## 1) Multiplication/ Division Rules:

The number that has "the fewest number of Significant Figures" decides the number of significant figures in the final answer.

#### **Example:**

2.711 x 6.3 = 17.0793 => 
$$\boxed{17}$$
4 SF 2 SF

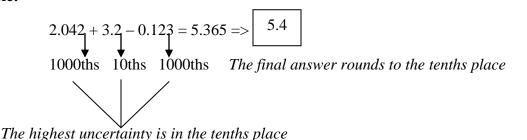
2 SF in the final answer (Choose the fewest SF)

# 2) Addition/Subtraction Rules:

When two numbers are added or subtracted the final answer should not have greater certainty than the original measurements.

Round the result of addition/subtraction to the same decimal place as the measurement with the highest/biggest uncertainty.

#### **Example:**



## • Addition/ Subtraction of Scientific Numbers with the <u>SAME</u> Exponents:

Step 1: If exponents are the same, then proceed with the addition/ subtraction operations immediately.

#### **Example:**

$$(2.661 \times 10^{3}) + (3.01 \times 10^{3}) = 5.671 \times 10^{3} => \boxed{5.67 \times 10^{3}}$$

$$1000 ths \qquad 100 ths \qquad The final answer rounds to the hundredths place$$

The highest uncertainty is in the hundredths place.

### • Addition/ Subtraction of Scientific Numbers with *DIFFERENT* Exponents:

Step 1: Make exponents the same.

Step 2: Perform the addition or subtraction operation.

Step 3: After the exponents have been made the same, round answer to the same decimal place as the measurement with the highest/biggest uncertainty.

Step 4: Make sure the final answer is in standard scientific notation.

**Example:** 
$$(9.98 \times 10^{-3}) + (8.04 \times 10^{-5}) = ?$$

Step 1: 
$$8.04 \times 10^{-5}$$
 becomes  $0.0804 \times 10^{-3}$ 

Step 2 and 3: 
$$(9.98 \times 10^{-3}) + (0.0804 \times 10^{-3}) = 10.0604 \times 10^{-3} = 10.06 \times 10^{-3}$$

The highest uncertainty is in the hundredths place.

Step 4: The correct scientific notation adjustment must be made! Final answer  $\Rightarrow$  1.006 x 10<sup>-2</sup>

# **Special Cases:**

**Internal Zeros** are ALWAYS Significant

Example: 4.001 => 4 Significant Figures

**Leading Zeros** are NEVER Significant

0.000007 => 1 Significant Figure Example:

**Trailing Zeros** are *Significant* ONLY IF the decimal point is specified

Example: 200000 => 1 Significant Figure

200. => 3 Significant Figures

200.1 => 4 Significant Figures

# **Practice Problems:**

4. 
$$(2.66 \times 10^4) - (1.03 \times 10^3) =$$

$$2. \quad 0.254 - 0.367 + 5.4892 =$$

6. 
$$(112 \times 0.456) / (3.2 \times 120) =$$

**Solutions:** (1) 10700, (2) 5.376, (3) 48000 or 4.8 X 10<sup>4</sup>, (4) 2.56 x 10<sup>4</sup>, (5) 0.422, (6) 0.13