Math Basics for Physics

$\frac{\frac{A}{B}}{\frac{C}{D}} = \frac{A}{B}\frac{D}{C}$ → Take the bottom fraction, flip-flop and multiply

$\frac{A}{\frac{B}{C}} = \frac{AC}{B}$ → Take the bottom fraction, flip-flop and multiply

$\frac{A}{B}\frac{D}{C} = \frac{AD}{BC}$ → Multiplying fractions is easy, just multiply all the top pieces together and all the bottom pieces together

$\frac{A}{B} + \frac{C}{B} = \frac{A+C}{B}$ → Adding (or subtracting) fractions is easy if both fractions have the same denominators

$\frac{A}{B} + \frac{C}{D} = \frac{AD+BC}{BD}$ → If they don't have the same fractions you need find common denominators, which is easiest by doing this "cross multiplication" trick

$AB + AC = A(B + C)$ → The 'Distributive Property' is always very useful

$AB = BA$ → The 'Commutative Property' is sometimes useful

$A + A = 2A$ → This is how multiplication is defined

$A*A*A=A^3$ → This is how 'powers' are defined

$A^B A^C = A^{B+C}$ → Useful trick

$(A^B)^C = A^{B*C}$ → Another useful trick

As a general rule when solving for a variable in any equation, you need to *first* get that variable 'on the top' (in the numerator), and *then* by itself.

"***FOIL***" is an acronym for: "First" "Outside" "Inside" "Last". This indicates an easy way to be sure to multiply all the right pieces in: $(A \pm B)^2$.

$$(A \pm B)^2 = (A \pm B)(A \pm B) = A^2 \pm AB \pm BA + B^2 = A^2 \pm 2AB + B^2$$

The Quadratic Equation (memorize):

$$\text{If: } A x^2 + B x + C = 0, \text{ Then: } x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

Basic Trigonometry

Memorize "SOH CAH TOA"

$$\text{SOH} \rightarrow \text{Sin}[\theta] = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\text{CAH} \rightarrow \text{Cos}[\theta] = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\text{TOA} \rightarrow \text{Tan}[\theta] = \frac{\text{Opposite}}{\text{Adjacent}}$$

A couple of trigonometric identities

$$\text{Sin}^2[\theta] + \text{Cos}^2[\theta] = 1$$

$$\text{Tan}[\theta] = \frac{\text{Sin}[\theta]}{\text{Cos}[\theta]}$$

Pythagorean's Theorem (where A & B are the adjacent and opposite sides, and the C is the hypotenuse) → only applies to *right* triangles!

$$A^2 + B^2 = C^2$$