**Math quick reference sheet for CGP600**

***Vectors***

This is a vector. It is represented with:

* It has a direction and magnitude (size)
* It has no origin or position and it is **NOT** the same as a point

***Vector magnitude:***

* The vector magnitude is denoted with: ||v||
* Pythagoras is used to calculate the magnitude, as follows:

||v|| =

***Unit Vector:***

* A unit vector is denoted with:
* A unit vector is a vector with a magnitude of 1
* To find the unit vector:

∴

***Dot Product (otherwise known as the scalar product):***

* Useful for:
  1. Finding the cosθ between two unit vectors
  2. Multiplying Matrices (MM or +)
* Things to note:
  1. will be positive when θ < 90°
  2. will be negative when θ > 90°
  3. will be 0 when θ = 90° (perpendicular)
* Calculating the dot product from two unit vectors:

Also:

**Calculating Radians**

This is needed when working with most APIs/game engines.

**Trigonometry**

Hypotenuse

Opposite

θ

Adjacent

***Matrices***

* Layout:

x y z w

***Matrix to Matrix multiplication:***

Do this to calculate each element of M3 *(note that this is also the same way of calculating dot product)*

***Matrices and geometry***

*Scaling*

Remember the Identity Matrix

*Rotations*

*Translation*

Remember: Always **Scale × Rotate × Translate**