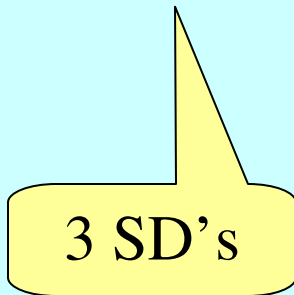


# Significant Digits

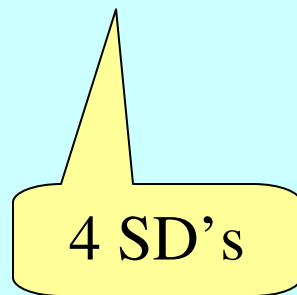
## Rules:

1. All non-zero digits are significant

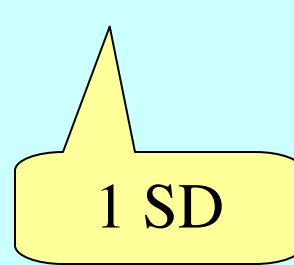
1.22



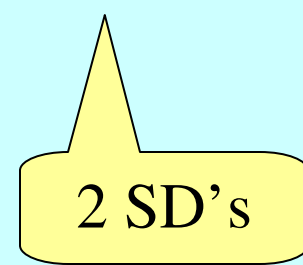
9456



8



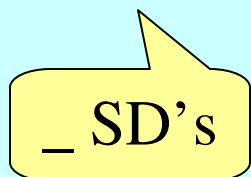
8.2



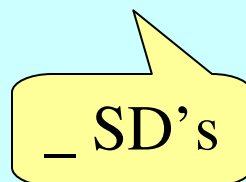
## 2. Zero's between non-zero digits are significant

eg.

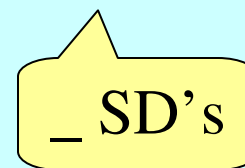
2005



3.06



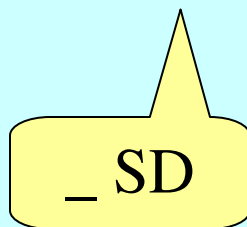
900.0035



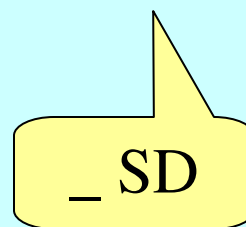
## 3. All zero's to the LEFT of the 1<sup>st</sup> non-zero digit are NOT significant. (called leading zero's)

eg.

0.005



0.00000506



## 2. Zero's between non-zero digits are significant

eg.

2005

4 SD's

3.06

3 SD's

900.0035

7 SD's

## 3. All zero's to the LEFT of the 1<sup>st</sup> non-zero digit are NOT significant. (called leading zero's)

eg.

0.005

\_ SD

0.00000506

\_ SD's

## 2. Zero's between non-zero digits are significant

eg.

2005

4 SD's

3.06

3 SD's

900.0035

7 SD's

## 3. All zero's to the LEFT of the 1<sup>st</sup> non-zero digit are NOT significant. (called leading zero's)

eg.

0.005

1 SD

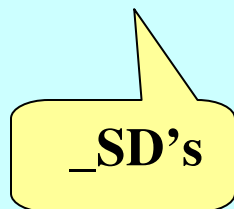
0.00000506

3 SD's

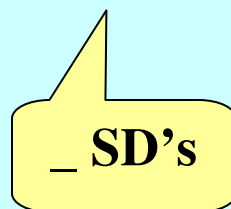
**4. Zero's to the RIGHT of the last non-zero digit (trailing zero's) ARE significant IF the decimal point is SHOWN.**

**Eg.**

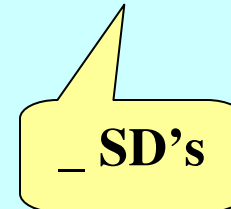
**4.00**



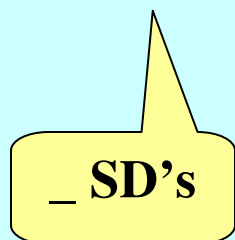
**300.000**



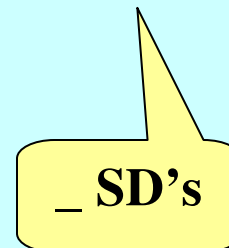
**4000.**



**0.0560**



**0.0050600**



**4. Zero's to the RIGHT of the last non-zero digit (trailing zero's) ARE significant IF the decimal point is SHOWN.**

**Eg.**

**4.00**

**3 SD's**

**300.000**

**6 SD's**

**4000.**

**4 SD's**

**0.0560**

**3 SD's**

**0.0050600**

**5 SD's**

**5. Zero's to the RIGHT of the last non-zero digit (trailing zero's) ARE NOT significant if there is an UNDERSTOOD decimal point.**

An Understood decimal point

Eg. **600**      **9 800 000**      **10**

**\_SD**      **\_SD's**      **\_SD**

**50.0060**      **0.005600200**      **59 000**

**\_SD's**      **\_SD's**      **\_SD's**

The diagram illustrates the concept of significant figures (SD) and significant digits (SD's) for various numbers. A green speech bubble at the top points to the decimal point in the examples below, stating 'An Understood decimal point'. The examples are arranged in two rows. The first row shows '600', '9 800 000', and '10'. The second row shows '50.0060', '0.005600200', and '59 000'. For each number, a yellow callout box indicates the number of significant figures or significant digits. For '600', the callout is '\_SD'. For '9 800 000', the callout is '\_SD's'. For '10', the callout is '\_SD'. For '50.0060', the callout is '\_SD's'. For '0.005600200', the callout is '\_SD's'. For '59 000', the callout is '\_SD's'. The numbers '600', '9 800 000', and '10' have their trailing zeros in red, while the other digits are in green. The numbers '50.0060', '0.005600200', and '59 000' have all their digits in black.

**5. Zero's to the RIGHT of the last non-zero digit (trailing zero's) ARE NOT significant if there is an UNDERSTOOD decimal point.**

An Understood decimal point

Eg. **600**      **9 800 000**      **10**

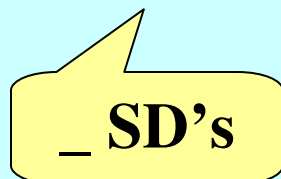
1 SD      2 SD's      1 SD

**50.0060**      **0.005600200**      **59 000**

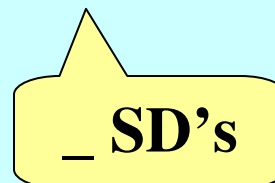
6 SD's      7 SD's      2 SD's

## 6. In Scientific Notation, the exponent part of the number is NOT significant.

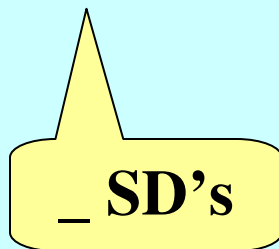
Eg.  $3.45 \times 10^3$

\_SD's

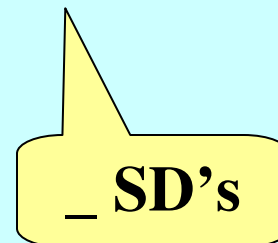
$2.000 \times 10^{-14}$

\_SD's

$4.903 \times 10^{23}$

\_SD's

$0.05600 \times 10^6$

\_SD's

## 6. In Scientific Notation, the exponent part of the number is NOT significant.

Eg.  $3.45 \times 10^3$

3 SD's

$2.000 \times 10^{-14}$

4 SD's

$4.903 \times 10^{23}$

4 SD's

$0.05600 \times 10^6$

4 SD's

Find the number of significant digits in each of the following measurements:

**0.002060** \_\_\_\_\_

**98 000** \_\_\_\_\_

**200.003** \_\_\_\_\_

**5678.94** \_\_\_\_\_

**0.0000012** \_\_\_\_\_

**3.500 x 10<sup>-4</sup>** \_\_\_\_\_

**876 000.** \_\_\_\_\_

**3.2 x 10<sup>46</sup>** \_\_\_\_\_

**1.000000** \_\_\_\_\_

**0.002 x 10<sup>4</sup>** \_\_\_\_\_

Find the number of significant digits in each of the following measurements:

**0.002060** 4

**98 000** 2

**200.003** 6

**5678.94** 6

**0.0000012** 2

**3.500** x  $10^{-4}$  4

**876 000.** 6

**3.2** x  $10^{46}$  2

**1.000000** 7

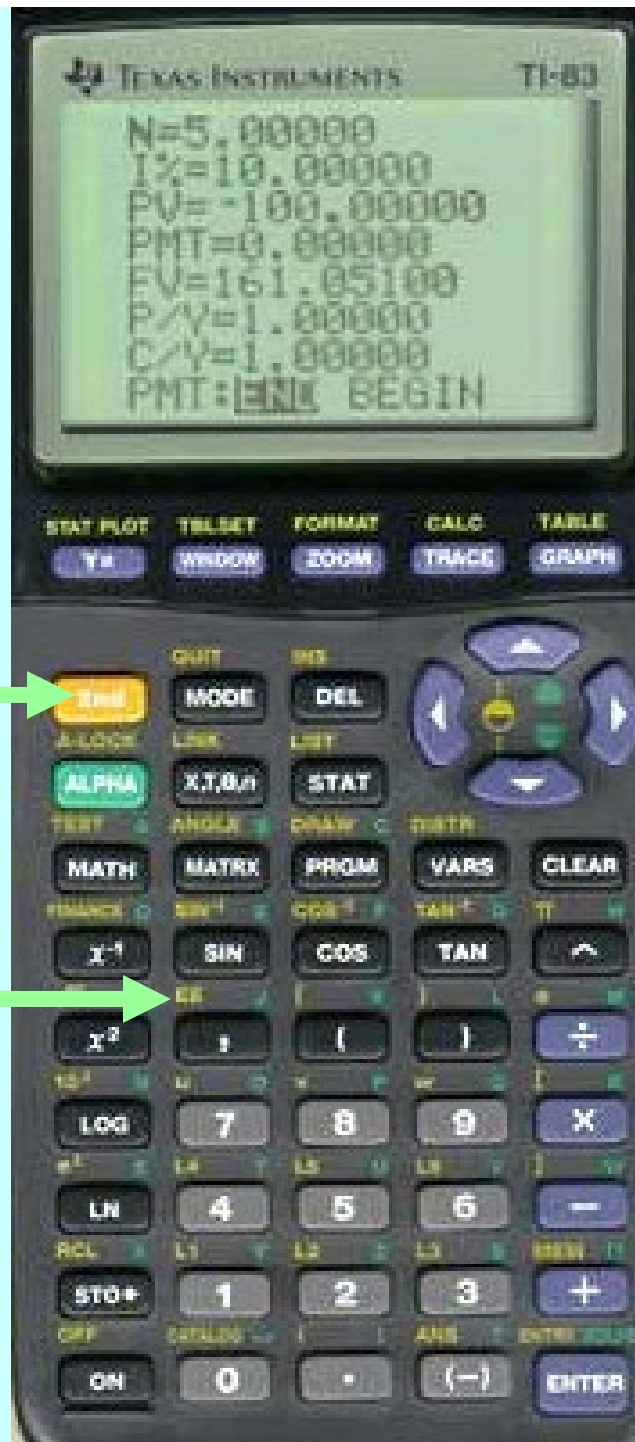
**0.002** x  $10^4$  1

To use the “Exponential”  
button on a calculator  
for Scientific Notation

TI 83

2<sup>nd</sup> function

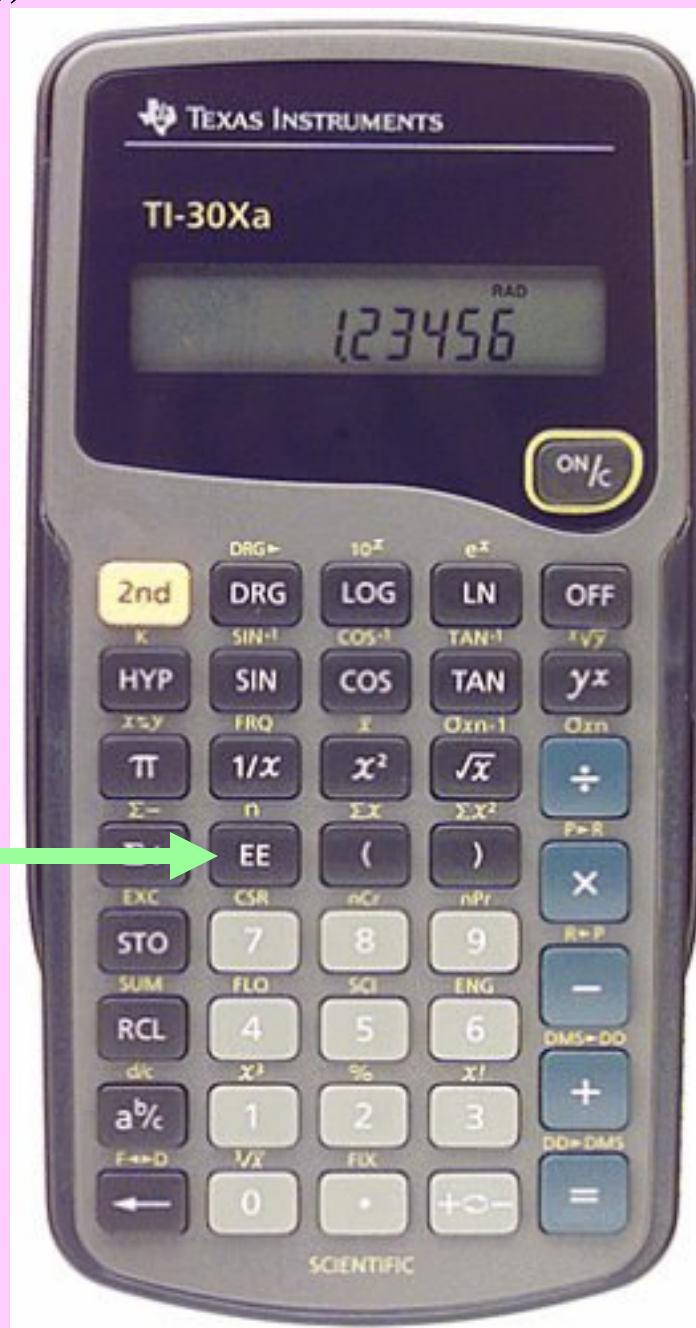
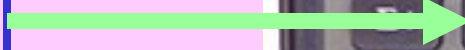
EE (above the ‘)



To use the “Exponential”  
button on a calculator  
for Scientific Notation

TI30Xa

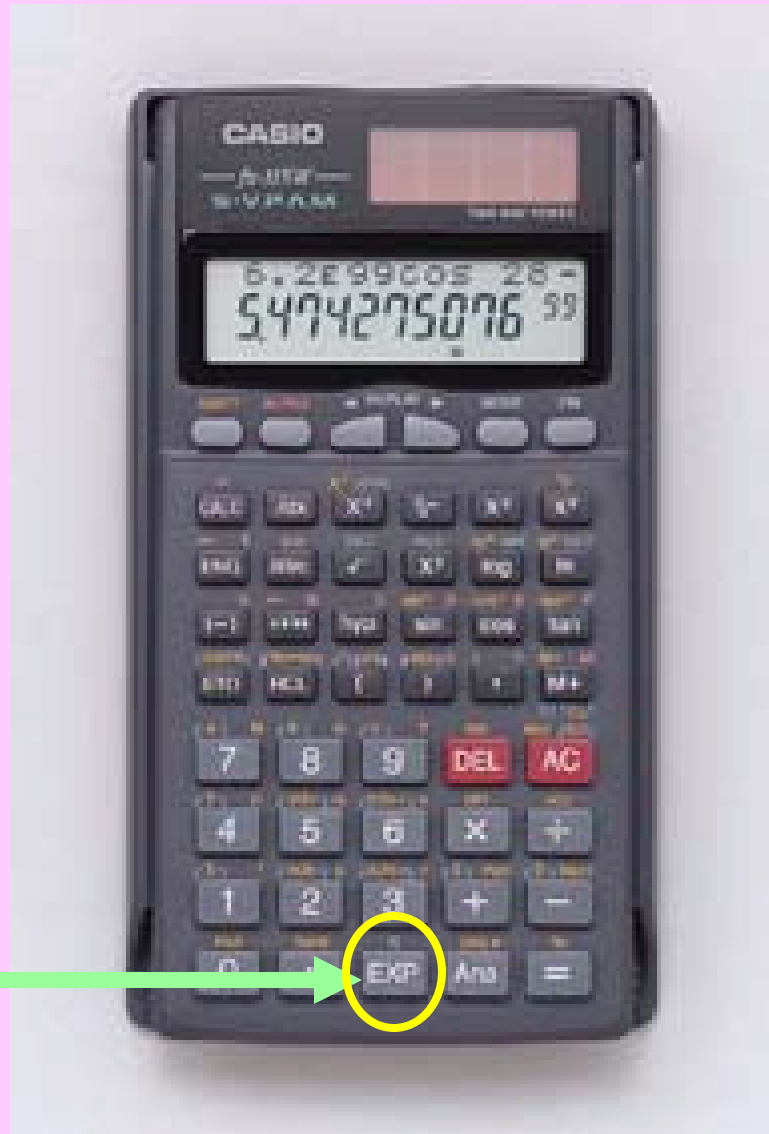
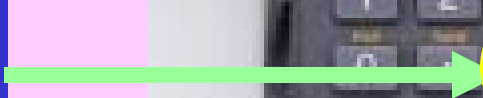
EE



To use the “Exponential”  
button on a calculator  
for Scientific Notation

CASIO

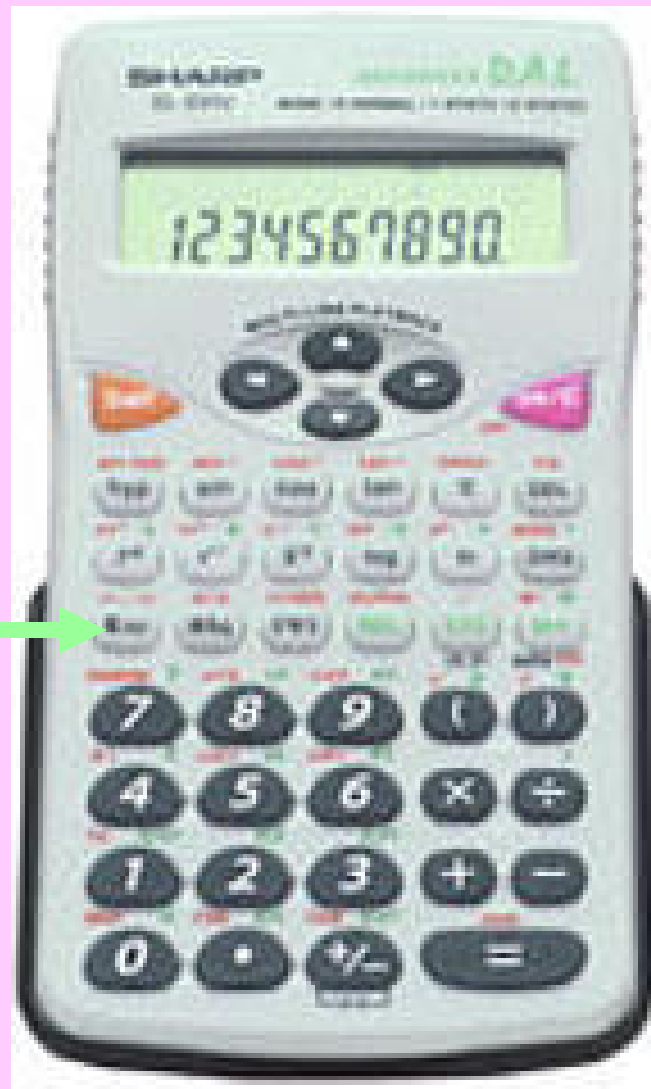
EXP



To use the “Exponential”  
button on a calculator  
for Scientific Notation

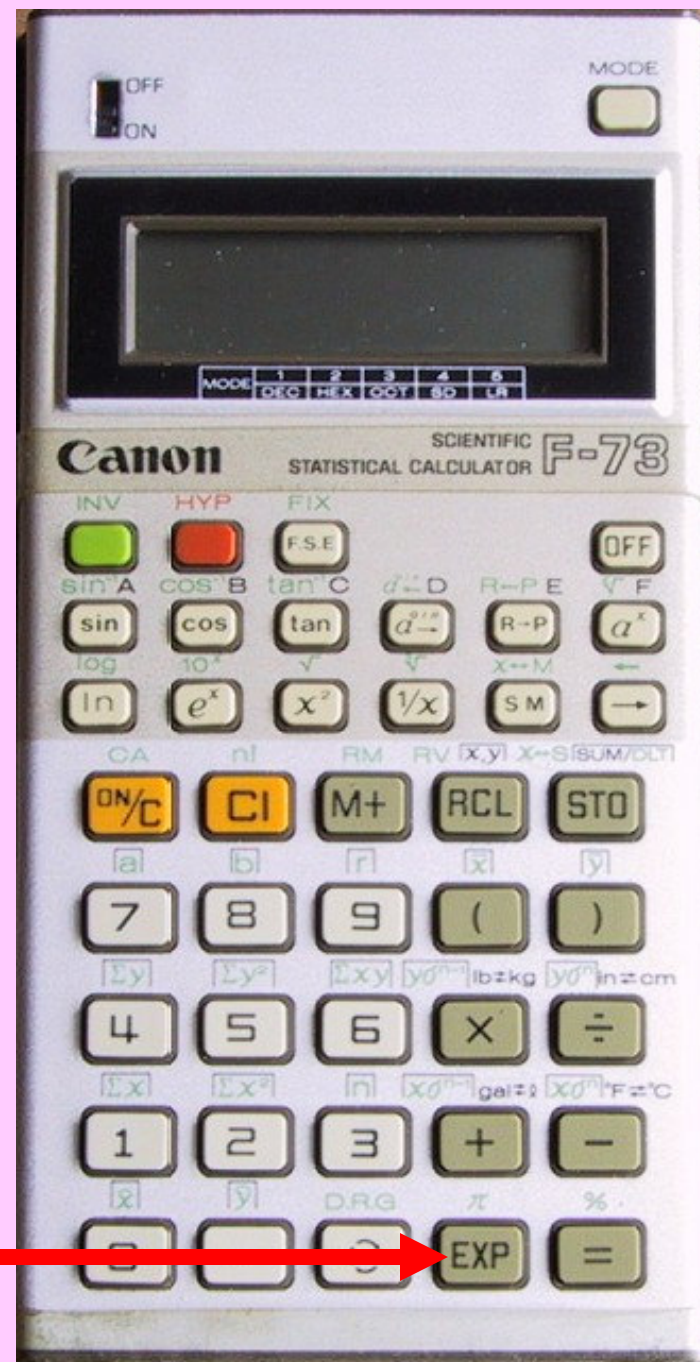
SHARP

EXP



To use the “Exponential”  
button on a calculator  
for Scientific Notation

CANON



EXP

**When entering Scientific Notation on a calculator, NEVER USE “x” and “10” . Instead of “10 to the...”, use EE (or EXP).**

**Enter  $4.56 \times 10^5$  on you calculator:**

**It should show “ 4.56E5” or “4.56 <sup>05</sup>”  
or “4.56 <sub>05</sub>” or maybe even “4.56 x 10<sup>5</sup>”**

Do the following calculations using your Scientific Calculator:

$$(3.456 \times 10^{-9}) \times (566.2) \underline{\hspace{10em}}$$

$$\frac{6.500 \times 10^{-12}}{0.0257} = \underline{\hspace{10em}}$$

Do the following calculations using your Scientific Calculator:

$$(3.456 \times 10^{-9}) \times (566.2) = 0.000001957$$

**or**  $1.9567872 \times 10^{-6}$

$$\frac{6.500 \times 10^{-12}}{0.0257} = \underline{\hspace{10em}}$$

Do the following calculations using your Scientific Calculator:

$$(3.456 \times 10^{-9}) \times (566.2) = 0.000001957$$

**or**  $1.9567872 \times 10^{-6}$

$$\frac{6.500 \times 10^{-12}}{0.0257} = 2.529182879 \times 10^{-10}$$

# **Rules for Calculations with Significant Digits**

## **For Multiplication or Division:**

**Answer is rounded to the LOWEST # OF SD'S  
in the data.**

**Perform the following calculation and round the answer to the correct number of significant digits:**

$$(5.6 \times 10^3) (3.651 \times 10^{-7})$$

*(calculator answer \_\_\_\_\_)*

**Final answer \_\_\_\_\_**

**Perform the following calculation and round the answer to the correct number of significant digits:**

$$(5.6 \times 10^3) (3.651 \times 10^{-7})$$

2 SD's

4 SD's

*(calculator answer \_\_\_\_\_)*

**Final answer \_\_\_\_\_**

Rounded to 2 SD's

**Perform the following calculation and round the answer to the correct number of significant digits:**

$$(5.6 \times 10^3) (3.651 \times 10^{-7})$$

Less than 5, so the "0" is not rounded up.

*(calculator answer*  **$2.04456 \times 10^{-3}$  or  $0.00204456$** *)*

**Final answer**  **$2.0 \times 10^{-3}$  or  $0.0020$**

Rounded to 2 SD's

Rounded to 2 SD's

**Perform the following calculation and round the answer to the correct number of significant digits:**

$$\frac{(9.533 \times 10^3)}{(3.02 \times 10^{-7})}$$

*(calculator answer \_\_\_\_\_)*

**Final answer \_\_\_\_\_**

**Perform the following calculation and round the answer to the correct number of significant digits:**

4 SD's

$$(9.533 \times 10^3)$$

---

$$(3.02 \times 10^{-7})$$

3 SD's

*(calculator answer \_\_\_\_\_)*

**Final answer \_\_\_\_\_**

Round to 3 SD's

**Perform the following calculation and round the answer to the correct number of significant digits:**

4 SD's

$$(9.533 \times 10^3)$$

---

$$(3.02 \times 10^{-7})$$

3 SD's

*(calculator answer  $3.156622517 \times 10^{10}$ )*

**Final answer  $3.16 \times 10^{10}$**

Round to 3 SD's

# **Rules for Calculations with Significant Digits**

## **For Addition or Subtraction:**

**Answer is rounded to the LOWEST # OF DECIMAL PLACES in the data.**

**Do the following calculation and round the answer off correctly:**

$$4456.9833 + 32.41 = \underline{\hspace{10em}}$$

**Do the following calculation and round the answer off correctly:**

$$4456.9833 + 32.41 = \underline{\hspace{10em}}$$

4 Dec.  
places

2 Dec.  
places

Round answer to  
2 Dec. places

Do the following calculation and round the answer off correctly:

$$4456.9833 + 32.41 = \underline{\hspace{10em}}$$

4 Dec.  
places

2 Dec.  
places

Round answer to  
2 Dec. places

*(Calculator answer = 4489.3933)*

**Final Answer = 4489.39**

Rounded to  
2 Dec. places

**NOTE: When adding or subtracting numbers in Scientific Notation:**

- 1. Adjust so all data is to the same exponent**
- 2. Use the decimal place rule on the regular (*non-exponent*) part of the numbers**

**See examples from your teacher**

## **Mixed Calculations**

**(Addition or Subtraction MIXED WITH Multiplication or Divison)**

**See examples from your teacher**