Scientific Notation

- more convenient to express very small or very large numbers.
- to express values with the correct number of significant digits

integer

$n \times 10^{?}$ $\quad 1 \leq n < 10$

Examples:

$1525\,g = 1.525 \times 10^{3}\,g$

$0.00471\,m = 4.71 \times 10^{-3}\,m$

$7.81 \times 10^{-2}\,km = 0.0781\,km$

$6.02 \times 10^{23} = 602$ + 21 zeros

$565 \times 10^{-9}\,m = 5.65 \times 10^{-7}\,m$.

Calculations Involving Scientific Notation

Multiplication + Division:

$$\frac{6.6 \times 10^{-8}}{3.3 \times 10^{-4}} = 2.0 \times 10^{-4}$$

subtract exponents $-8-(-4)$

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

$$(2.5 \times 10^{-6}) \times (3.0 \times 10^{-7}) = 7.5 \times 10^{-13}$$

add exponents $-6+(-7)$

$$x^2 x^3 = x^5$$

Addition + Subtraction:

$$(2.67 \times 10^{-3}) - (9.5 \times 10^{-4})$$

these must match to align the place values

$$(26.7 \times 10^{-4}) - (9.5 \times 10^{-4})$$

The place values align now

$$17.2 \times 10^{-4}$$

$$1.72 \times 10^{-3}$$

Think about:

$$\begin{array}{r} 1258.2 \\ 2.57 \\ 131 \\ +\ 58.591 \\ \hline \end{array}$$

line up place values.

Scientific Notation on your calculator

Graphing Calculator: EE (2nd ,)

Scientic Calculator: EXP EE

$$\frac{6.6 \times 10^{-8}}{3.3 \times 10^{-4}}$$

6.6 EE -8 ÷ 3.3 EE -4

2×10^{-4}

0.0002

2 E -4 (2×10^{-4})

Homework:

1. a) $4.5 \times 10^{7} + 6.45 \times 10^{7}$

b) $5.4 \times 10^{7} + 7.8 \times 10^{6}$

c) $7.8 \times 10^{-6} - 8.4 \times 10^{-7}$

d) $2.3 \times 10^{4} - 4.2 \times 10^{3}$

e) $6.7 \times 10^{-8} + 8.2 \times 10^{-7}$

2. a) $(4.5 \times 10^{2})(2.3 \times 10^{-4})$

b) $(2.0 \times 10^{6})(3.5 \times 10^{-9})$

c) $(1.2 \times 10^{7})(1.2 \times 10^{4})$

d) $\dfrac{6.0 \times 10^{7}}{1.5 \times 10^{2}}$

e) $\dfrac{7.2 \times 10^{-4}}{1.2 \times 10^{-4}}$

f) $\dfrac{(5.5 \times 10^{-5})(6.0 \times 10^{4})}{(2.1 \times 10^{4})}$