**Scientific Notation Notes**

**Scientific Notation** is an abbreviated (short) way of writing very large and very small numbers. It is used in almost all areas of science to describe physical objects and distances.

6.022 x **10**23 = 602,200,000,000,000,000,000,000

1.67 x **10**-23 = 0.0000000000000000000000167

All Scientific notation have

* A **base of ten**
* A positive exponent for large numbers, a negative exponent for small numbers
* A coefficient greater than or equal to 1 and less than 10

 $1\leq coefficient<10$

**Multiplication**

Because scientific notation is written in coefficients, like bases (10) and exponents.

We follow the same rules as regular expressions

* Multiply coefficients
* Keep base
* Add exponents

$$5x^{2}\*10x^{6}=50x^{8}$$

$$2y^{-5}\*4x^{7}=8x^{2}$$

$$\left(2 x 10^{3}\right)\*\left(4 x 10^{6}\right)=8x 10^{9}$$

$\frac{10x^{5}}{5x^{2}}=2x^{3}$

Division

We follow the same rules as regular expressions

* Divide coefficients
* Keep base
* Subtract exponents

$$\frac{(3.0 x 10^{20})}{(1.5 x 10^{2})}=2.0 x 10^{18}$$

$$\frac{(6.3 x 10^{10})}{(3.0 x 10^{-5})}=2.1 x 10^{15}$$

Ratios are comparisons of two numbers, we generally will express them as fractions.

4 COMPARED TO 1 means that 4 is the numerator, 1 is the denominator.

