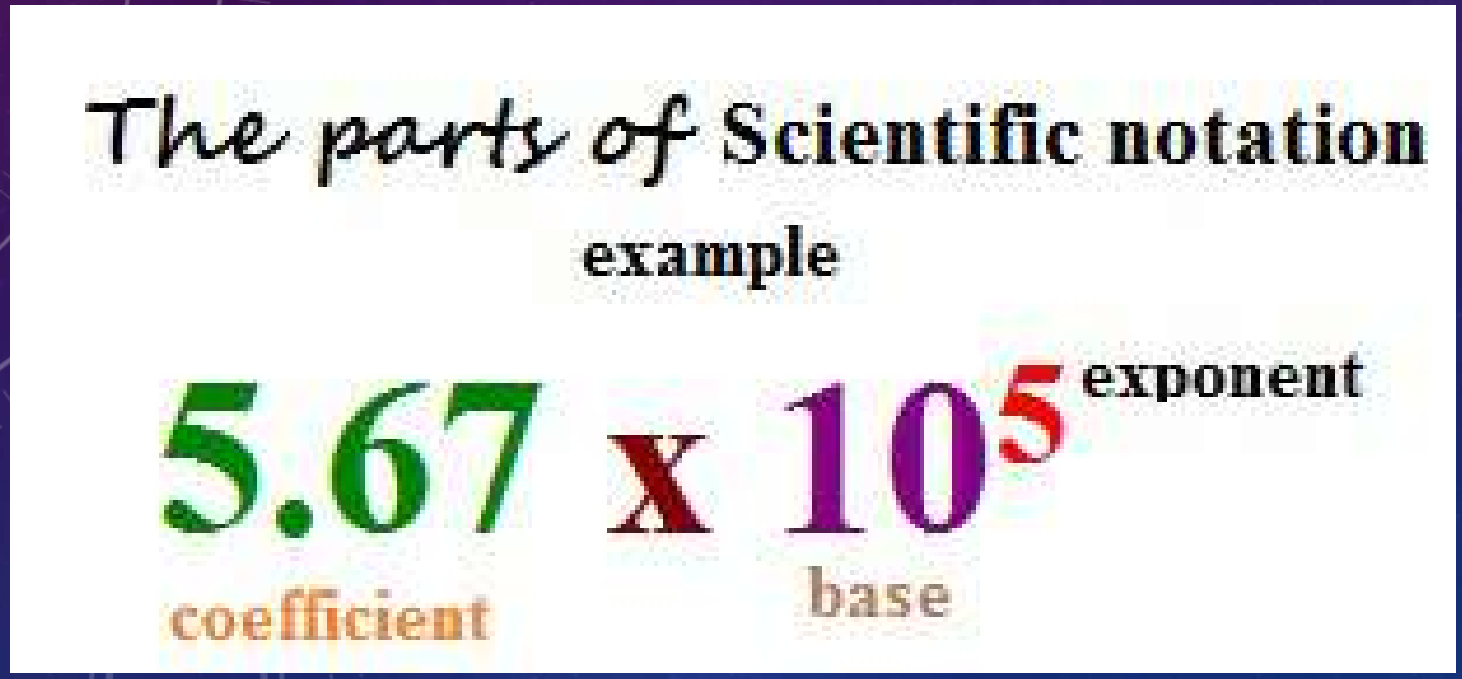
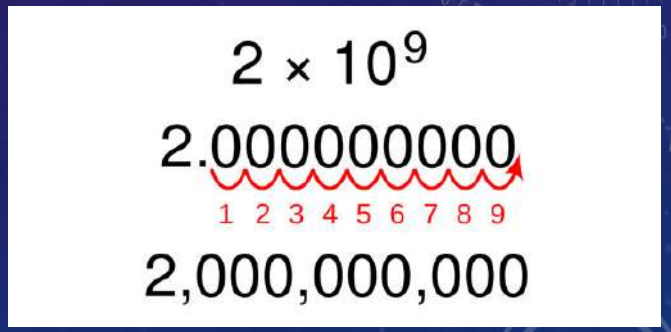
NOTES: SCIENTIFIC NOTATION



WHAT IS SCIENTIFIC NOTATION?

- A shorter way to express very long numbers (numbers that are either very LARGE such as 6,000,000 or that are very small such as 0.0000000000001).

Note: NO comas are used in scientific notation.



Example: The distance between New York City and San Francisco = 4,741,000m

4,741,000m = (4.741 x 1,000,000)m or 4.741 x 10^6m

RULES FOR USING SCIENTIFIC NOTATION

1. Put the decimal after the first non-zero digit so you have a number between one and ten
- Example: 1200 becomes 1.2×10^3

2. Count the number of places the decimal was moved.
- Using the example above… the decimal was moved 3 places to the left so it equals 10^3
  - When you move the decimal point to the **LEFT** = positive exponent (+)
  - When you move the decimal point to the **RIGHT** = negative exponent (-)

3. Addition and subtraction MUST have like powers of 10
- Example: $(3.4 \times 10^{2)} + (5.7 \times 10^2) = 9.1 \times 10^2$

4. Multiplication adds the exponents and multiplies the digits
- Example: $10^a \times 10^b = 10^{a+b}$
- $(2.1 \times 10^{3)} \times (5.8 \times 10^2) = 12.18 \times 10^5 = 12 \times 10^5$

5. Division subtracts the exponents and divides the digits
- Example: $100^a / 100^b = 10^{a-b}$

Numbers into Scientific Notation

0.0043

The Number is a decimal **less than 1**, so the **Exponent will be Negative**.

= 0 .0 0 4 3

3 places

Move the Decimal point to the RIGHT to create a number between 1 and 10.

= ~~0 0 0~~ 4.3

Remove Zeroes that are not needed.

= 4.3×10^{-3} ✓

We moved **3 places** so Power of 10 is three : 10^{-3}

Numbers into Scientific Notation

0.0050

The Number is a decimal **less than 1**, so the **Exponent will be Negative**.

= 0 .0 0 5 0

3 places

Move the Decimal point to the RIGHT to create a number between 1 and 10.

= ~~0 0 0~~ 5.0

Remove Zeroes that are not needed.

NEVER REMOVE ZEROES THAT CAME AFTER A DECIMAL POINT.

= 5.0×10^{-3} ✓

We moved **3 places** so Power of 10 is three : 10^{-3}

PRACTICE

- Convert each of the following into scientific notation:
  1. 248,000g =
  2. 0.000091kg =
  3. 25,000,000m =

- Convert each of the following into decimal form:
  4. 523.9 x 10-5 =
  5. 0.56 x 105 =

- Calculate each of the following:
  6. (2.6 x 105) + (3.4 x 105) =
  7. (7.5 x 102) x (6.45 x 108) =
  8. (4.6 x 107) / (2.42 x 105) =

Scientific notation	Expanded form
1×10^{-9}	0.000000001
1×10^{-6}	0.000001
1×10^{-3}	0.001
1×10^{-2}	0.01
1×10^{0}	1
1×10^{3}	1,000
1×10^{6}	1,000,000
1×10^{9}	1,000,000,000

PRACTICE PROBLEMS - KEY

Convert each of the following into scientific notation:

1. 248,000g = 2.48×10^{5}
2. 0.000091kg = 9.1×10^{-5}
3. 25,000,000m = 2.5×10^{7}

Convert each of the following into decimal form:

4. 523.9×10^{-5} = 0.005239
5. 0.56×10^{5} = 56,000

Calculate each of the following:

6. $(2.6 \times 10^{5)} + (3.4 \times 10^{5}) = 6.0 \times 10^{5}$
7. $(7.5 \times 10^{2)} \times (6.45 \times 10^{8}) = 48.375 \times 10^{10} = 48.4 \times 10^{10}$
8. $(4.6 \times 10^{7)} / (2.42 \times 10^{5}) = 1.90 \times 10^{2}$