**Units of Measurement:**

* **SI Units**
	+ SI – System Internationale d’Unites
	+ All units of measurement are based on unchanging STANDARDS
	+ Uses metric prefixes (to convert from one prefix to another just move the decimal point but MUST be the same base unit!!)
		1. Length – meter (m)
		2. Mass – kilogram (kg)
			- Mass is a measure of the amount of matter in a substance
		3. Temperature – Kelvin (K)
			- Kelvin scale is an absolute scale (lowest possible temperature is absolute zero which is 0 K or -273.15oC)
			- Celsius scale is based on freezing and boiling points of water being 0oC and 100oC
			- Fahrenheit scale based on freezing and boiling points of water being 32oF and 212oF
			- **K = C + 273.15**
			- **C = 5/9 (F – 32)**
			- **F = 9/5 C + 32**
	+ Derived SI Units (combining other units together)
		1. Volume
			- Volume—the amount of space that an object occupies\
			- Volume of cube = length x width x height
			- **V = L x W x H**



* + 1. Density
			- Density is the ratio of an object’s mass to it’s volume
			- **D = M / V**
			- Because substances usually change their volume with changes in temperature, density is temperature dependent



**- Uncertainty in Measurements:**

* In science some numbers are EXACT (exactly 12 eggs in 1 dozen or 1000 g in 1 kg)
* Other measured numbers are INEXACT (based on the limitations of the measuring instrument)
* Uncertainty ALWAYS exists in measured values
	+ Accuracy – how close your measured value is to the real value
	+ Precision – how close YOUR repeated measurements of something are to each other



* **Significant Figures**
	+ Significant figures – the number of digits that are known for certain in a measurement PLUS one more digit that is estimated or rounded
	+ Uncertainty is measured in the last digit reported (as a ± but is frequently just dropped in the reported measurement) (i.e. 2.2405 ± 0.0001)
	+ **RULES FOR SIG FIGS:**
		1. **All nonzero digits are significant**
		2. **Zeros between 2 nonzero #s are significant**
		3. **Zeros at the beginning of a number are not significant**
		4. **Zeros at the end of a number and AFTER the decimal point are significant**
		5. **Zeros in a number that ends in zero but has no decimal point are not significant**
		6. **There are UNLIMITED significant digits in an EXACT equality**
		7. **ALL digits in the coefficient of scientific notation are significant**
	+ **Atlantic Pacific Rule:**



***NEVER START COUNTING WITH ZERO!!!!!***

* **Significant Figures in Calculations**
	+ Rules for Rounding Off Sig Figs:
		- Looking at the LEFTMOST digit to be dropped (immediately to the RIGHT of the place you are rounding off) when rounding
		- If that leftmost digit is LESS THAN 5 then the preceding number is UNCHANGED
		- If that leftmost digit is MORE THAN 5 then the preceding digit is INCREASED (round up)
		- If that leftmost digit is 5 followed by other NONZERO numbers anywhere after it then round up
		- If that leftmost number is EXACTLY 5 then use the EVEN/ODD rule (even numbers stay the same, odd numbers round up!)
	+ When multiplying or dividing numbers, round off the answer to the LEAST # of significant digits from any of the numbers used for the calculation
	+ When adding or subtracting then round the answer to the leftmost uncertain COLUMN (PLACE)
	+ When doing a series of calculations in order to eliminate accumulated rounding errors you should ONLY round off your FINAL ANSWER – Carry all other numbers until the very end and then round off based on the rules

**- Dimensional Analysis:**

* used as a means to convert from one unit to another based on equalities between units
* a CONVERSION FACTOR is used (fraction or ratio whose numerator and denominator are the SAME QUANTITY expressed in DIFFERENT UNITS)



* conversion factors (12 eggs / 1 doz or 1 doz / 12 eggs) are used so the units you are converting will CANCEL and you convert to the units you want
* may have to use several conversion factors before you reach the units that you need in your answer
* the units MUST be identical in order to cancel (if you have to square or cube the units then you have to square or cube the whole conversion factor!!)