Unit 0: Math Skills - Things To Memorize

1. Scientific Notation:

- Scientific Notation always has three parts: the *coefficient*, the *base*, and the *exponent*:

$$\text{Coefficient} \rightarrow 6.022 \times 10^{23} \leftarrow \text{Exponent}$$
$$\uparrow$$
$$\text{Base}$$

- In scientific notation the base is always 10.
- A negative in front of the coefficient means the whole number is negative.
- A negative exponent means the number is very small (close to zero).
- The exponent counts how many places the decimal moved, NOT the number of zeroes.
- When comparing numbers in scientific notation, look at (in order):
  (a) Negatives in front of the coefficient.
  (b) Exponents
  (c) Coefficients
- To multiply, multiply coeffients, then ADD exponents.
- To divide, divide coefficients, then SUBTRACT exponents.
- To raise to a power, raise the coefficient to the power, then MULTIPLY exponents.
- To enter scientific notation on most calculators use the "EE" key. 6.022×10^{23} is entered as 6.022E23. Calculator notation should **never** be handwritten.
- Metric Prefixes are really just scientific notation:

Prefix	Letter	Power of 10
nano	n	$\times 10^{-9}$
micro	μ	$\times 10^{-6}$
milli	m	$\times 10^{-3}$
centi	c	$\times 10^{-2}$
deci	d	$\times 10^{-1}$
Deka	D	$\times 10^{1}$
Hecto	H	$\times 10^{2}$
Kilo	k	$\times 10^{3}$
Mega	M	$\times 10^{6}$
Giga	G	$\times 10^{9}$

2. Algebra:

- To solve for something in the top of a fraction, multiply by the bottom.

$$A = \frac{B}{C} \quad \longrightarrow \quad A \times C = \frac{B}{\cancel{C}} \times \cancel{C} \quad \longrightarrow \quad AC = B$$

- To solve for something in the bottom of a fraction, make sure the fraction is isolated on one side of the equation. Then, switch the bottom with the other side:

$$A = \frac{B}{C} \rightarrow C = \frac{B}{A}$$

- To solve for a variable, undo steps using inverse operations:
  - Addition $\leftrightarrow$ Subtraction
  - Multiplication $\leftrightarrow$ Division
  - Squared $\leftrightarrow$ Square Root (more like Exponents $\leftrightarrow$ nth roots)
  - sin, cos, and tan $\leftrightarrow$ $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$
  - When you undo operations, you use reverse order of operations. (PEMDAS $\rightarrow$ SADMEP)

3. Trigonometry

- Remember: SOH-CAH-TOA. It means:

$$\sin(\theta) = \frac{opp}{hyp} \qquad \cos(\theta) = \frac{adj}{hyp} \qquad \tan(\theta) = \frac{opp}{adj}$$

- Hypotenuse is always the longest side.
- Cut the angle of interest in half and draw a line across the triangle to find the opposite side.
- The adjacent side and the hypotenuse create the angle.
- To find a side, use regular functions (sin, cos, tan)
- To find an angle use inverse functions (called arcsin, arccos arctan or $\sin^{-1}$ $\cos^{-1}$ $\tan^{-1}$)
- All trigonometric functions need an argument - They never go anywhere without (θ).

4. Arc Length

- 2π radians = $360°$ = 1 full rotation
- 1 radian is the angle where the radius = the arc length $\approx 57.2958°$
- To use the arc-length formula, all angles must be measured in radians.