a small number and a power of 10. For example: 1,473,000,000,000,000 can be written as 1.473×10^{15}. Scientific notation is used frequently in science, especially in chemistry.

Converting numbers to scientific notation.
To convert a large number to scientific notation, first move the decimal so that there is only one number to the left of it. Let n = the number of spaces that you moved the decimal. Multiply your new number by 10^n if you moved the decimal to the left, or 10^{-n} if you had to move the decimal to the right.

Examples:

$1,254,300 = 1.2543 \times 10^6$ $0.0000000029 = 2.9 \times 10^{-9}$

Practice Problems:

34,294 = _____ 0.0000284 = _____

944 = _____ 0.00000000000734 = _____

Converting numbers in scientific notation back to standard notation.
To convert a number in scientific notation back to standard notation, move the decimal the correct number of spaces indicated by the exponent. If the exponent is positive, move the decimal to the right. If the exponent is negative, move the decimal to the left.

Examples:

$2.387 \times 10^7 = 23,870,000$ $6.5 \times 10^{-4} = 0.00065$

Practice Problems:

$4.3 \times 10^6 =$ _____ $3.29 \times 10^{-5} =$ _____

Multiplication with scientific notation.
To multiply numbers written in scientific notation, follow these steps.
1. Multiply the numerals.
2. Add the exponents on the tens.
3. Multiply the product from step 1 by 10^n, where n is the sum from step 2.
4. Rewrite the answer in correct scientific notation form.

Example: $5.6 \times 10^{11} \times 3.2 \times 10^5 = (5.6 \times 3.2) \times 10^{16} = 17.92 \times 10^{16} = 1.792 \times 10^{17}$

Practice Problems:

$3.56 \times 10^4 \times 4.8 \times 10^3 =$ _____

$1.547 \times 10^3 \times 2 \times 10^{12} =$ _____

Division with scientific notation.
To divide numbers written in scientific notation, follow these steps.
1. Rewrite the division problem in fraction form (if it isn¢t already).
2. Divide the numerals.
3. Subtract the exponent on the denominator from the exponent on the numerator.
4. Multiply the quotient from step 2 by 10^n, where n is the difference from step 3.
5. Rewrite the answer in correct scientific notation form.

Example: $\dfrac{4.589 \times 10^9}{3.74 \times 10^3}$ $(4.589/3.74) \times 10^6 = 1.227 \times 10^6$

Practice Problems:

$\dfrac{1.23 \times 10^8}{3.5 \times 10^4}$ $\dfrac{4.29 \times 10^4}{2.4 \times 10^{11}}$