

Handy Dandy Math Stuff

This is just some math facts you should have handy when doing physics along with some examples.

Powers of Ten

Scientific Notation and Prefixes

Exponents on the Calculator

Conversions

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Standards of measurement:

	mks	cgs	British
Length	meter (m)	centimeter (cm)	foot (ft)
Mass	Kilogram (Kg)	gram (g)	slug (sl)
Time	seconds (s) or (secs)	seconds (s) or (secs)	seconds (s) or (secs)

Powers of 10: The exponent = the number of zero's after the 1 (in 10^5 , the exponent = 5)

$10^0 = 1^*$ *Any number raised to the 0 power = 1 ($5^0 = 1$, $156^0 = 1$)

$10^1 = 10$ $10^{-1} = .1$

$10^2 = 100$ $10^{-2} = .01$

$10^3 = 1000$ $10^{-3} = .001$

Prefixes:

<i>Very small</i>	femto- (f)	1×10^{-15}
	pico- (p)	1×10^{-12}
	nano- (n)	1×10^{-9}
	micro- (μ)	1×10^{-6}
	milli- (m)	1×10^{-3}
	centi- (c)	1×10^{-2}
	deci- (d)	1×10^{-1}
	deka- (da)	1×10^1
	hecto- (h)	1×10^2
	kilo- (k)	1×10^3
	mega- (M)	1×10^6
	giga- (G)	1×10^9
	tera- (T)	1×10^{12}
<i>Very Large</i>	peta- (P)	1×10^{15}

Examples

$10 \text{ nm} = 10 \text{ nanometers} = 10 \times 10^{-9} \text{ m} = .00000001 \text{ m}$

$7.2 \text{ cg} = 7.2 \text{ centigrams} = 7.2 \times 10^{-2} \text{ grams} = .072 \text{ g}$

$5.1 \text{ km} = 5.1 \text{ kilometers} = 5.1 \times 10^3 \text{ meters} = 5,100 \text{ m}$

$3 \text{ Pb} = 3 \text{ petabytes} = 3,000,000,000,000,000 \text{ bytes}$

Scientific Notation: A way to write very large or very small numbers using powers of 10

Examples: $1.45 \times 10^6 = 1.45 \times 1,000,000 = 1,450,000$
 $1.45 \times 10^{-4} = 1.45 \div 10,000 = .000145$

Converting from Scientific Notation:

Move decimal the number of places shown by the exponent

Positive exponent: move decimal to the right

$$3.27 \times 10^4 = \underbrace{3.2700}_{\leftarrow} = 32,700$$

Negative exponent: move decimal to the left

$$4.61 \times 10^{-3} = \underbrace{.004.61}_{\leftarrow} = .00461$$

Converting to Scientific Notation:

Move the decimal until there is only number before it. The number of places moved is the exponent.

moving decimal left, the exponent is positive

$$15638.2 = 1 \underbrace{5638.2}_{\text{move decimal 4 places left}} = 1.56382 \times 10^4$$

moving decimal right, the exponent is negative

$$.003157 = \underbrace{.003157}_{\text{move decimal 3 places right}} = 3.157 \times 10^{-3}$$

Exponents on the Calculator:

- Easiest Method: Most calculators have an "EE" button or something equivalent. The "EE" means "x 10^"

Example: To enter 3.27×10^5 , type in 3.27 "EE" 5
To enter 1.26×10^{-2} , type in 1.26 "EE" -2

- Second option: When all else fails, just type it in as you see it. You will need to use the "^" key which means "raised to the power of"

Example: To enter 3.27×10^5 , type in $3.27 * 10^5$
To enter 1.26×10^{-2} , type in $1.26 * 10^{-2}$

Conversions: Units can be converted from one to another when a conversion factor is known.

- Cancel units on the diagonal.
- Multiply across the top and divide by what's on the bottom.

Examples:

1. Convert 452 cm to m ($1\text{m} = 100\text{cm}$) $452 \cancel{\text{cm}} \left(\frac{1\text{m}}{100\cancel{\text{cm}}} \right) = 4.52\text{ m}$

2. Convert 35 kilograms to slugs ($14.6\text{ kg} = 1\text{ slug}$) $35\cancel{\text{kg}} \left(\frac{1\cancel{\text{slug}}}{14.6\cancel{\text{kg}}} \right) = 2.397\text{ slugs} = 2.4\text{ slugs}$

3. Convert 5 days to seconds ($1\text{ day} = 24\text{hrs}$, $1\text{ hr} = 60\text{ min}$, $1\text{ min} = 60\text{ secs}$)

$$5 \cancel{\text{days}} \left(\frac{24\cancel{\text{hours}}}{1\cancel{\text{day}}} \right) \left(\frac{60\cancel{\text{min}}}{1\cancel{\text{hour}}} \right) \left(\frac{60\cancel{\text{secs}}}{1\cancel{\text{min}}} \right) = 432,000\text{ seconds}$$

4. Convert 27 mph to Km/min ($1\text{mile} = 1.609\text{ Km}$, $1\text{ hour} = 60\text{ min}$)

$$27 \frac{\cancel{\text{miles}}}{\cancel{\text{hour}}} \left(\frac{1.609\text{ Km}}{1\cancel{\text{mile}}} \right) \left(\frac{1\cancel{\text{hour}}}{60\text{ min}} \right) = 0.7241 \frac{\text{Km}}{\text{min}} = 0.72 \frac{\text{Km}}{\text{min}}$$