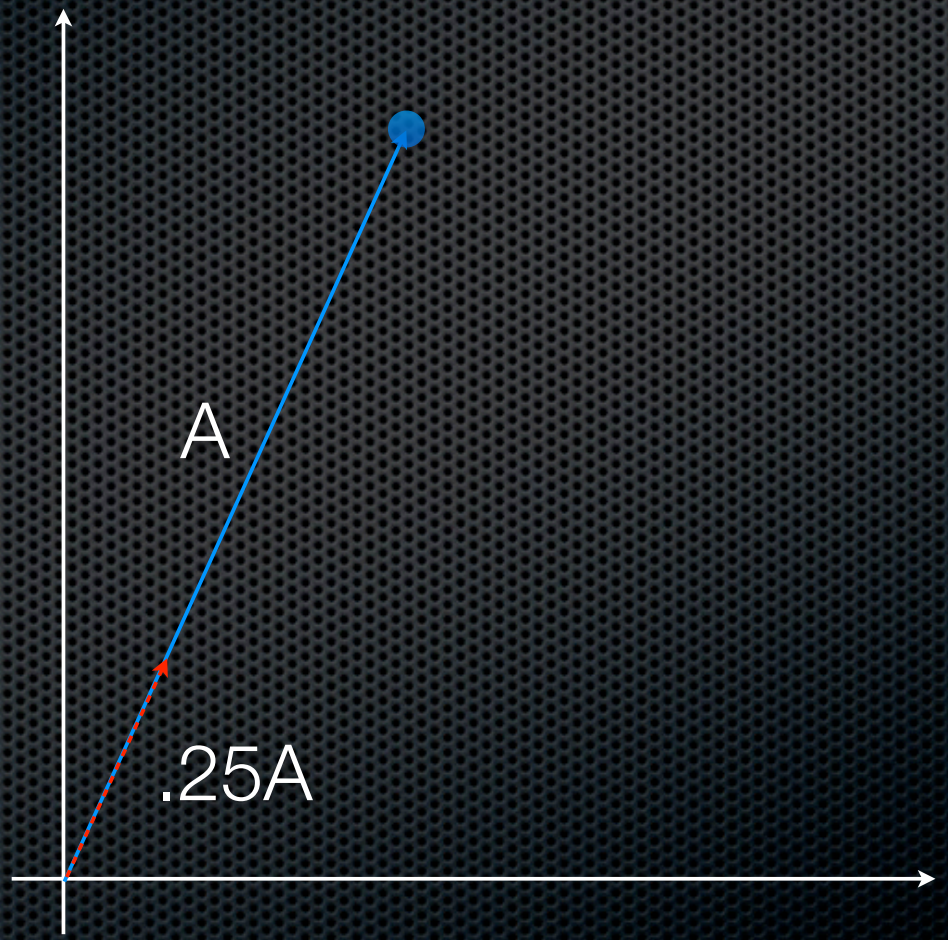
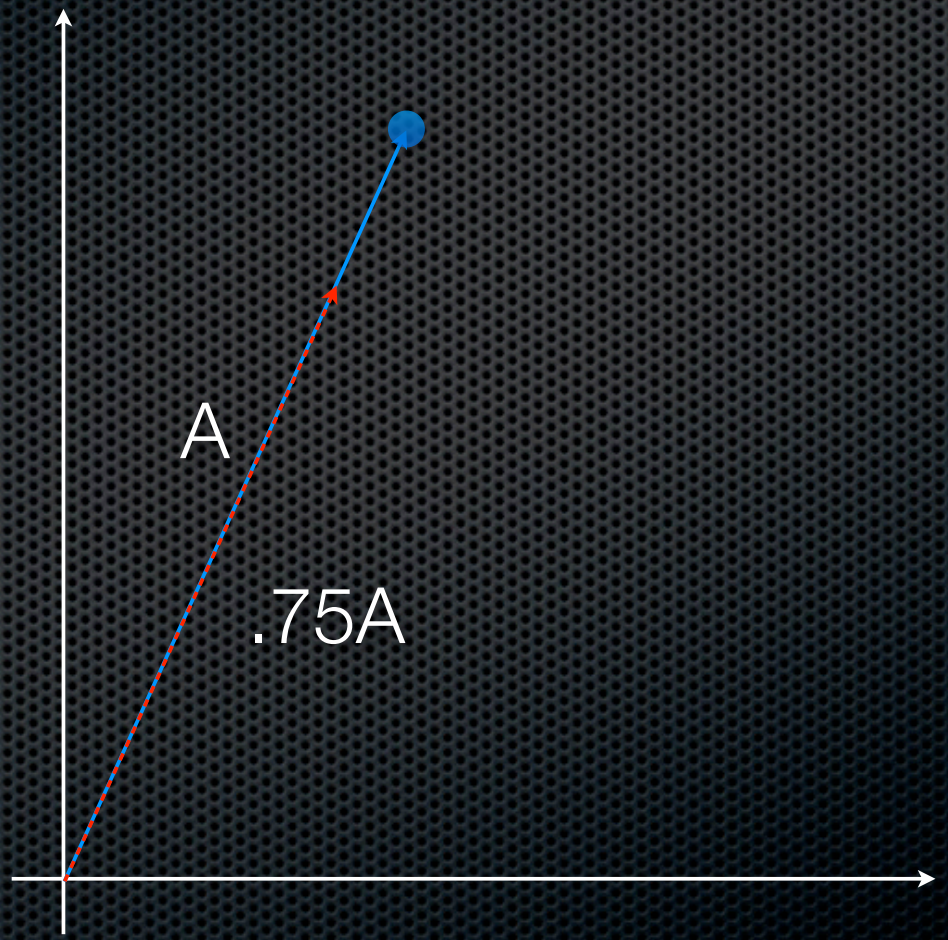
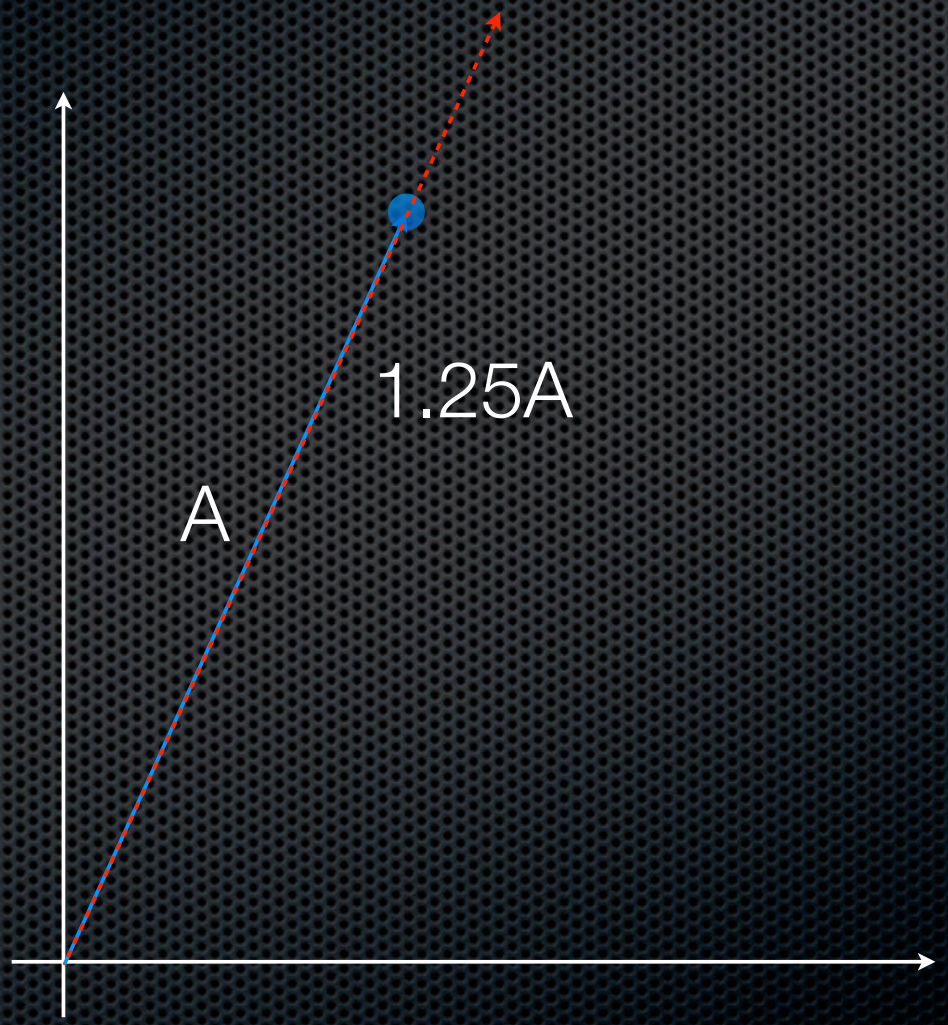
An Interesting Idea



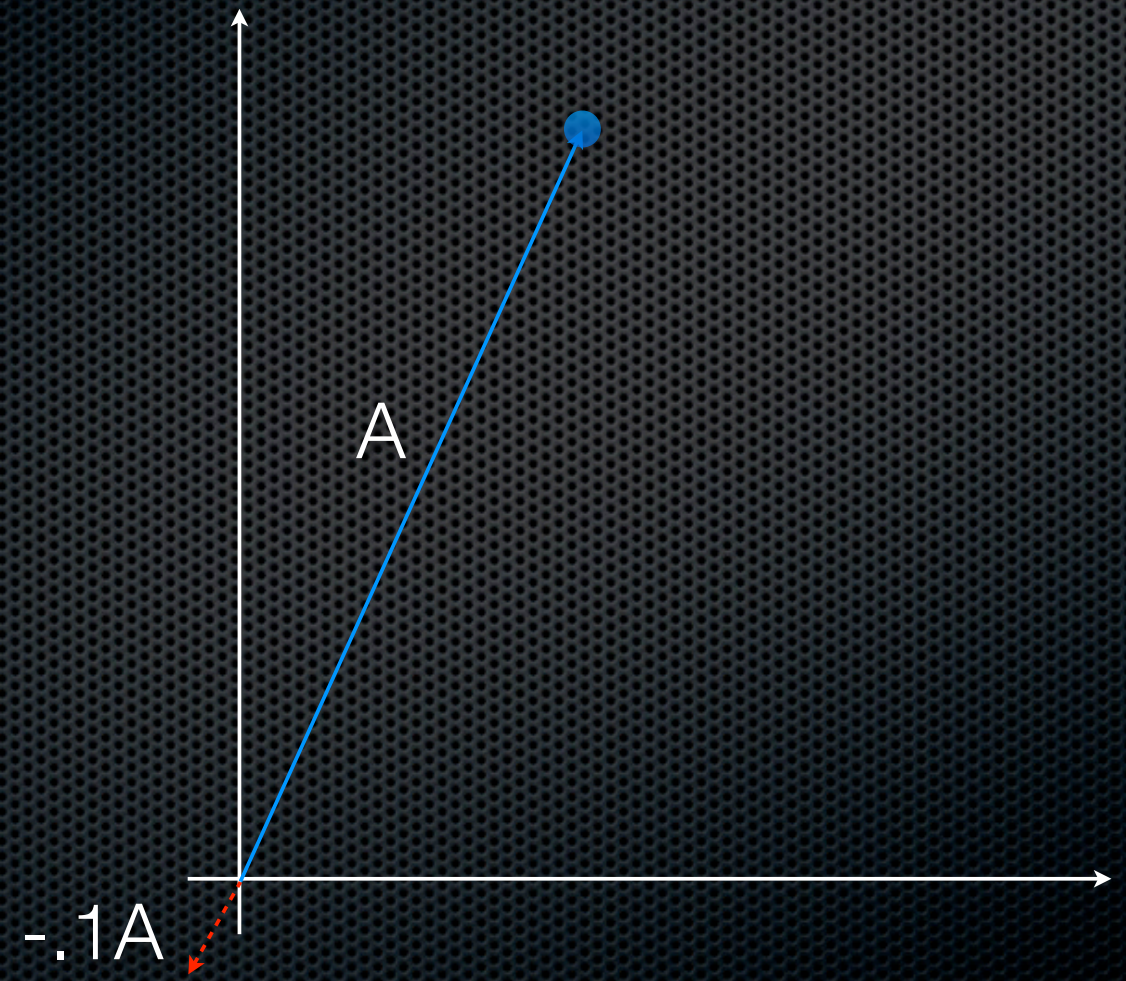
An Interesting Idea



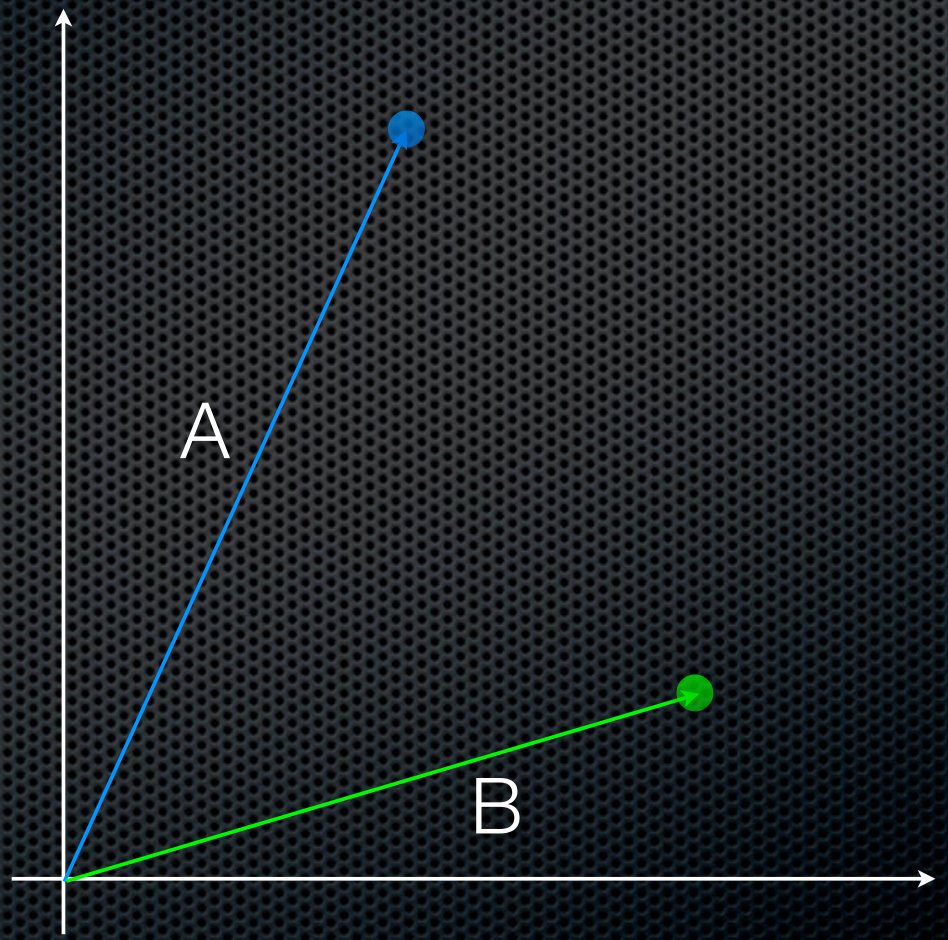
An Interesting Idea



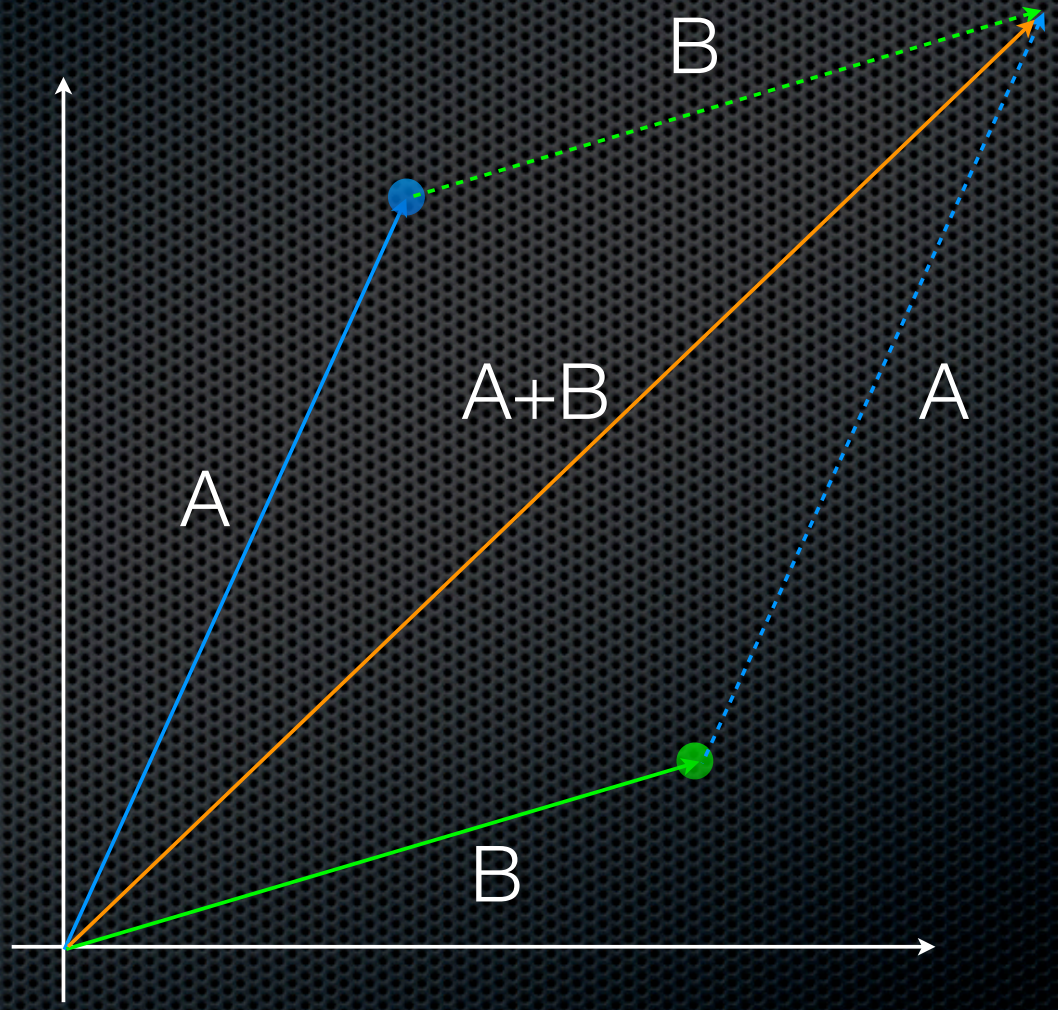
An Interesting Idea



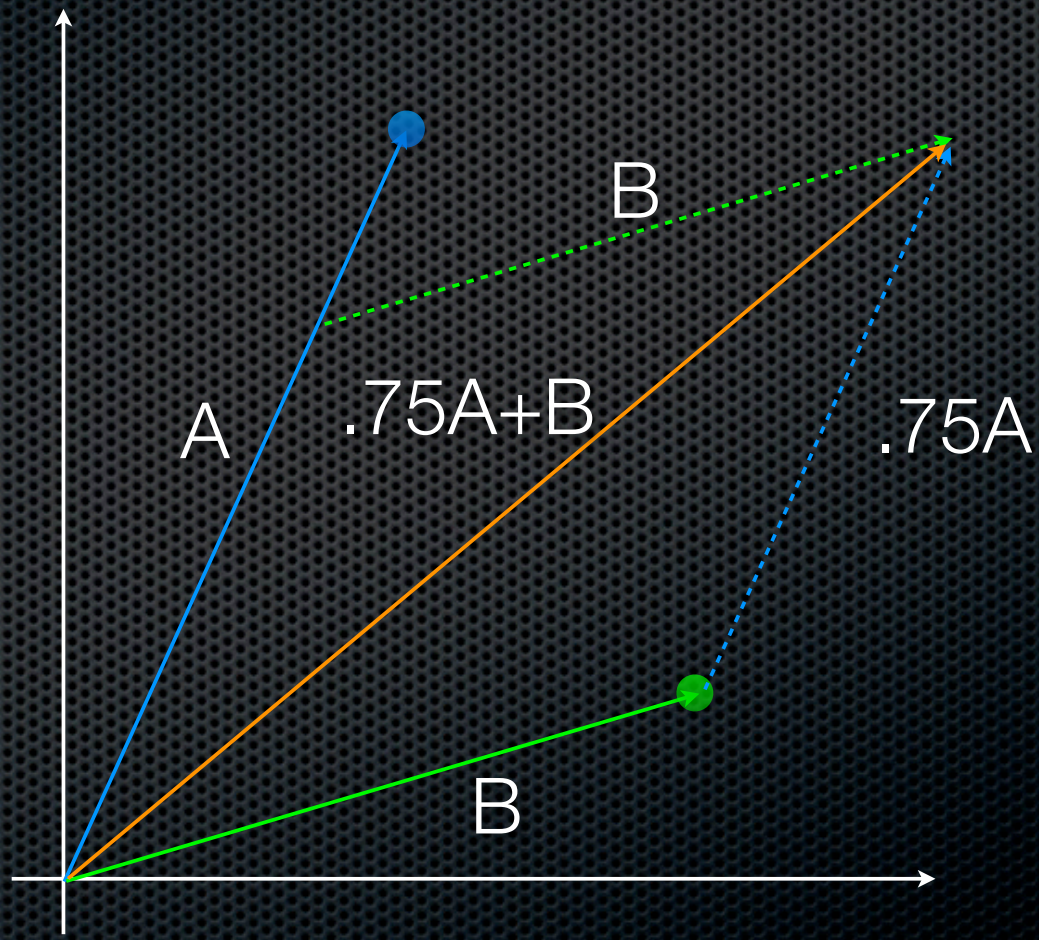
An Interesting Idea



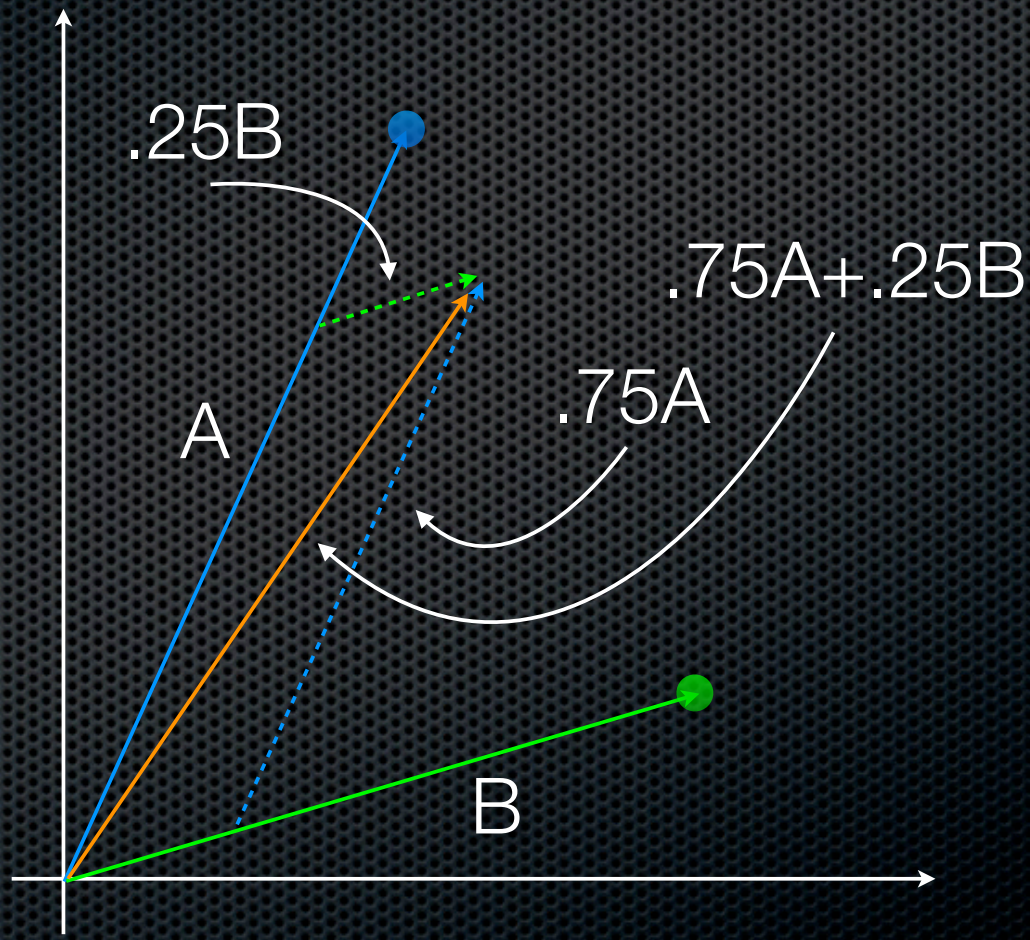
An Interesting Idea



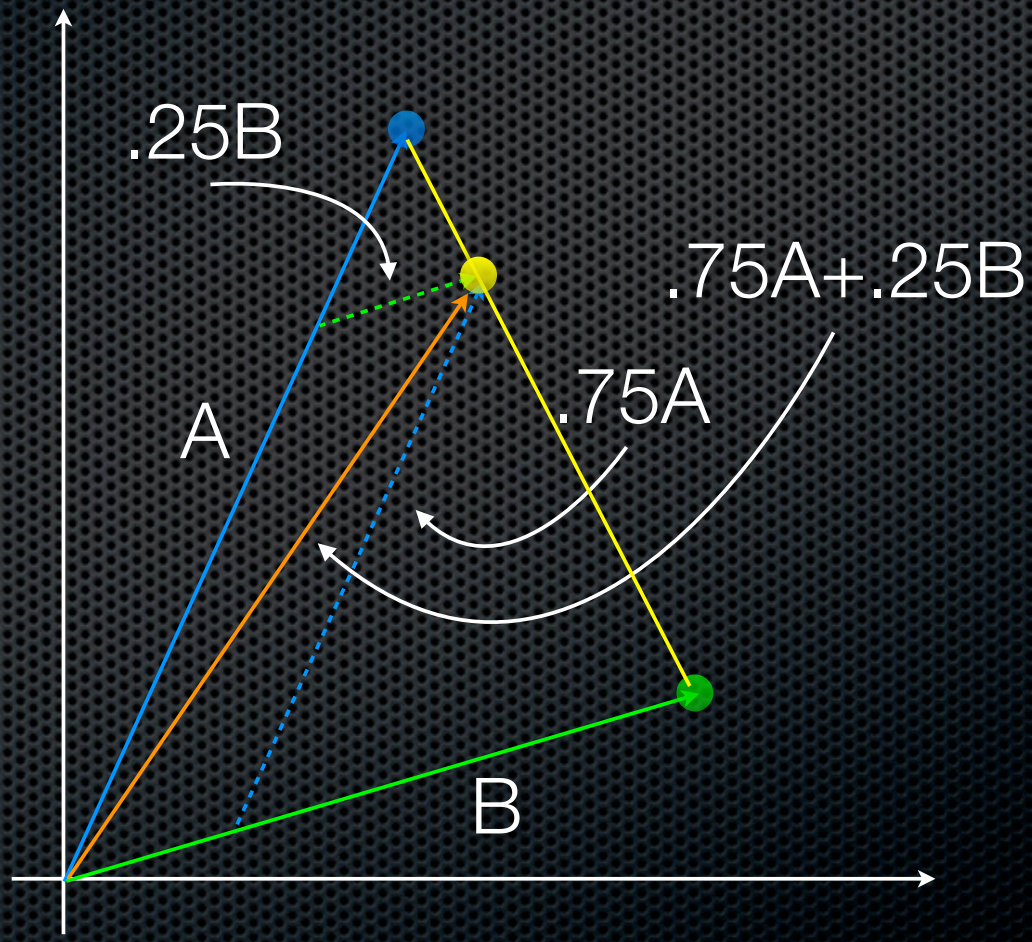
Linear Combination



Linear Combination

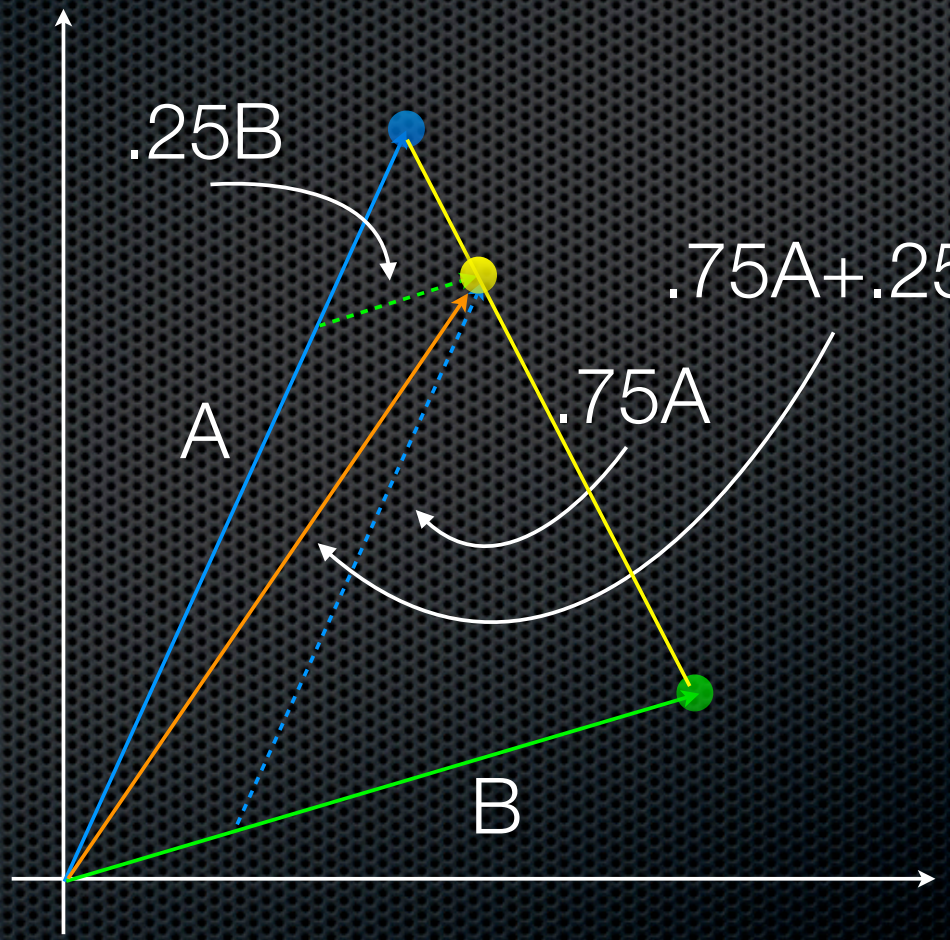


Linear Combination



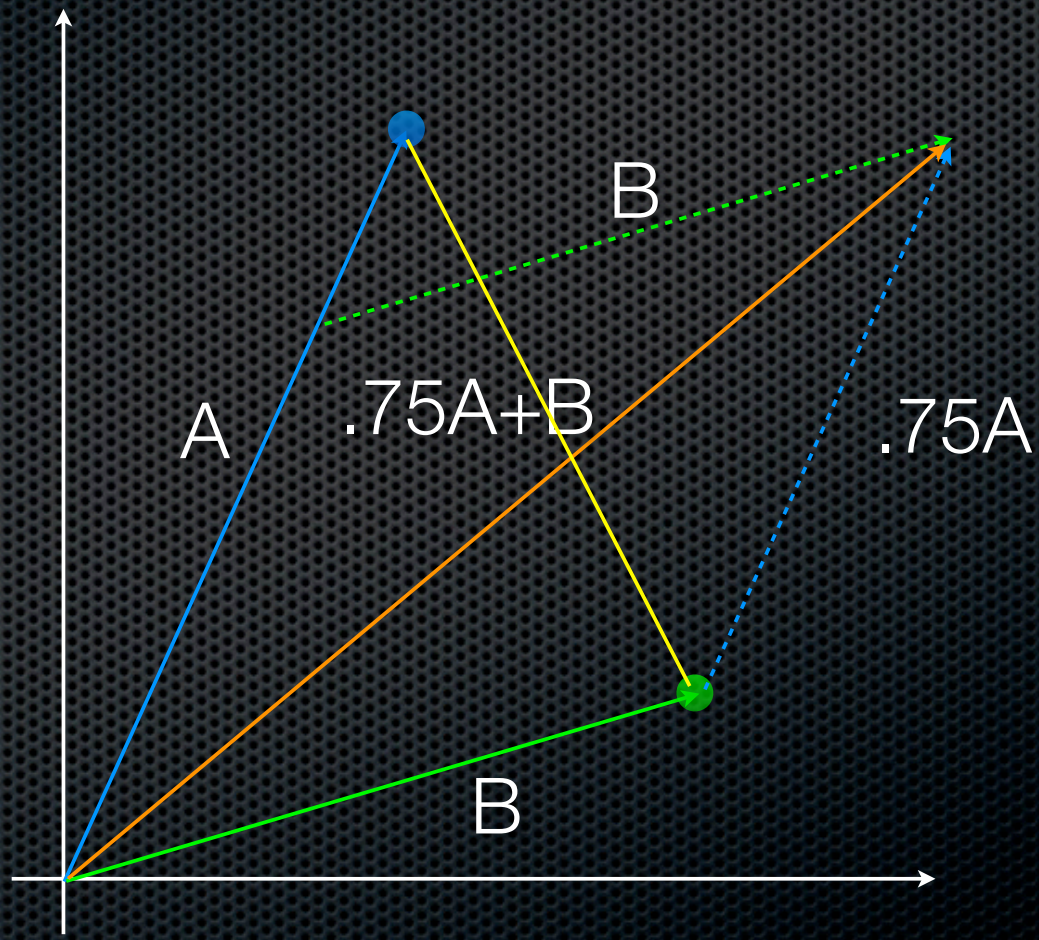
Linear Combination or Blend

.75 + .25 = 1



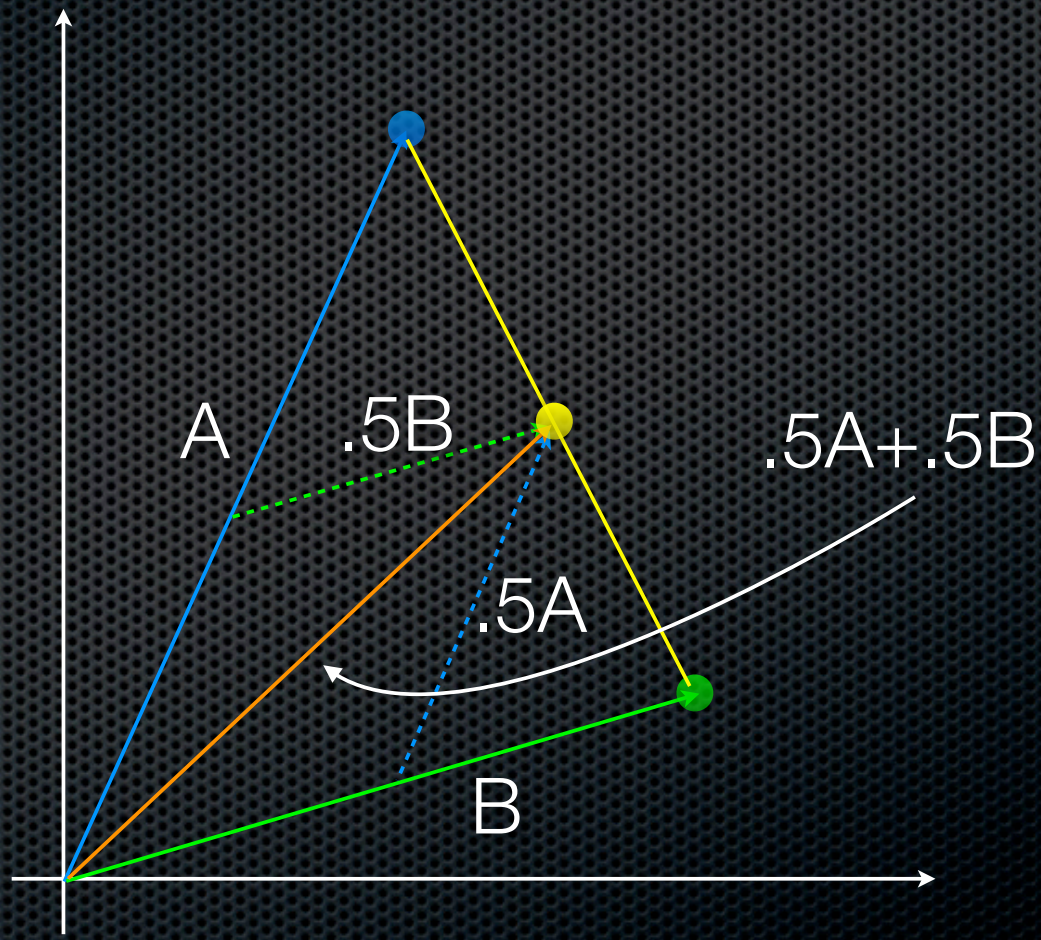
Linear Combination

.75 + 1 ≠ 1

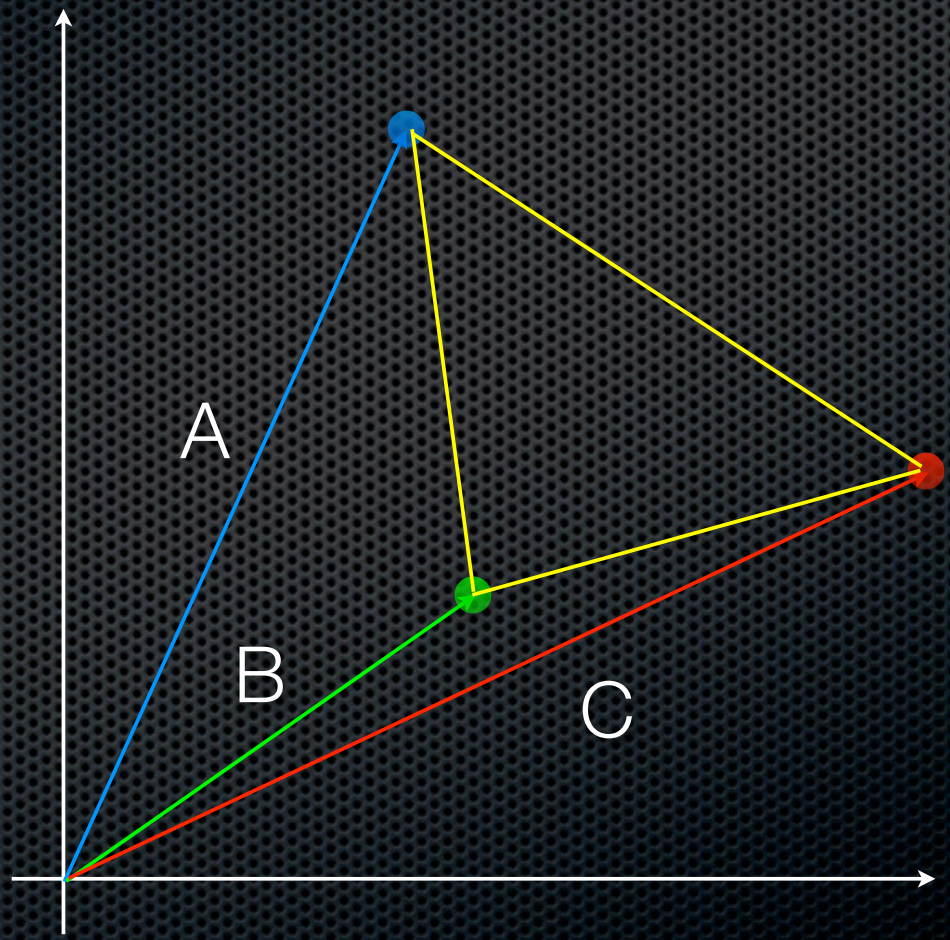


Linear Combination or Blend

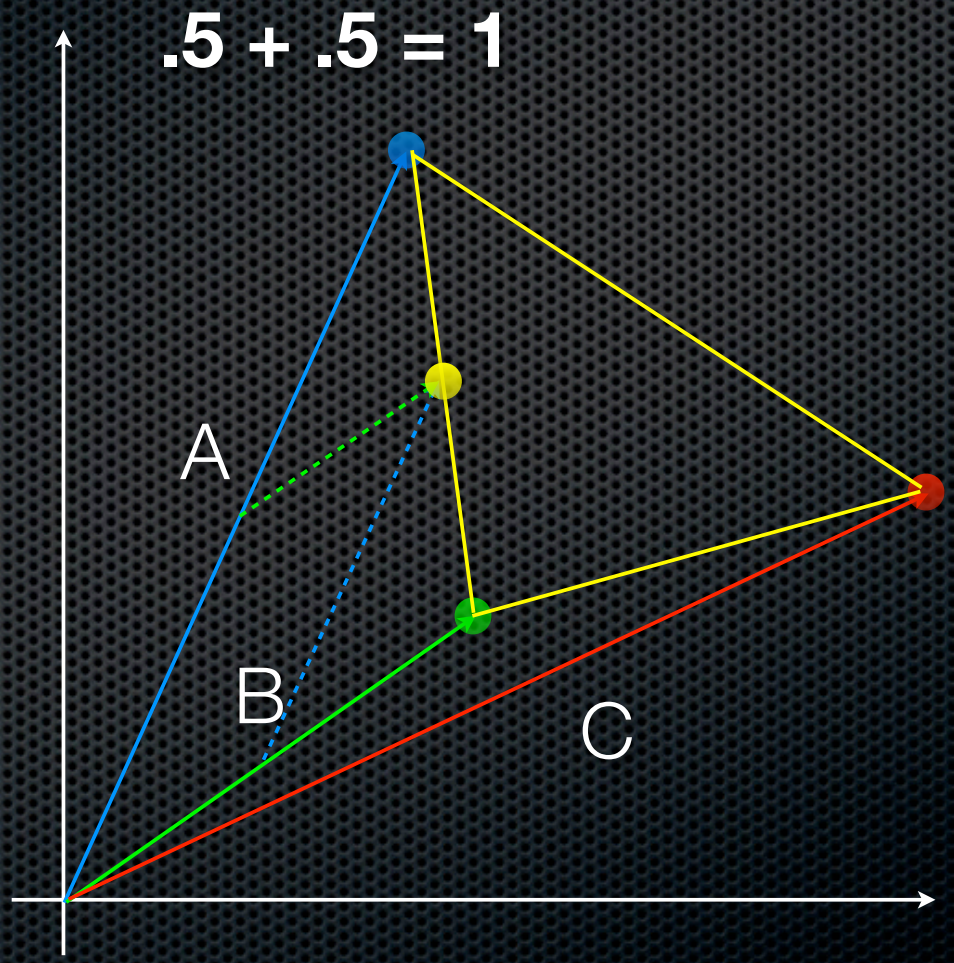
.5 + .5 = 1



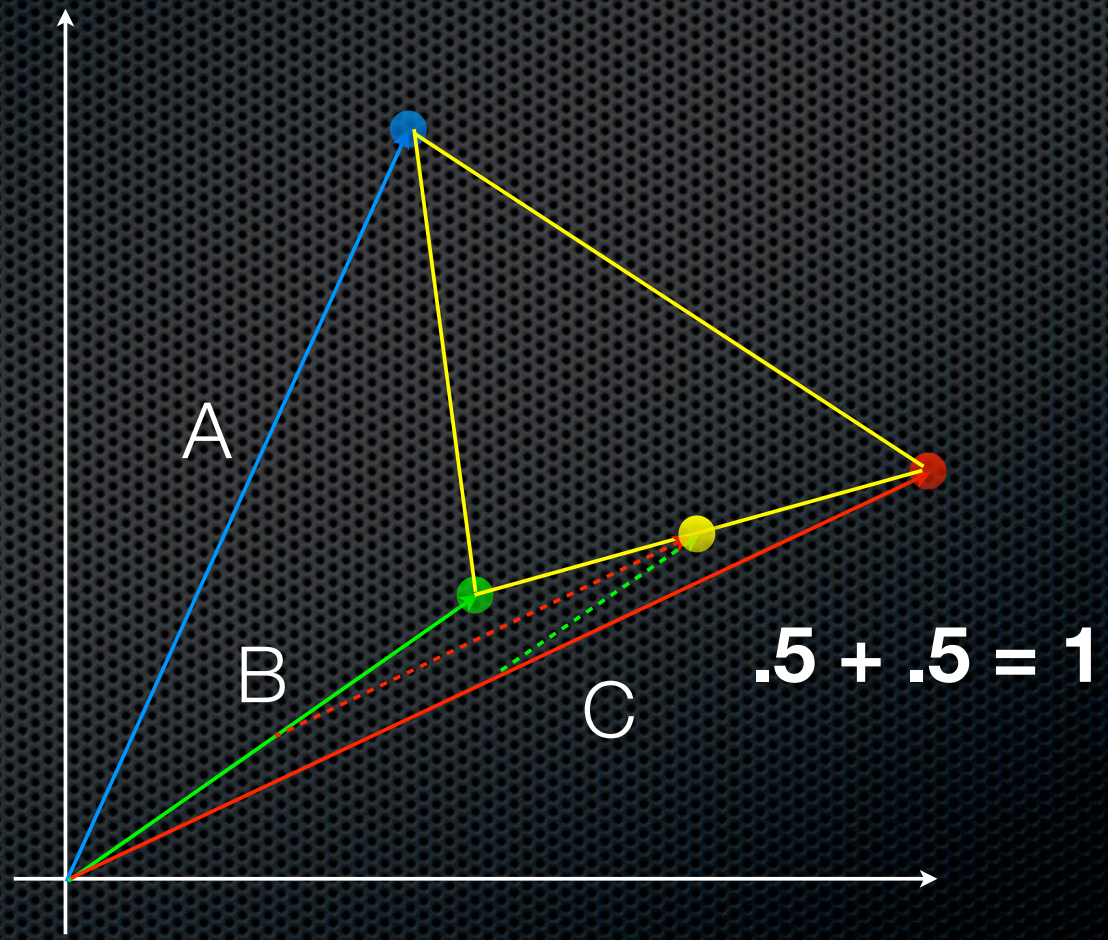
Triangle



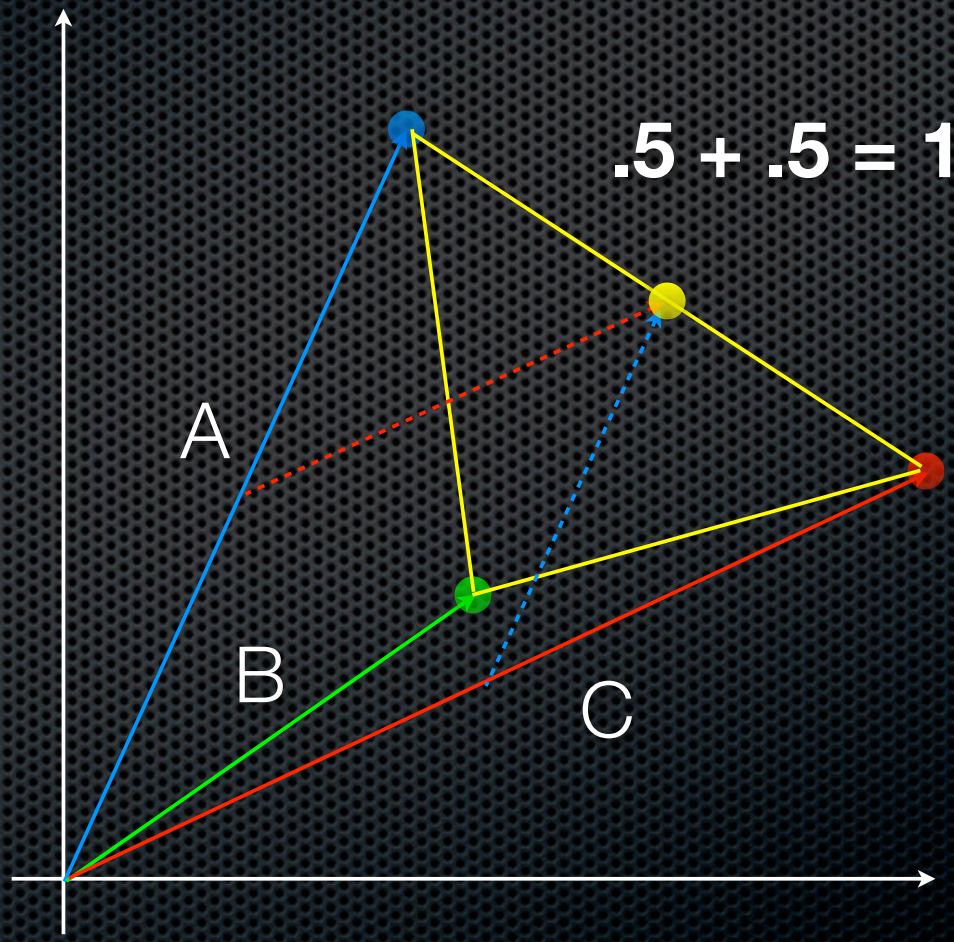
Triangle



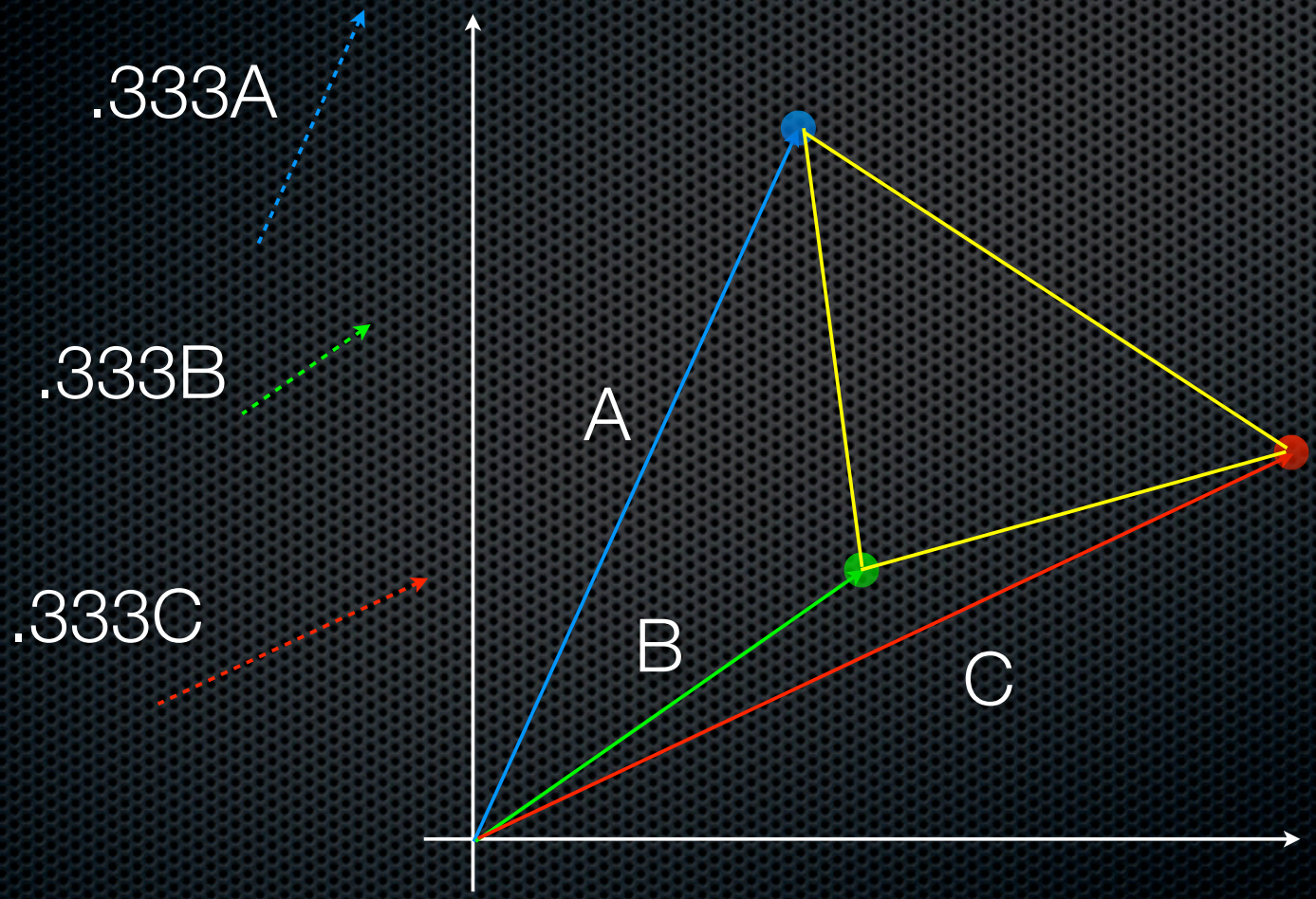
Triangle



Triangle

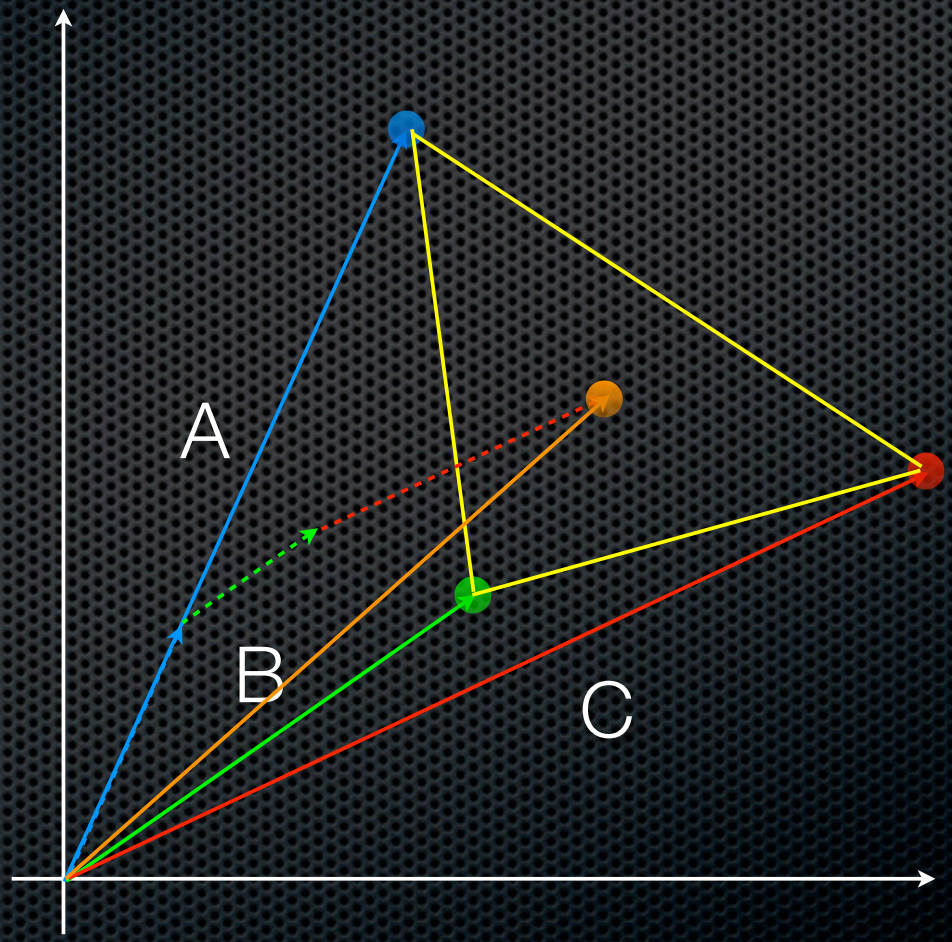


Triangle

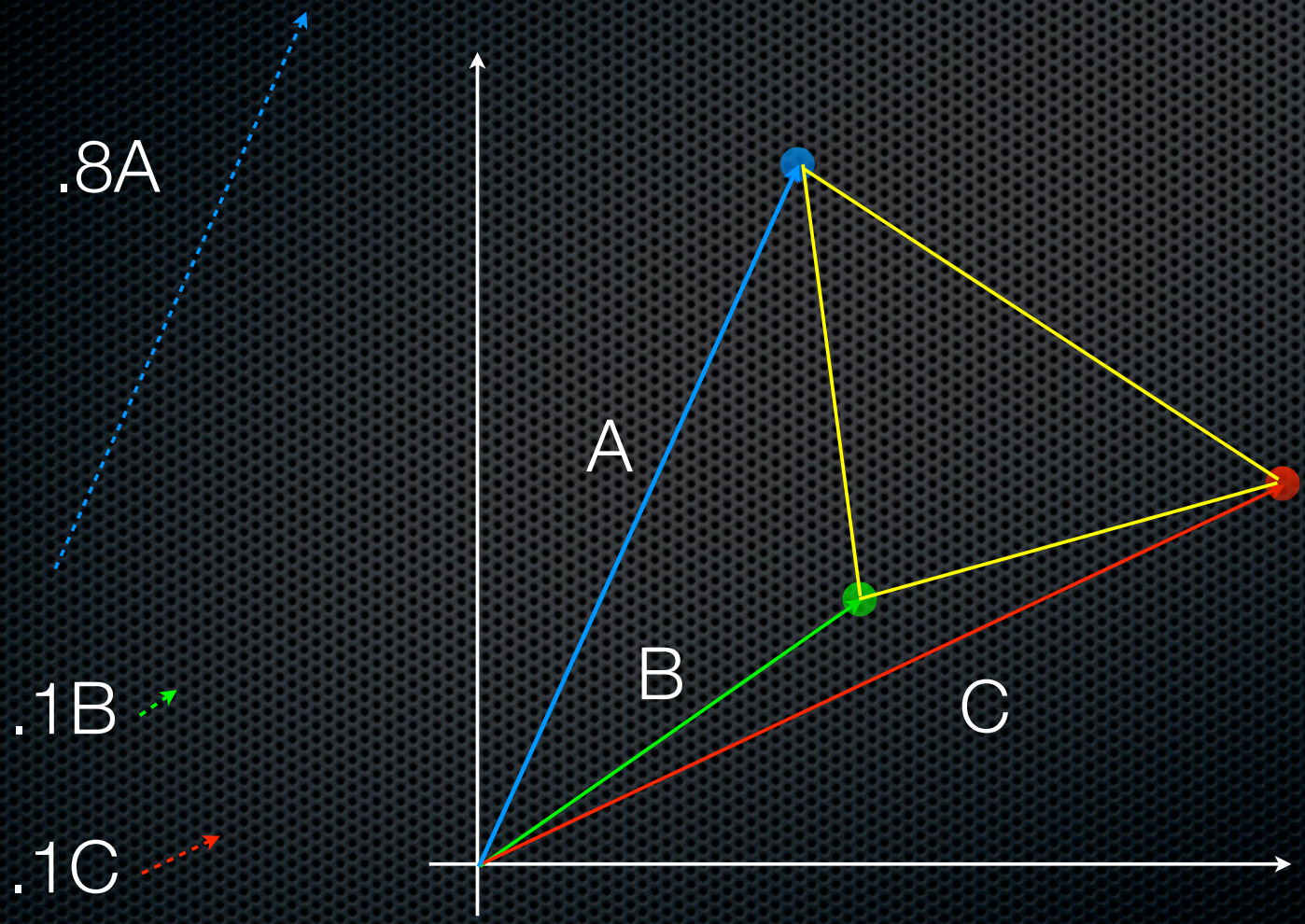


Triangle

.333 + .333 + .333 = 1

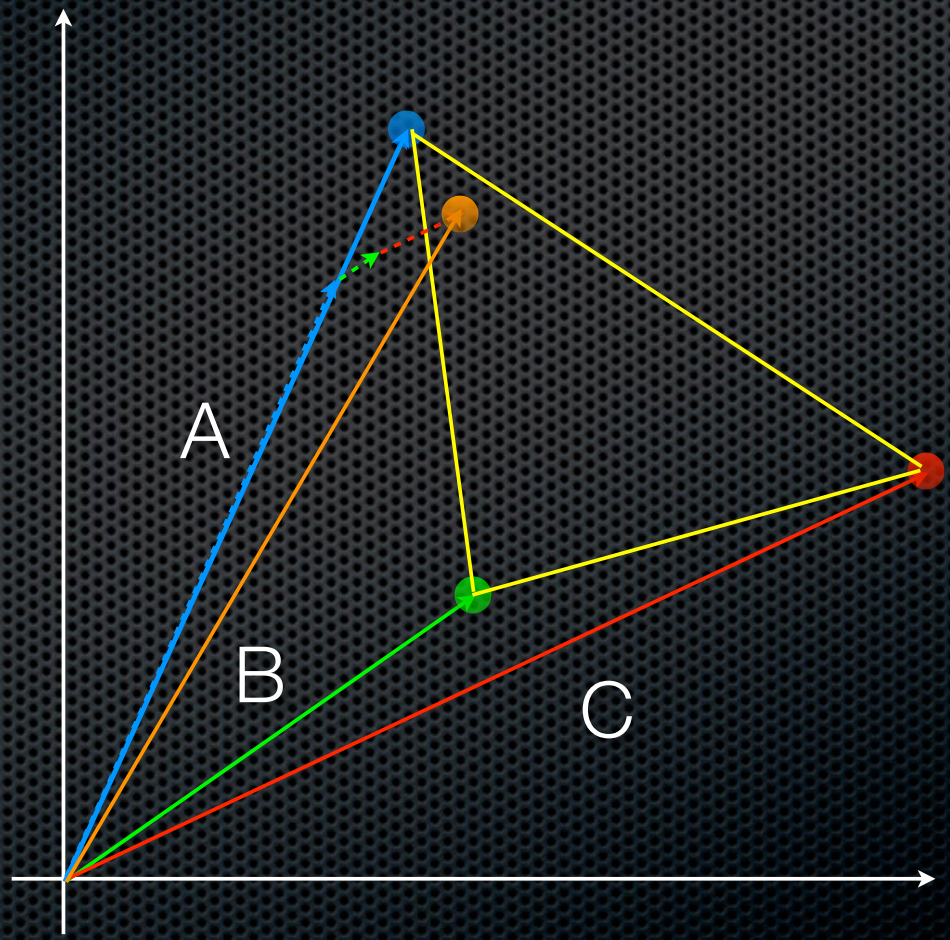


Triangle

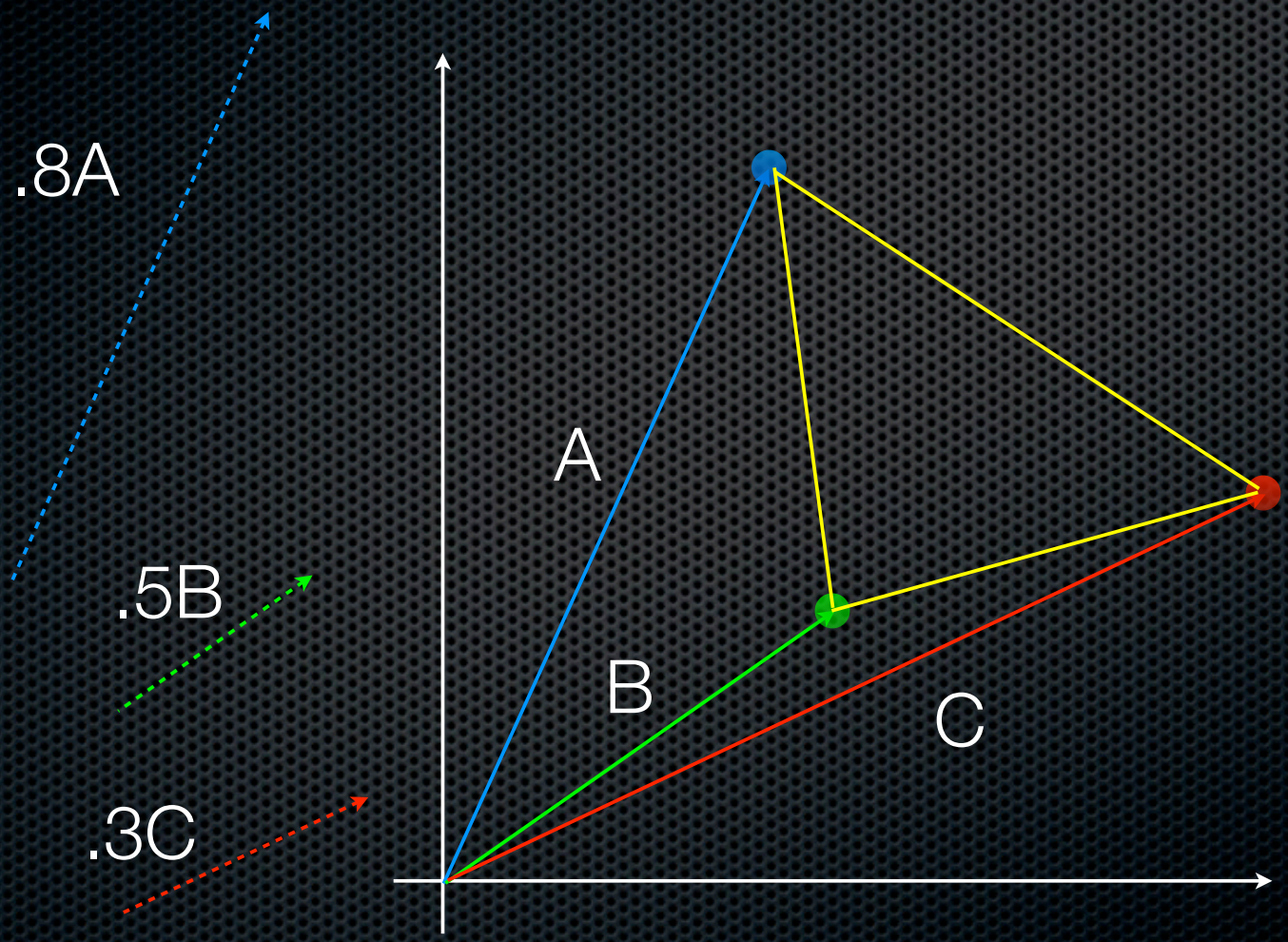


Triangle

.8 + .1 + .1 = 1

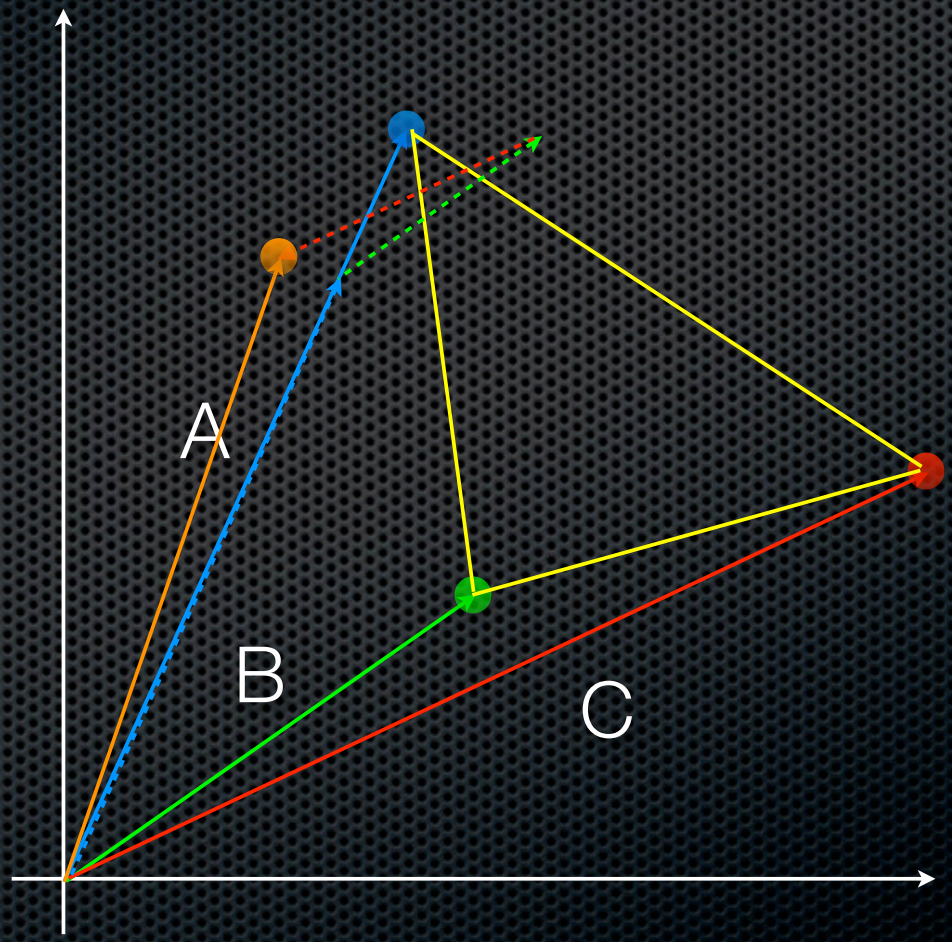


Triangle



Triangle

.8 + .5 - .3 = 1

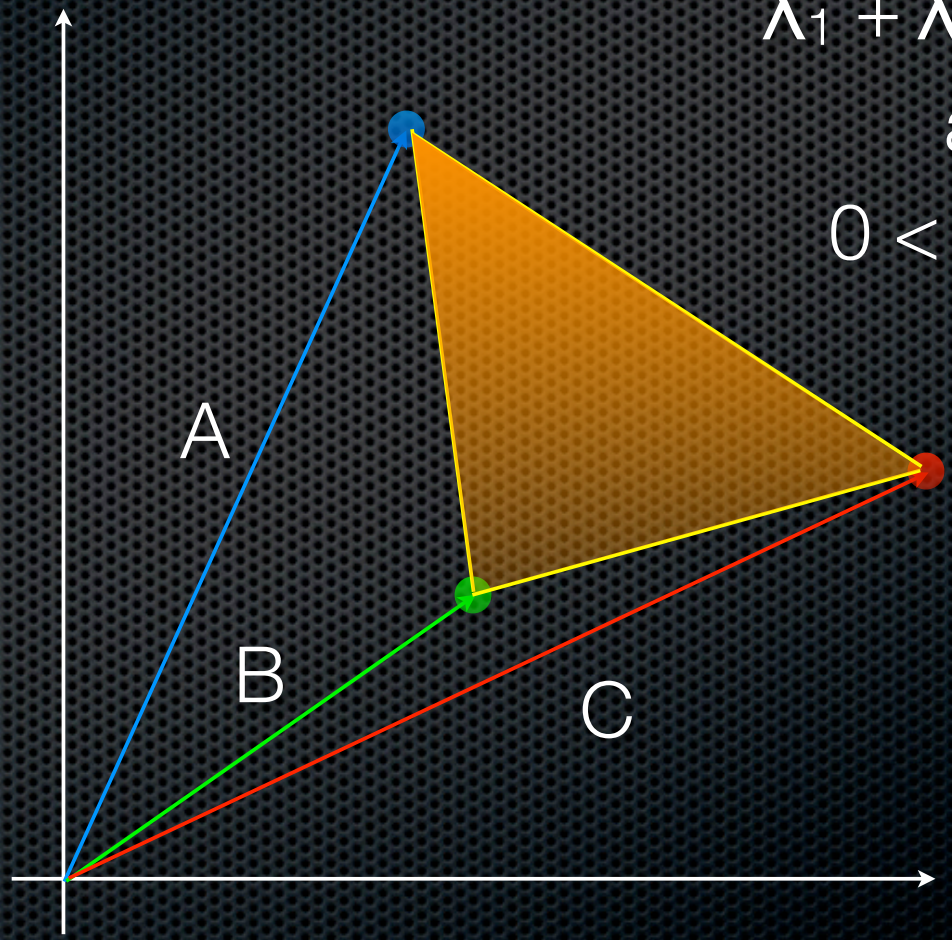


Barycentric Coordinates

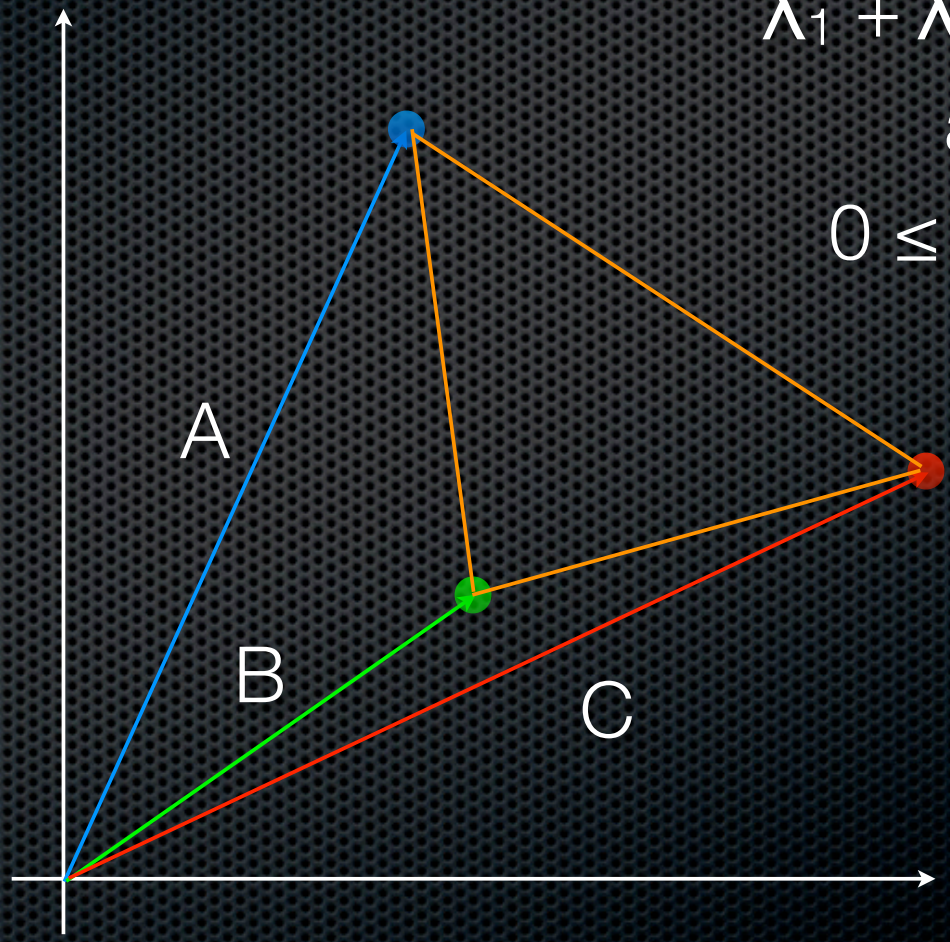
$\lambda_1 + \lambda_2 + \lambda_3 = 1$

and

$0 < \lambda_x < 1$



Barycentric Coordinates



$\lambda_1 + \lambda_2 + \lambda_3 = 1$

and

$0 \leq \lambda_x \leq 1$

and

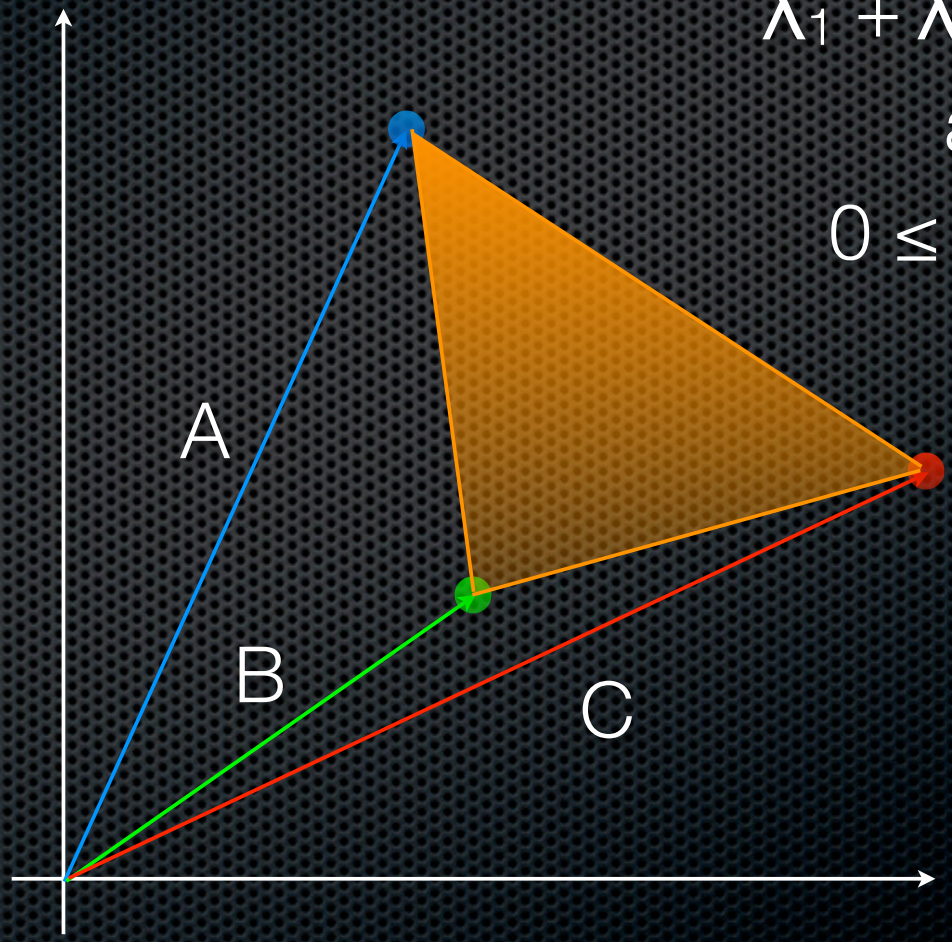
1 or 2 $\lambda_x = 0$

Barycentric Coordinates

$$\lambda_1 + \lambda_2 + \lambda_3 = 1$$

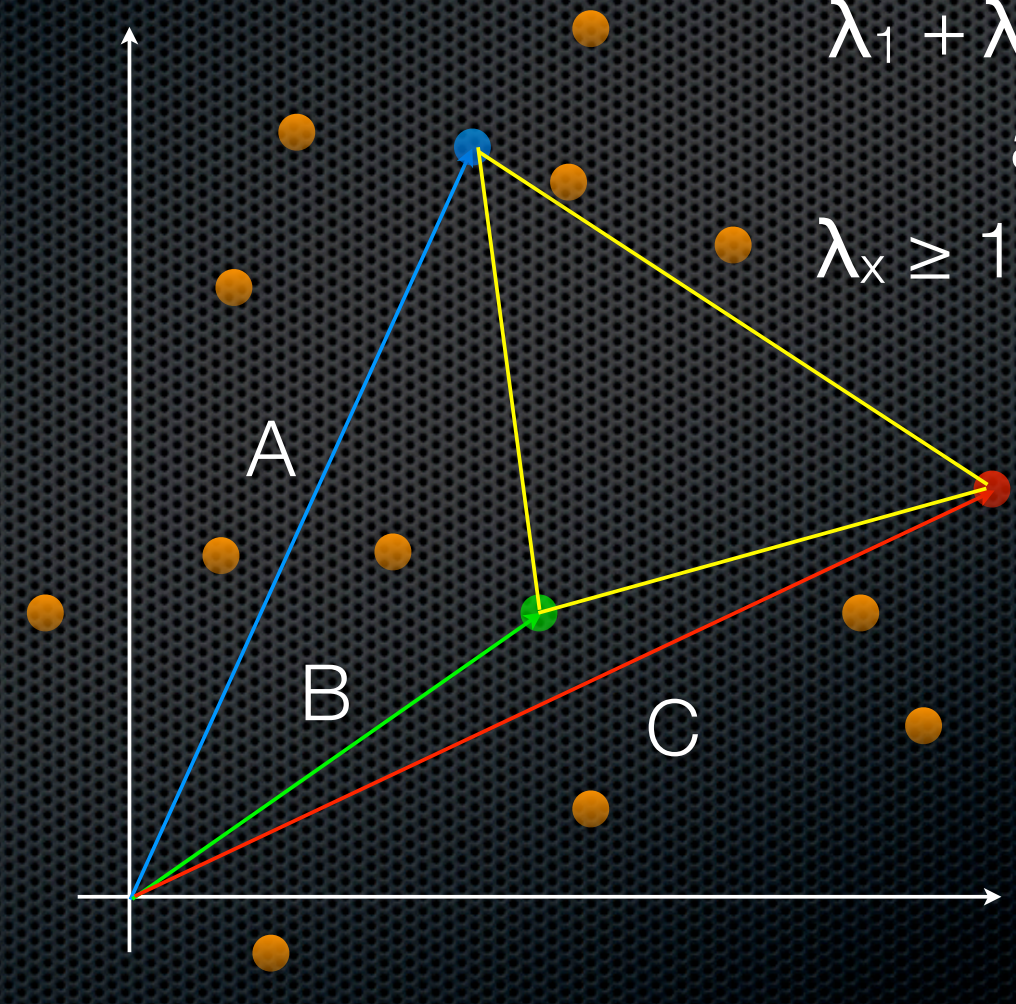
and

$$0 \leq \lambda_x \leq 1$$



Barycentric Coordinates

Outside



$\lambda_1 + \lambda_2 + \lambda_3 = 1$

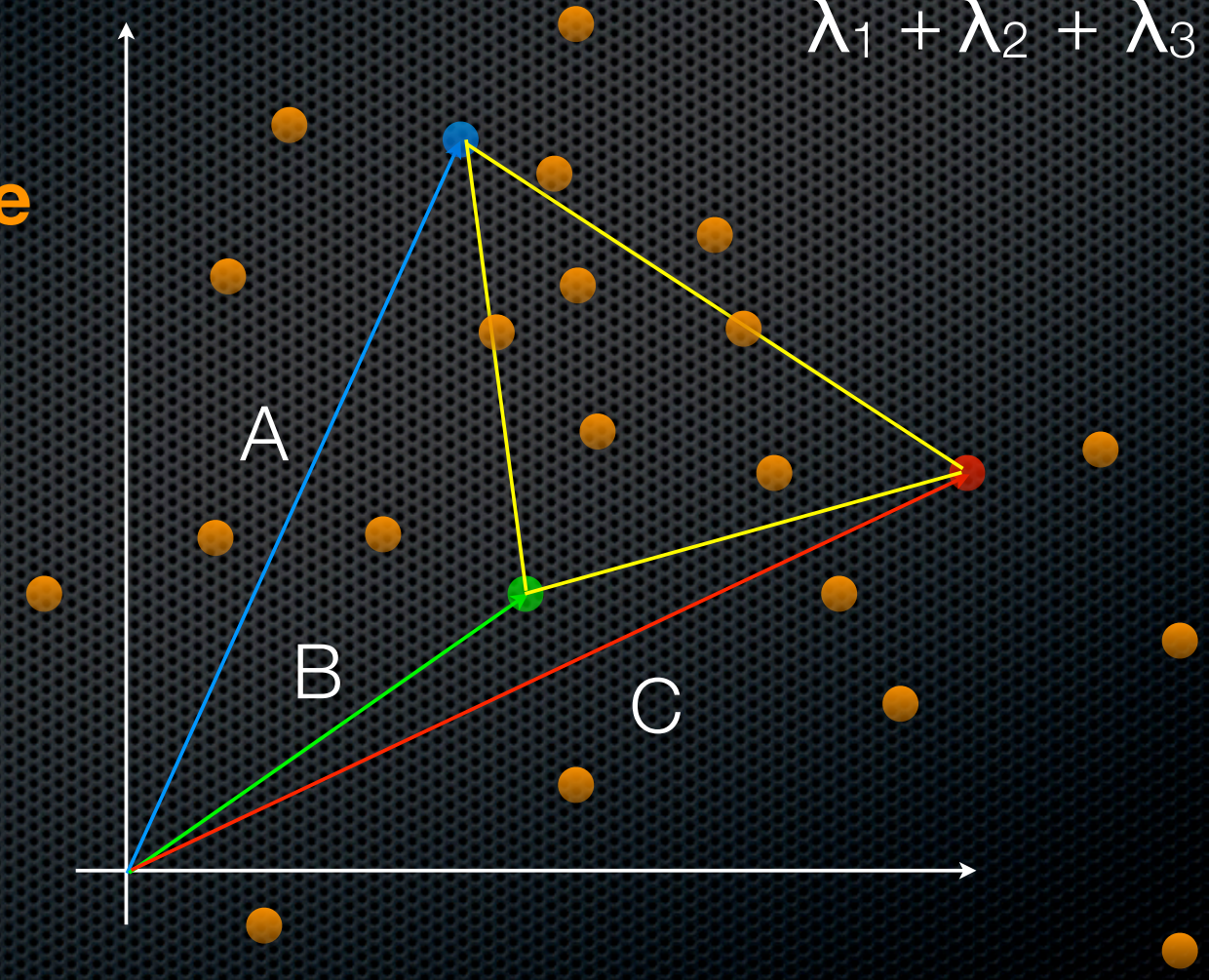
and

$\lambda_x \geq 1$ or $\lambda_x \leq 0$

Not Barycentric Coordinates

$\lambda_1 + \lambda_2 + \lambda_3 \neq 1$

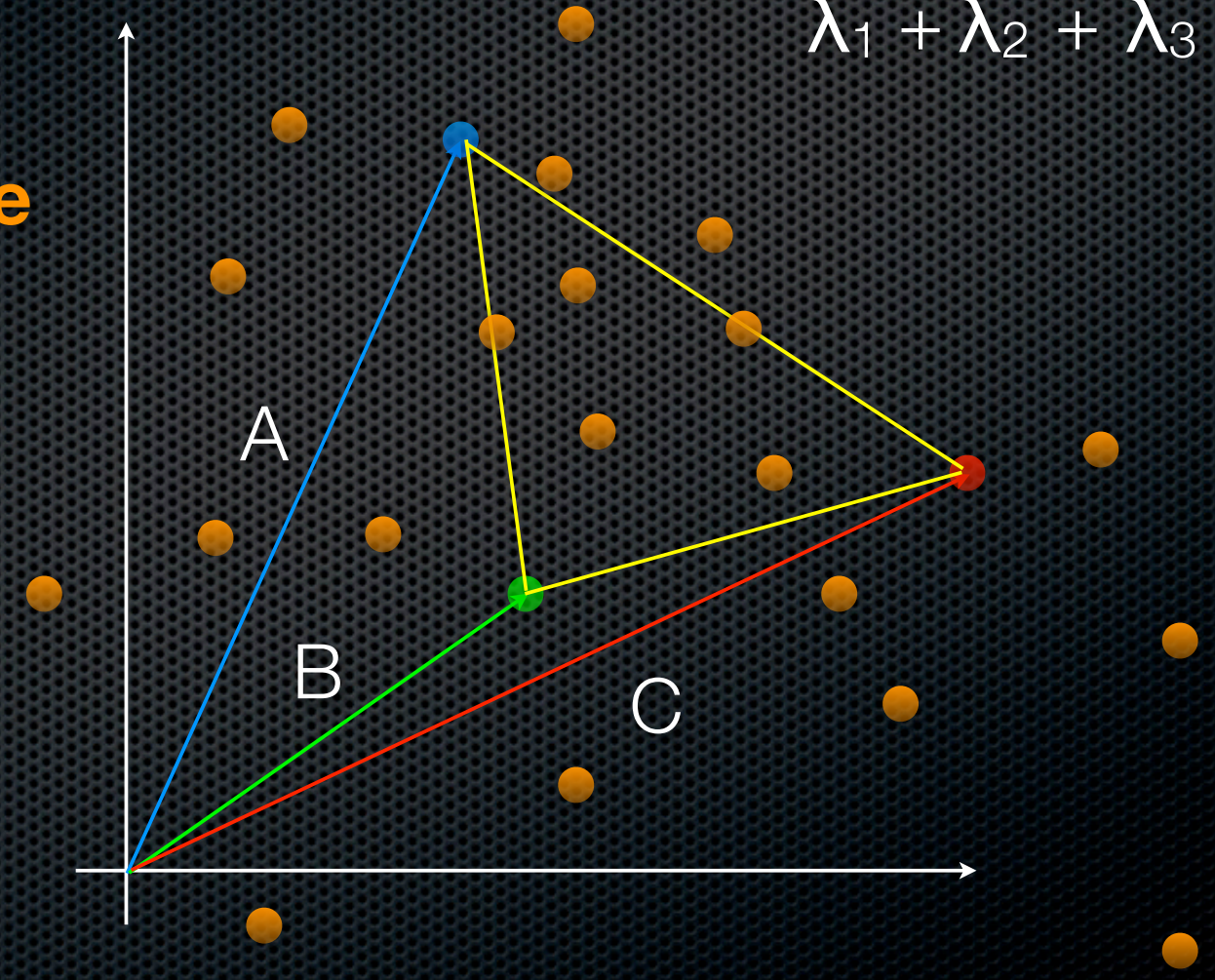
Anywhere



Linear Combination

$\lambda_1 + \lambda_2 + \lambda_3 \neq 1$

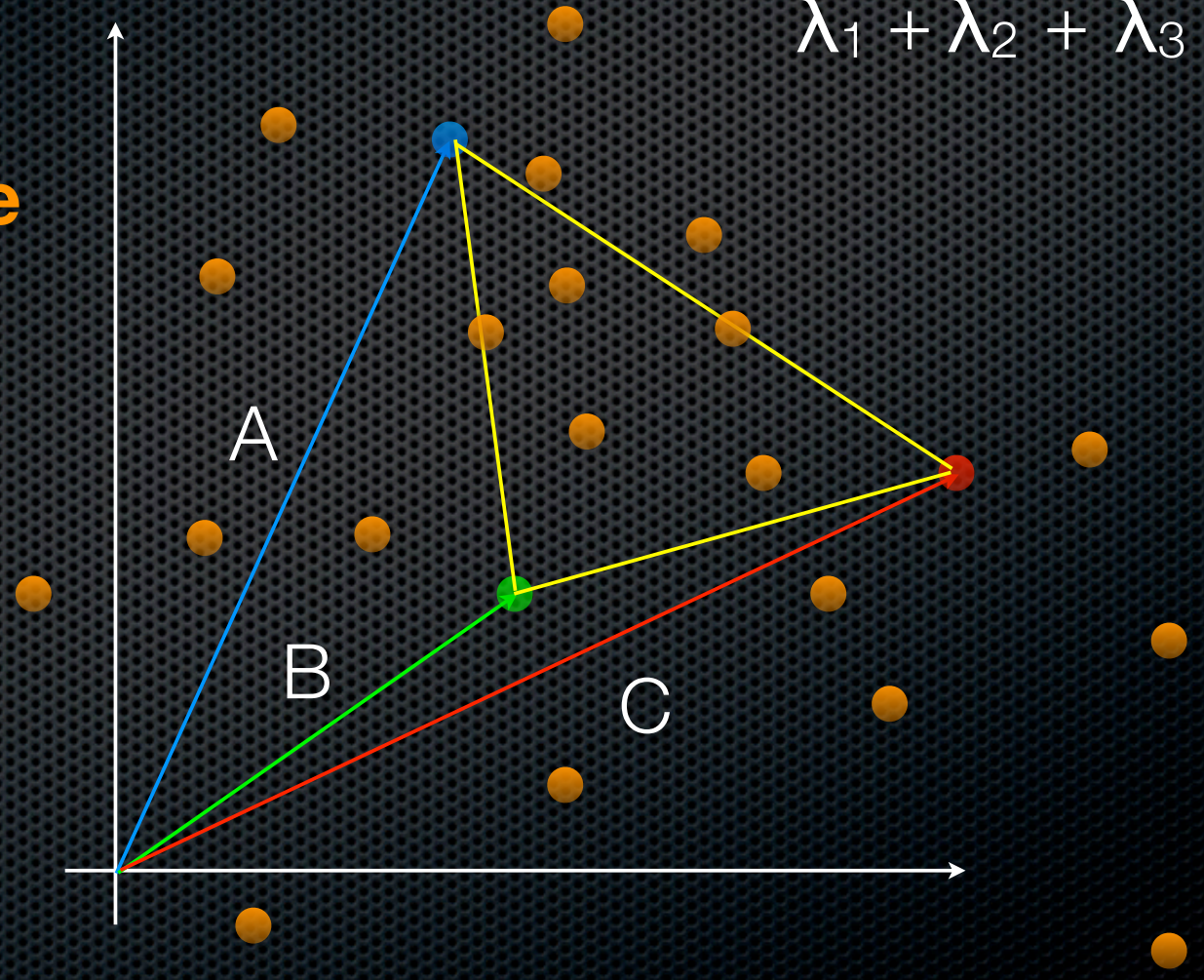
Anywhere



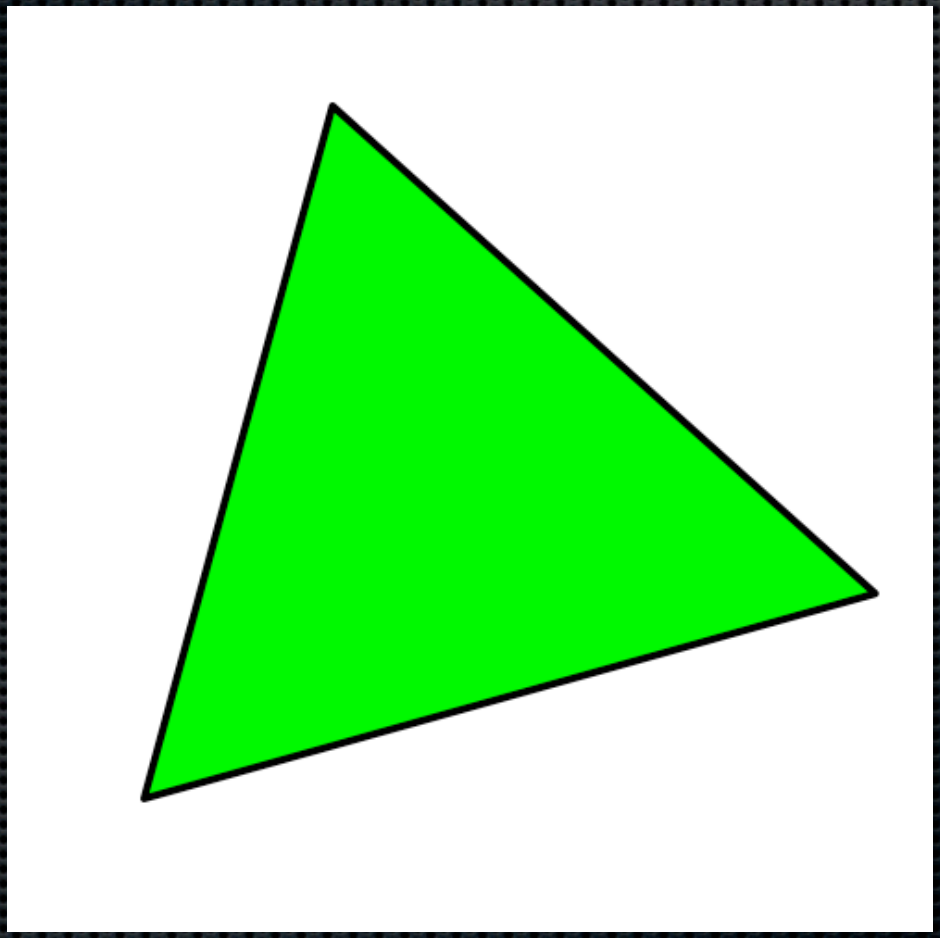
Linear Combination but **Not** a Blend

$\lambda_1 + \lambda_2 + \lambda_3 \neq 1$

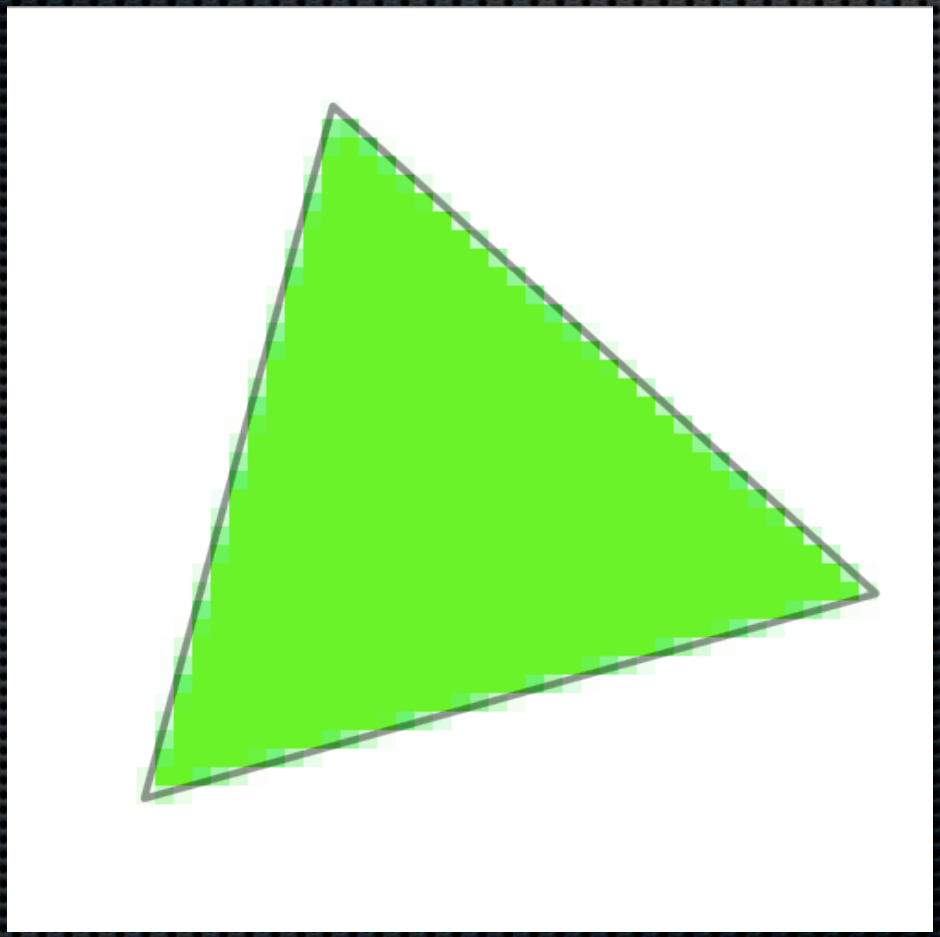
Anywhere



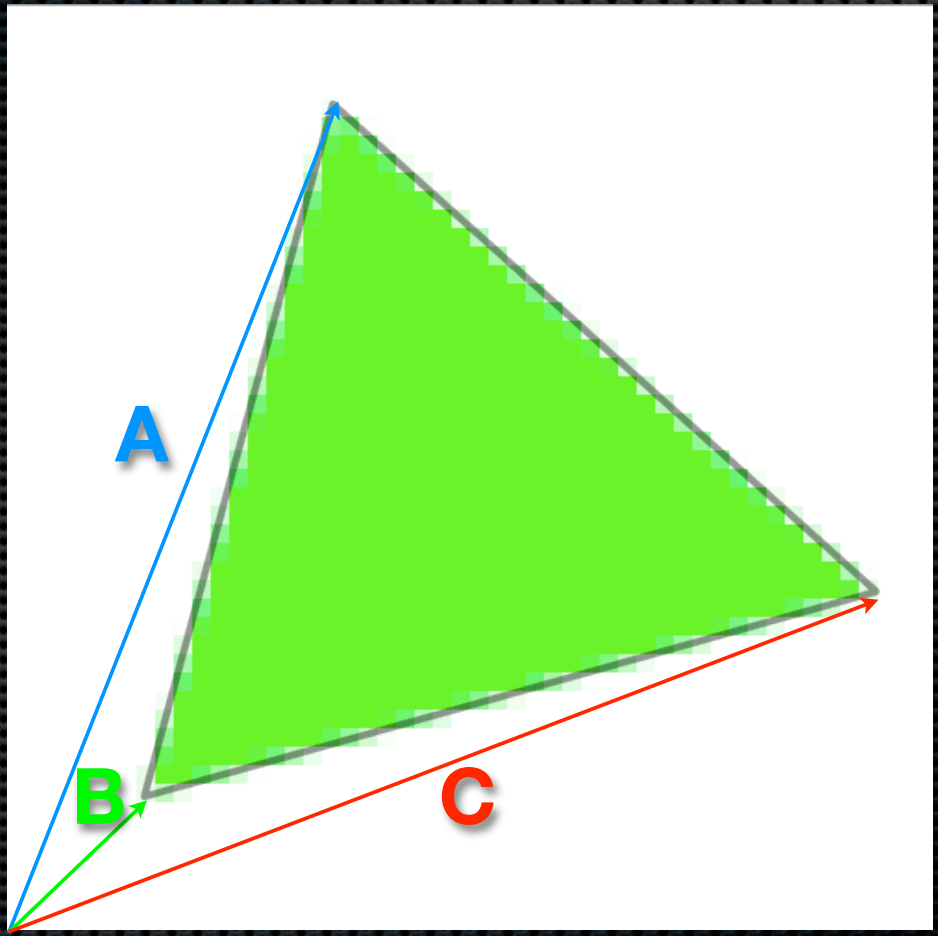
Rasterization



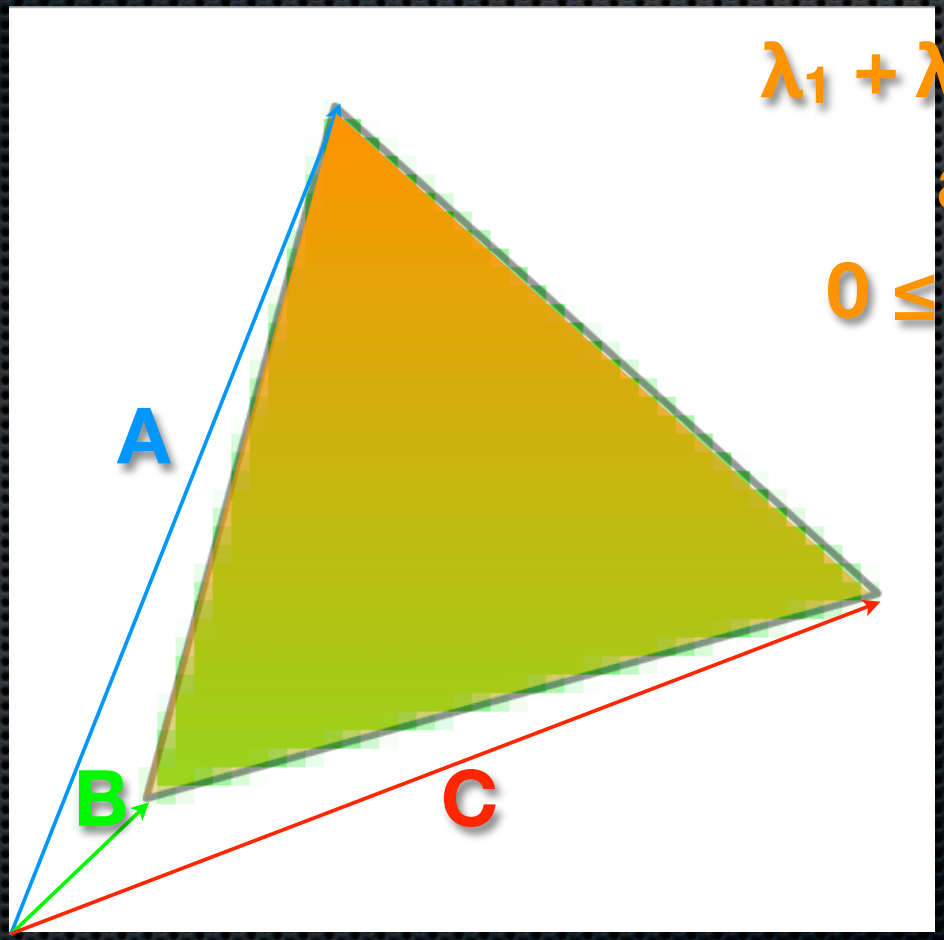
Rasterization



Rasterization



Barycentric Coordinates

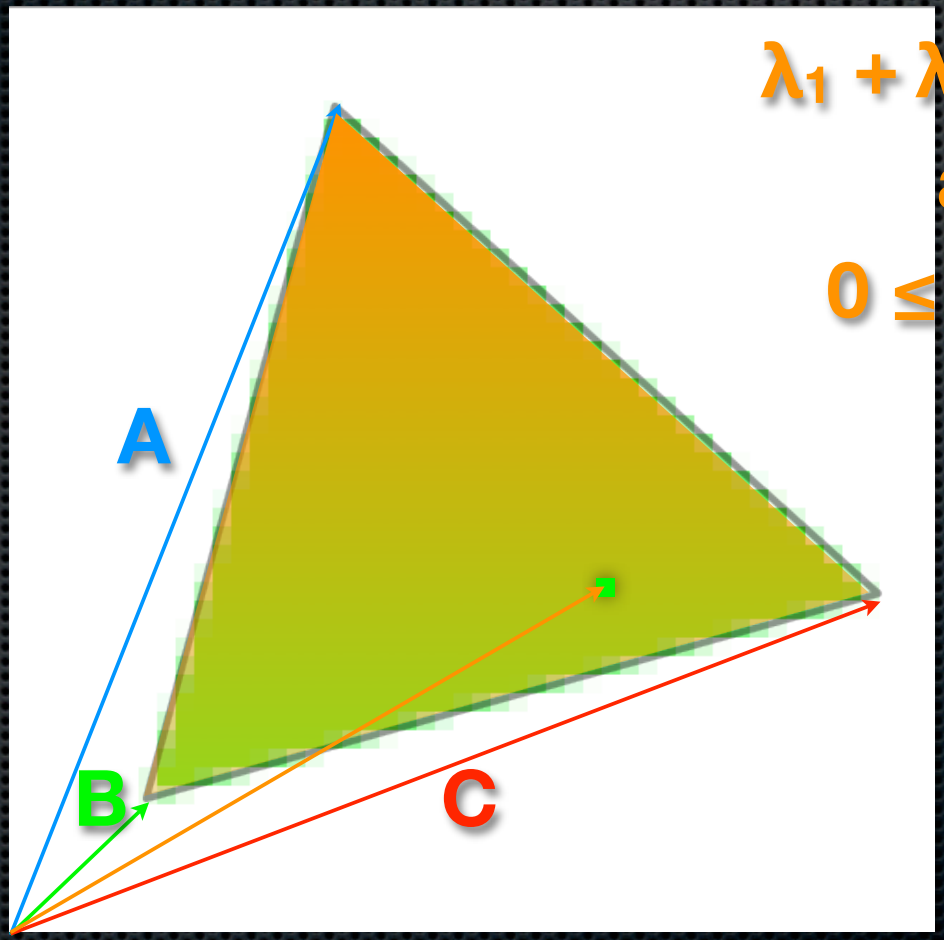


$\lambda_1 + \lambda_2 + \lambda_3 = 1$

and

$0 \leq \lambda_x \leq 1$

Barycentric Coordinates

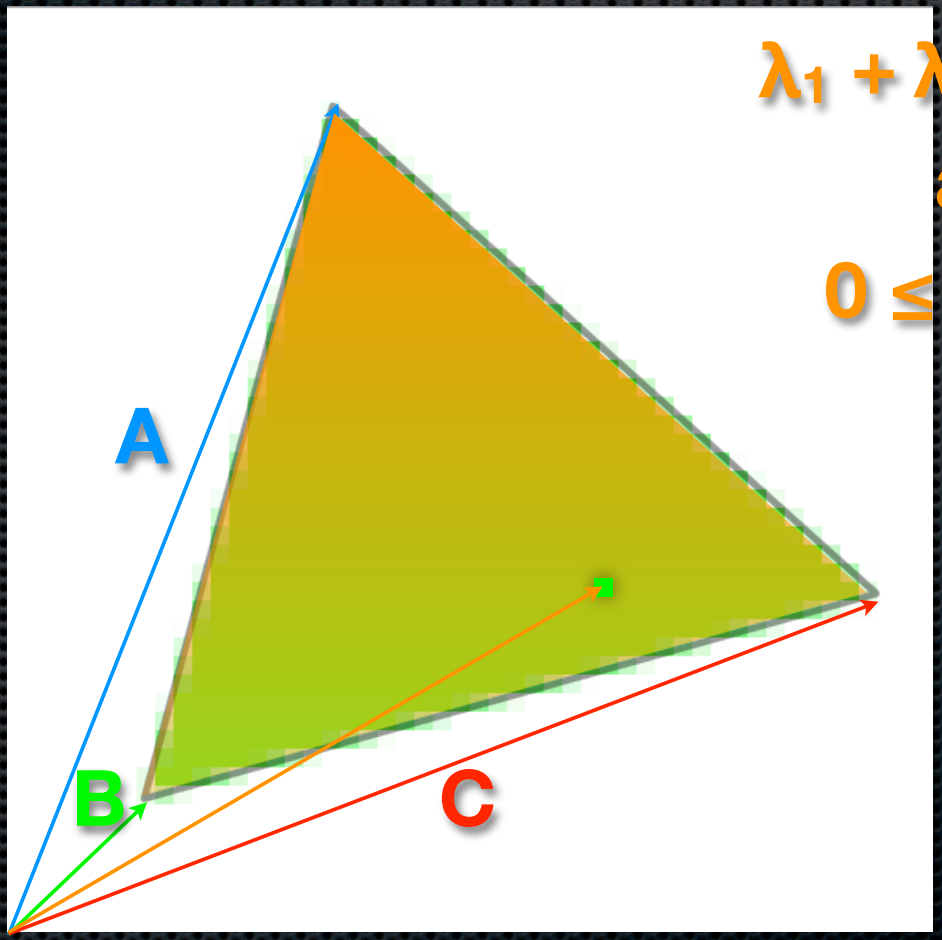


$\lambda_1 + \lambda_2 + \lambda_3 = 1$

and

$0 \leq \lambda_x \leq 1$

Barycentric Coordinates



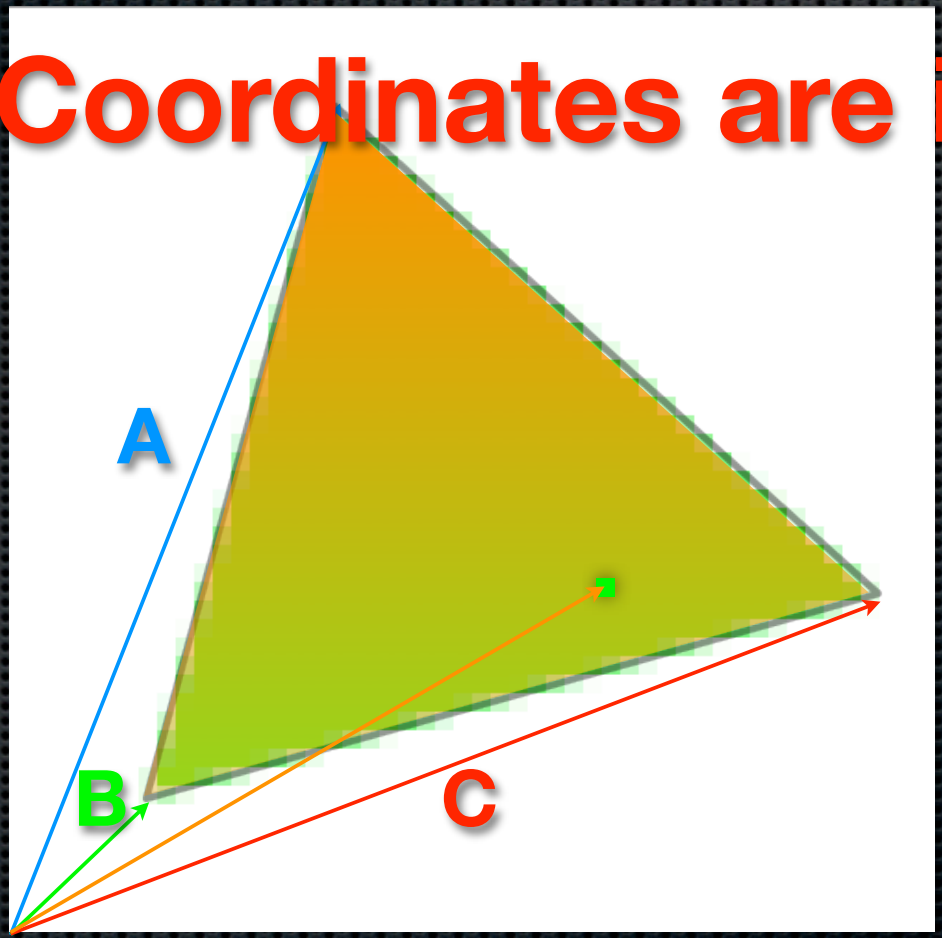
$\lambda_1 + \lambda_2 + \lambda_3 = 1$

and

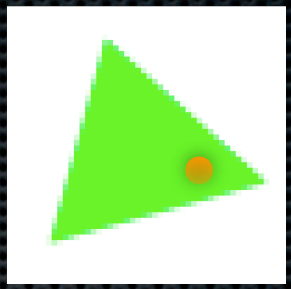
$0 \leq \lambda_x \leq 1$

Barycentric Coordinates

Pixel Coordinates are in X,Y



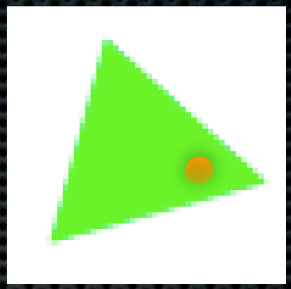
Barycentric Coordinates



$$x = \lambda_1 x_1 + \lambda_2 x_2 + \lambda_3 x_3$$
$$y = \lambda_1 y_1 + \lambda_2 y_2 + \lambda_3 y_3$$

$$\lambda_1 + \lambda_2 + \lambda_3 = 1$$

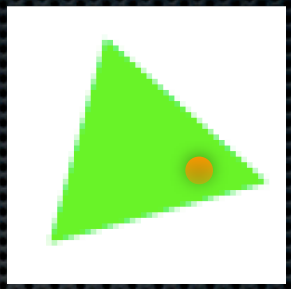
Barycentric Coordinates



$$x = \lambda_1 x_1 + \lambda_2 x_2 + \lambda_3 x_3$$
$$y = \lambda_1 y_1 + \lambda_2 y_2 + \lambda_3 y_3$$

$$\lambda_3 = 1 - \lambda_1 - \lambda_2$$

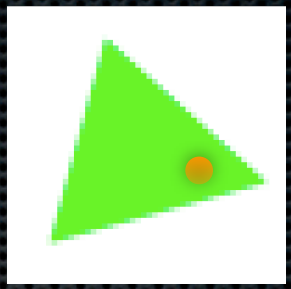
Barycentric Coordinates



$$x = \lambda_1 x_1 + \lambda_2 x_2 + (1 - \lambda_1 + \lambda_2) x_3$$
$$y = \lambda_1 y_1 + \lambda_2 y_2 + (1 - \lambda_1 + \lambda_2) y_3$$

$$\lambda_3 = 1 - \lambda_1 - \lambda_2$$

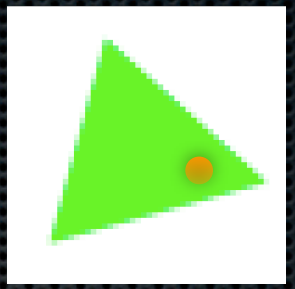
Barycentric Coordinates



Lots of rearranging...

$$\lambda_3 = 1 - \lambda_1 - \lambda_2$$

Barycentric Coordinates



$$\lambda_1 = \frac{(y_2 - y_3)(x - x_3) + (x_3 - x_2)(y - y_3)}{(y_2 - y_3)(x_1 - x_3) + (x_3 - x_2)(y_1 - y_3)}$$

$$\lambda_2 = \frac{(y_3 - y_1)(x - x_3) + (x_1 - x_3)(y - y_3)}{(y_2 - y_3)(x_1 - x_3) + (x_3 - x_2)(y_1 - y_3)}$$

$$\lambda_3 = 1 - \lambda_1 - \lambda_2$$

Barycentric Coordinates