

PURPOSE: scientific notation simply makes it easier to view and work with VERY large or small numbers that are often used in science and technology. REMEMBER, there was a time not long ago when scientist did not have calculators. Like when they sent the first men to the moon. They had to convert and calculate using huge and tiny numbers with ONLY THEIR MIND AND PAPER. And one day not far away, we could end up with no calculators. So it's important for us to know how to do this!

TERMS to LEARN:

1. **Original** number you start with is a very **BIG** or very small number, then you need to **CONVERT** to scientific notation.

2. **Coefficient** is the main number that is multiplied by 10 to a certain power (exponent)

Example: $4.5 \times 10^4 = 45,000$. The 4.5 is the coefficient.

3. **Exponent** is the superscript power on the 10 that shows how many times the coefficient is multiplied by 10.

Example: $4.5 \times 10^4 = 45,000$. The little superscript ⁴ above the 10 is the exponent.

SIMPLE RULES for CONVERTING from standard numbers to scientific notation format:

1. All coefficient numbers must be between 1 and less than 10. So the **decimal** in the original very big or very small number must be moved a number of spaces until the coefficient satisfies rule # 1. **EXAMPLE: $45,000 = 4.5 \times 10^4$.**

The coefficient should **ONLY** have **ONE** digit to the **LEFT** of the **DECIMAL**. (the **4** is the only # to the left of the decimal.)

2. All exponents above the 10 must be whole numbers.

3. The exponent above the 10 is equal to the number of spaces you moved the decimal to satisfy rule # 1.

4. If the original number is less than 1, then the exponent must be a negative number. (like 10^{-4})

* Otherwise, the exponent must be a positive number.

SIMPLE RULES doing CALCULATING with scientific notation numbers:

1. When adding or subtracting two scientific notation numbers that have the **SAME** exponent above their 10, you simply add or subtract the two coefficients and then **KEEP** the same exponent above the 10.

* **Example:** $5.0 \times 10^7 + 3.0 \times 10^7 = (5 + 3) \times 10^7$ (just keep the 7 same) = 8×10^7

BUT if the two numbers you want to add or subtract have DIFFERENT exponents above their 10, then it becomes more complicated. In middle school life science, you will NOT have to do those kinds of problems.

2. When multiplying two scientific notation numbers, you multiply the two coefficients and **ADD** the two exponents.

* **Example:** $5.0 \times 10^7 \times 3.0 \times 10^4 = (5 \times 3) \times 10^{7+4=11} = 15 \times 10^{11}$

3. When dividing two scientific notation numbers, you divide the two coefficients and **SUBTRACT** the two exponents.

* **Example:** $6.0 \times 10^7 \div 2.0 \times 10^4 = (6 \div 2) \times 10^{7-4=3} = 3 \times 10^3$