VECTORS

PALIMPSEST

VECTORS

- Definition
- Vector Addition
- Dot Product
- Distance Formula
- EXERCISE
- Matrices

VECTORS

What are they?


Not this guy.

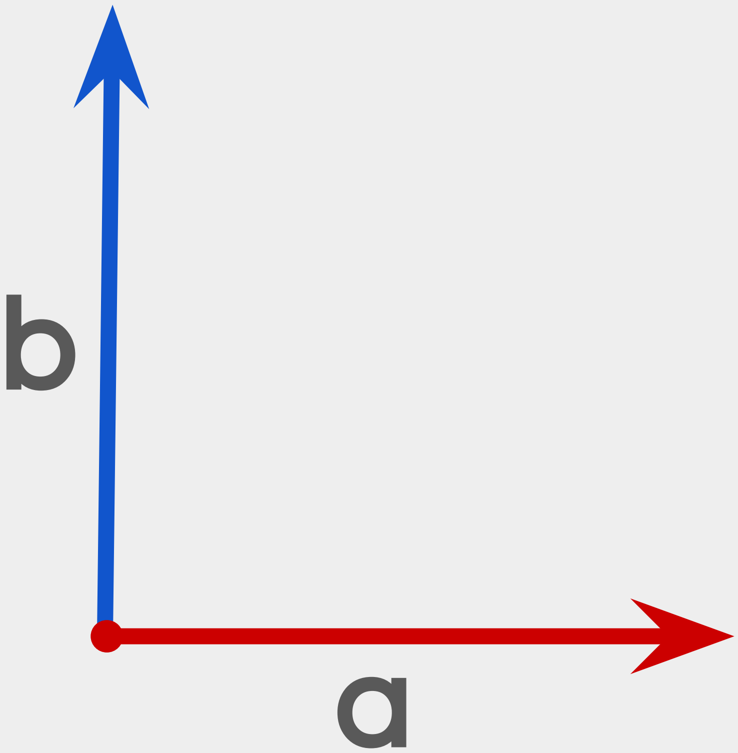

Hi, Vector.

Vectors have:

Magnitude

Direction

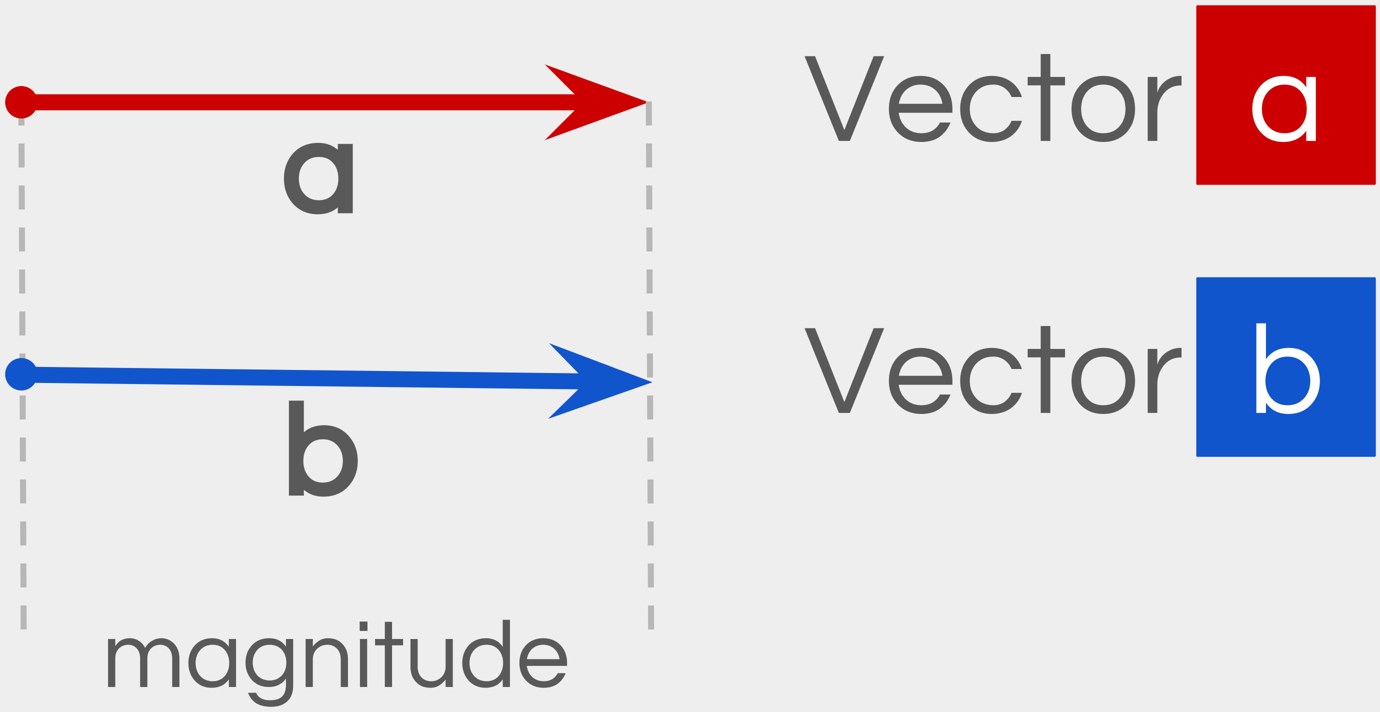
VECTOR DIRECTION



Vector a Right

Vector b Up

VECTOR MAGNITUDE



ADDING VECTORS

a + b =

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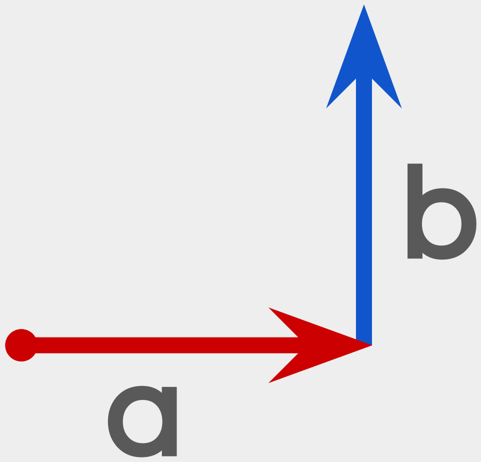
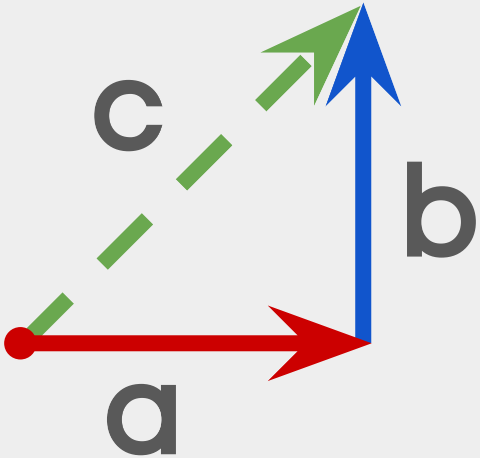


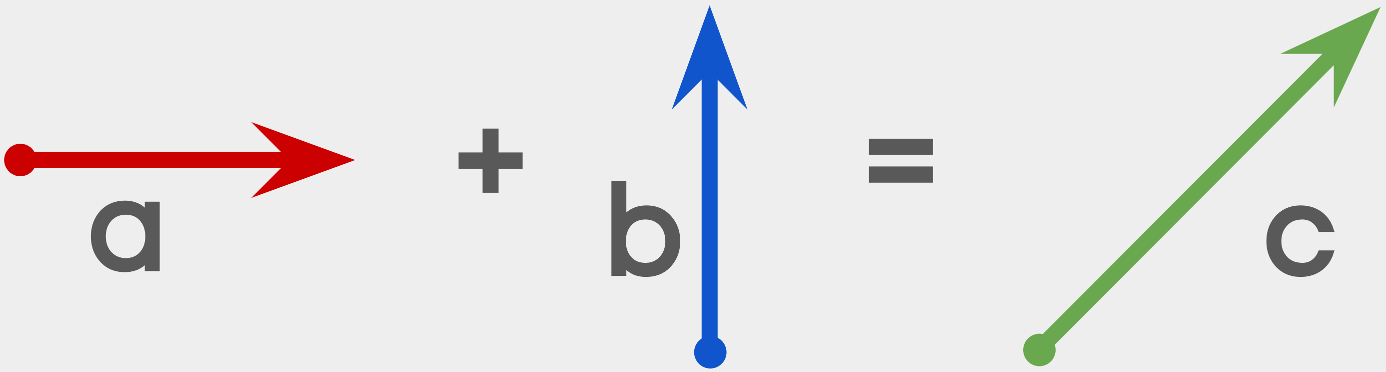
ADDING VECTORS

a + b = c



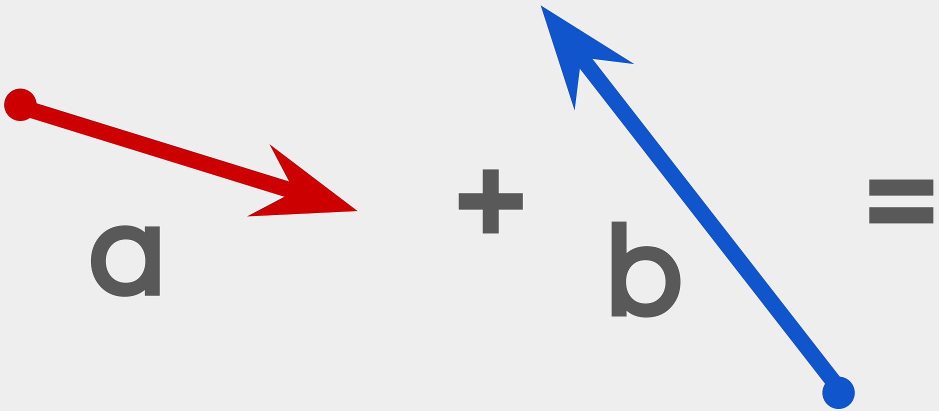
ADDING VECTORS

a + b = c



ADDING VECTORS

a + b =



ADDING VECTORS

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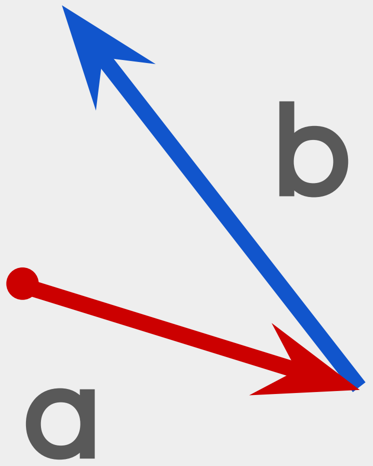
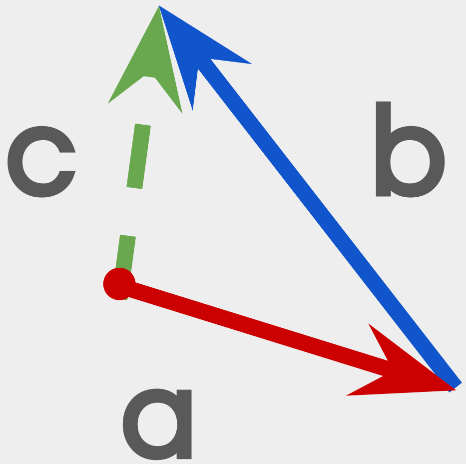


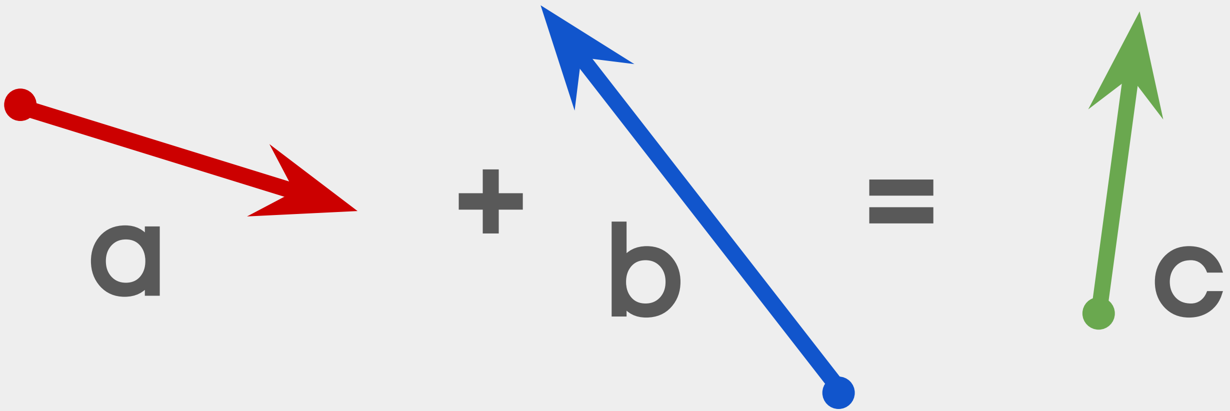
ADDING VECTORS

a + b = c



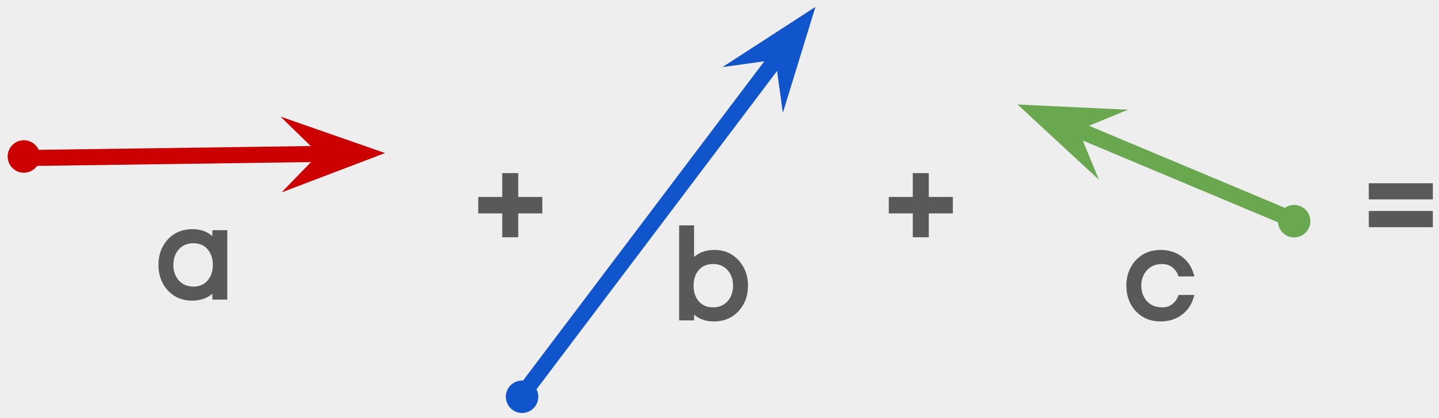
ADDING VECTORS

a + b = c



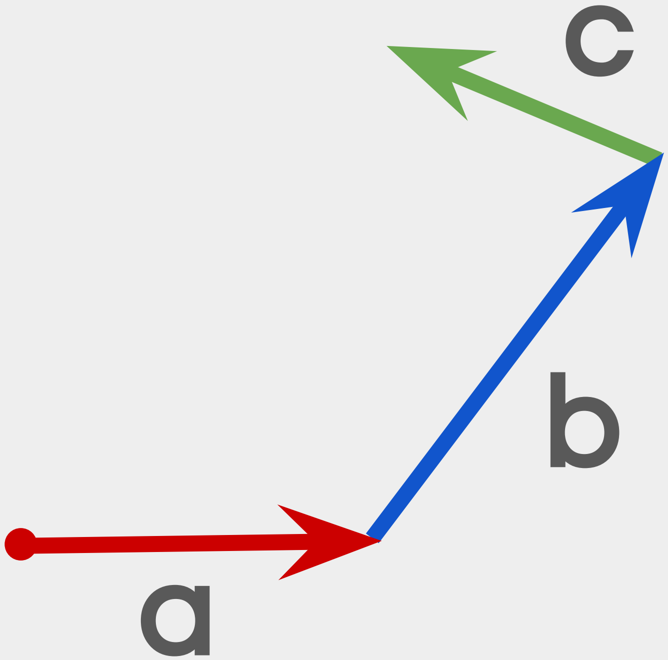
ADDING VECTORS

a + b + c =



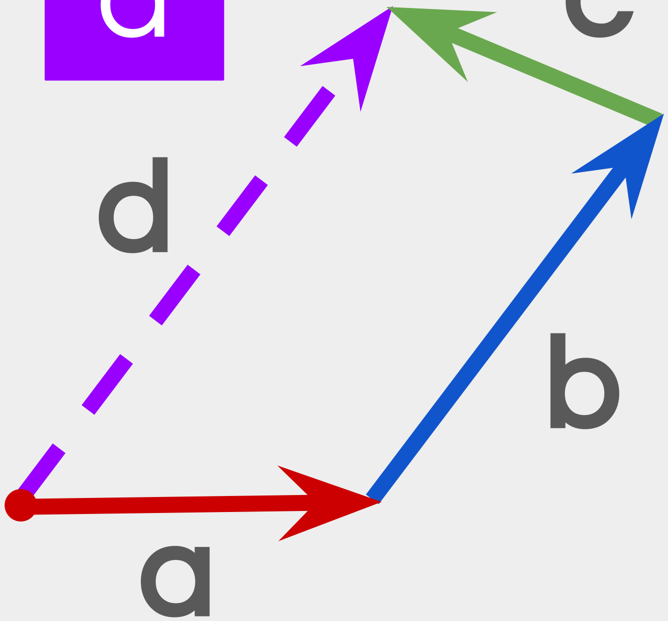
ADDING VECTORS

a + b + c =



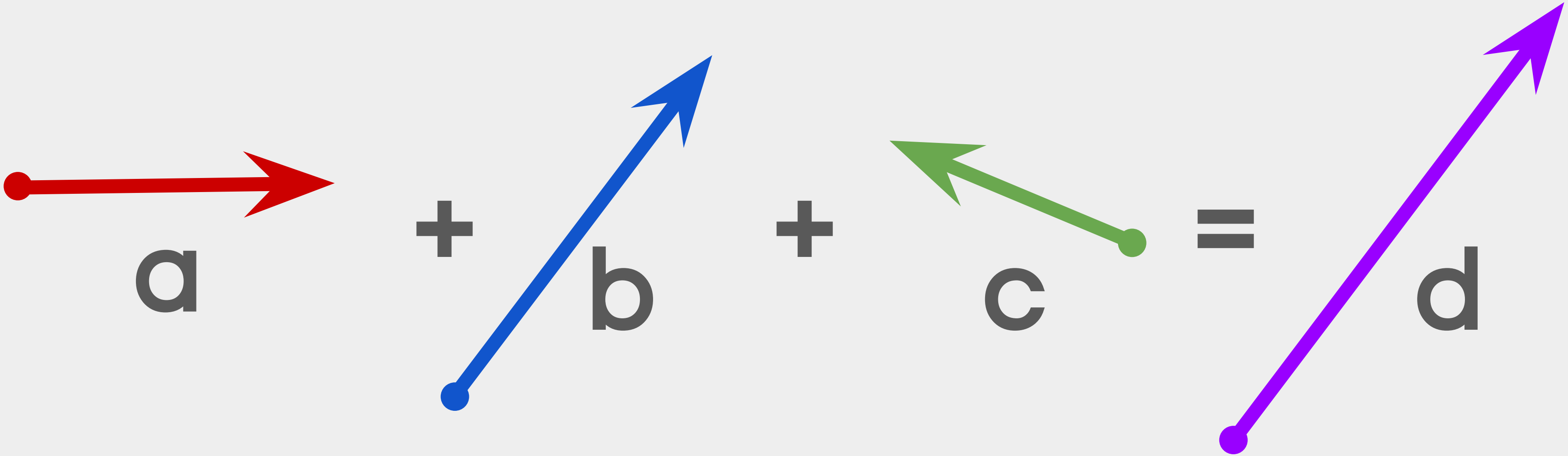
ADDING VECTORS

a + b + c = d



ADDING VECTORS

$$\mathrm{a} + \mathrm{b} + \mathrm{c} = \mathrm{d}$$

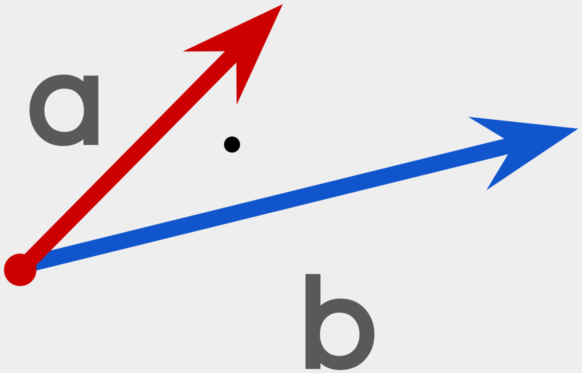


A vector can be anywhere

DOT PRODUCT

Dot Product shows how vectors overlap.

Break each vector into its X and Y components.



DOT PRODUCT

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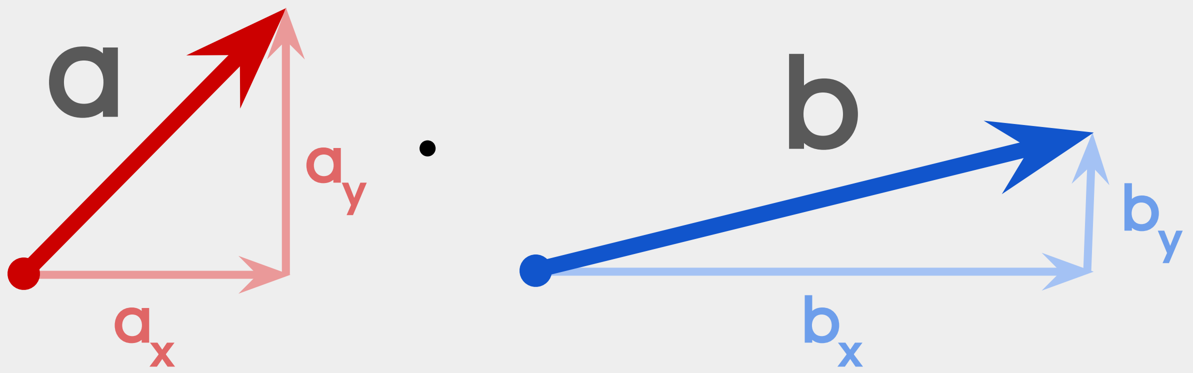
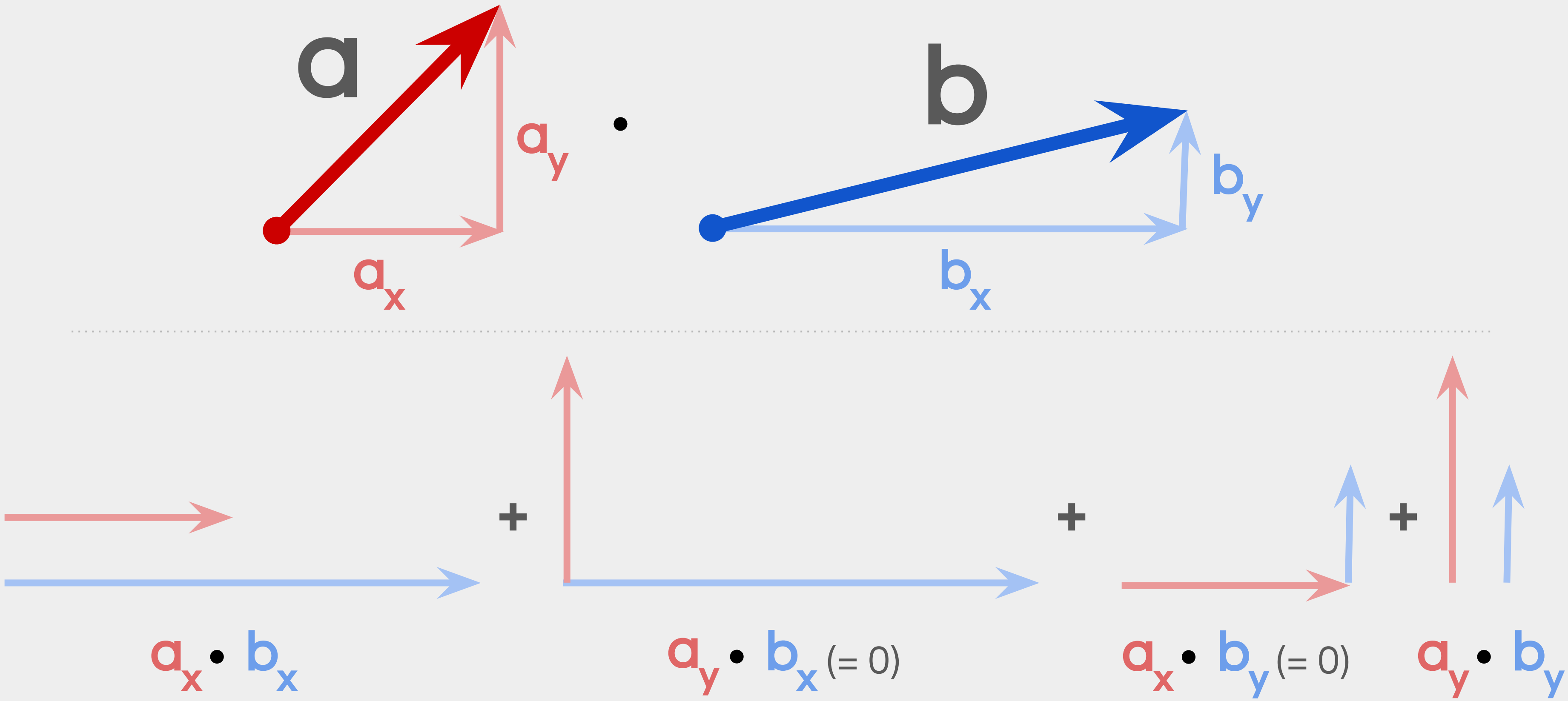
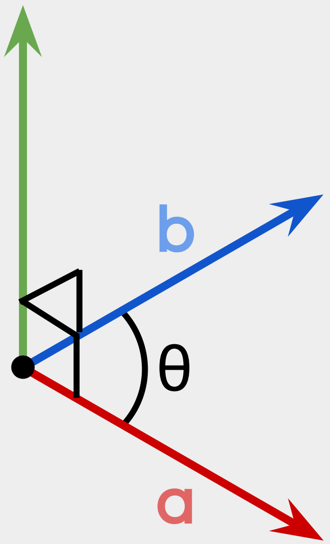




$$a_x \cdot b_x + a_y \cdot b_y$$

CROSS PRODUCT

The vectors a and b
together define a plane.



To find a vector parallel to both a and b...

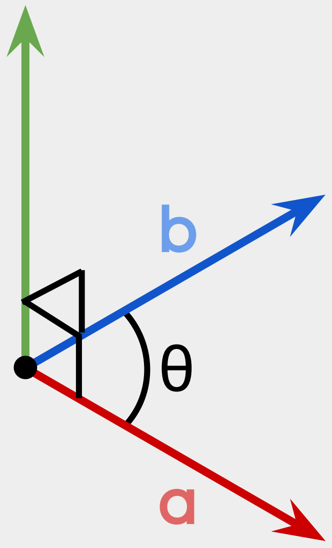
(otherwise known as ... ?)

CROSS PRODUCT

The vectors a and b
together define a plane.

To find a vector parallel to both a and b...

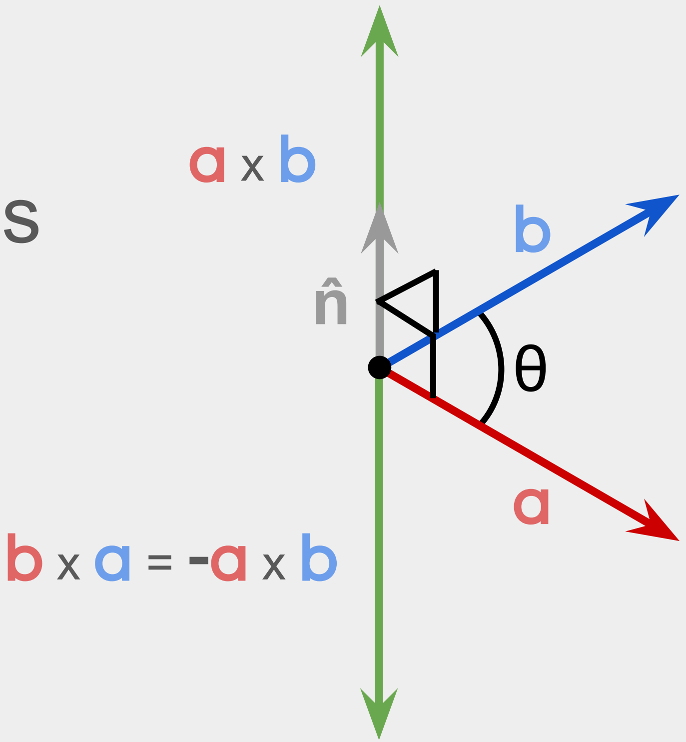
(otherwise known as the 3rd Dimension)



CROSS PRODUCT

Use the cross product.

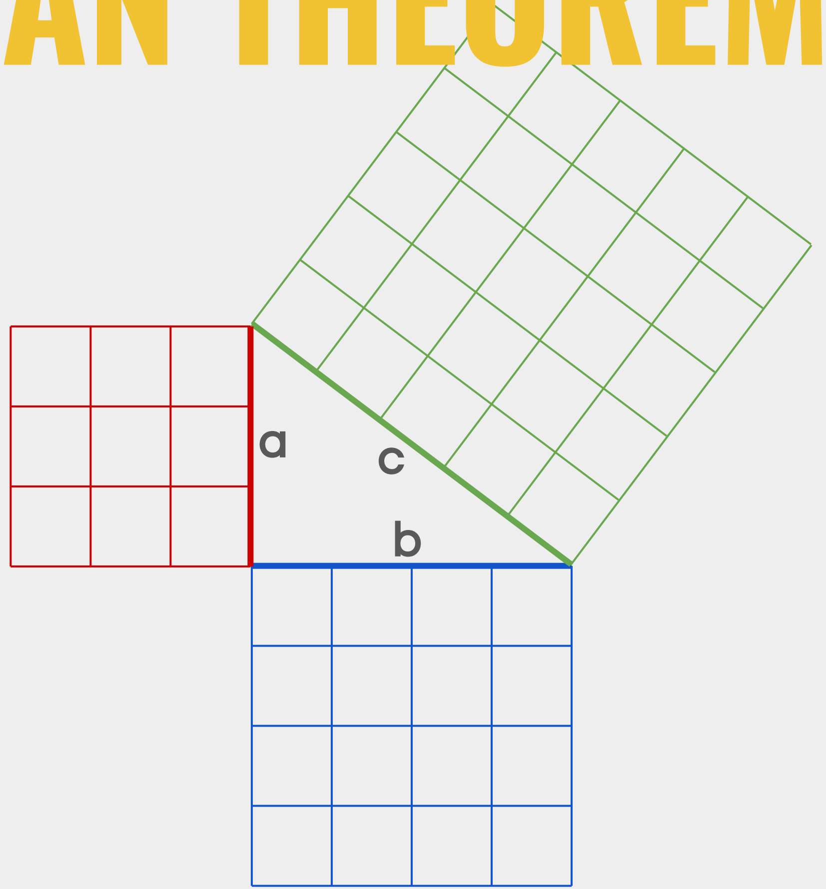
This gets the vector that is perpendicular to both vectors.



The n̂ vector is called the normal.

PYTHAGOREAN THEOREM

$$a^2 + b^2 = c^2$$



EXERCISE

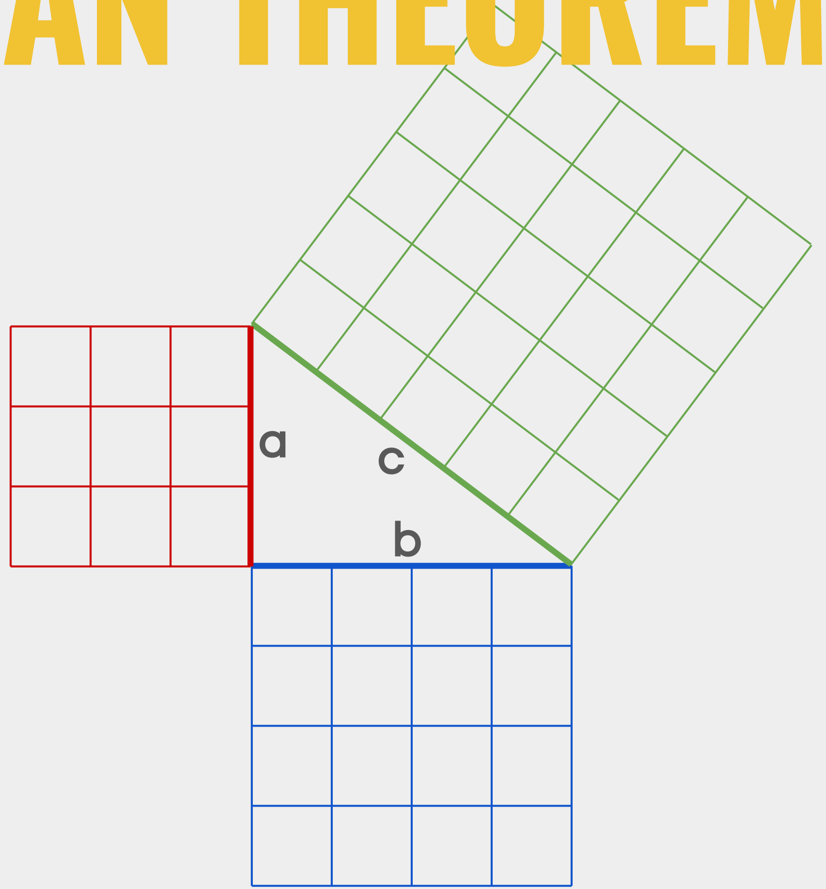
Pythagorean Physical Proof

PYTHAGOREAN THEOREM

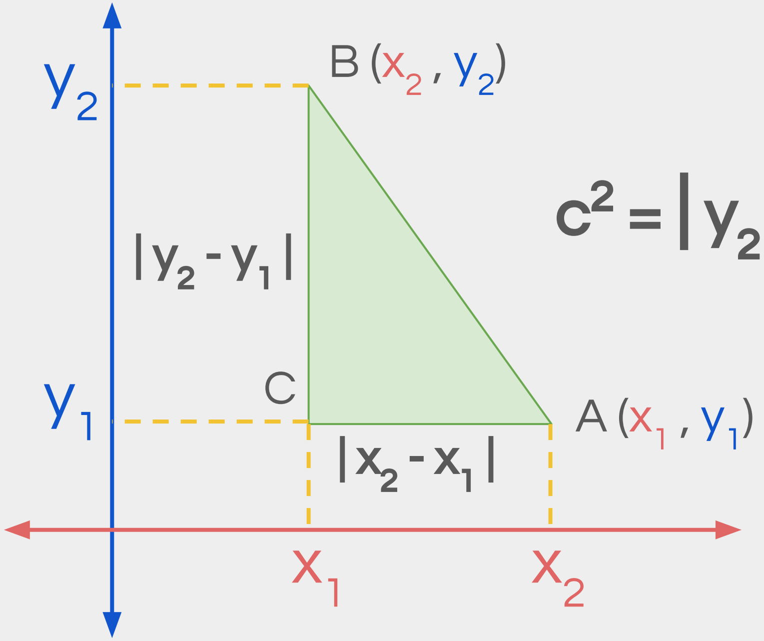
$$a^2 + b^2 = c^2$$

We can use this to get the distance between two points.

How?



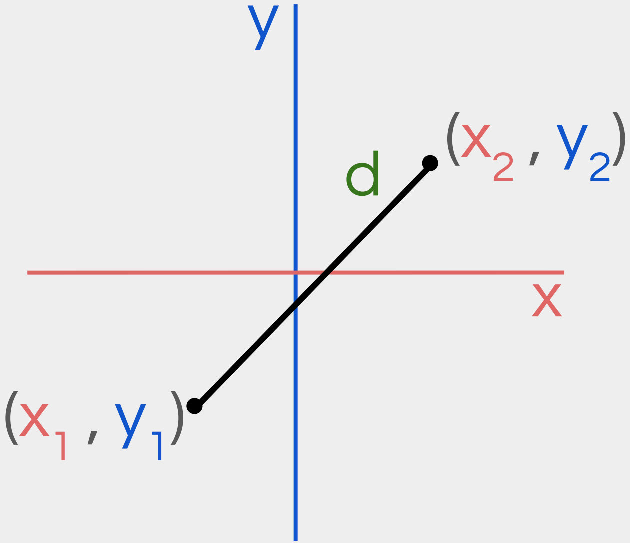
DISTANCE FORMULA



$$c^2 = |y_2 - y_1|^2 + |x_2 - x_1|^2$$

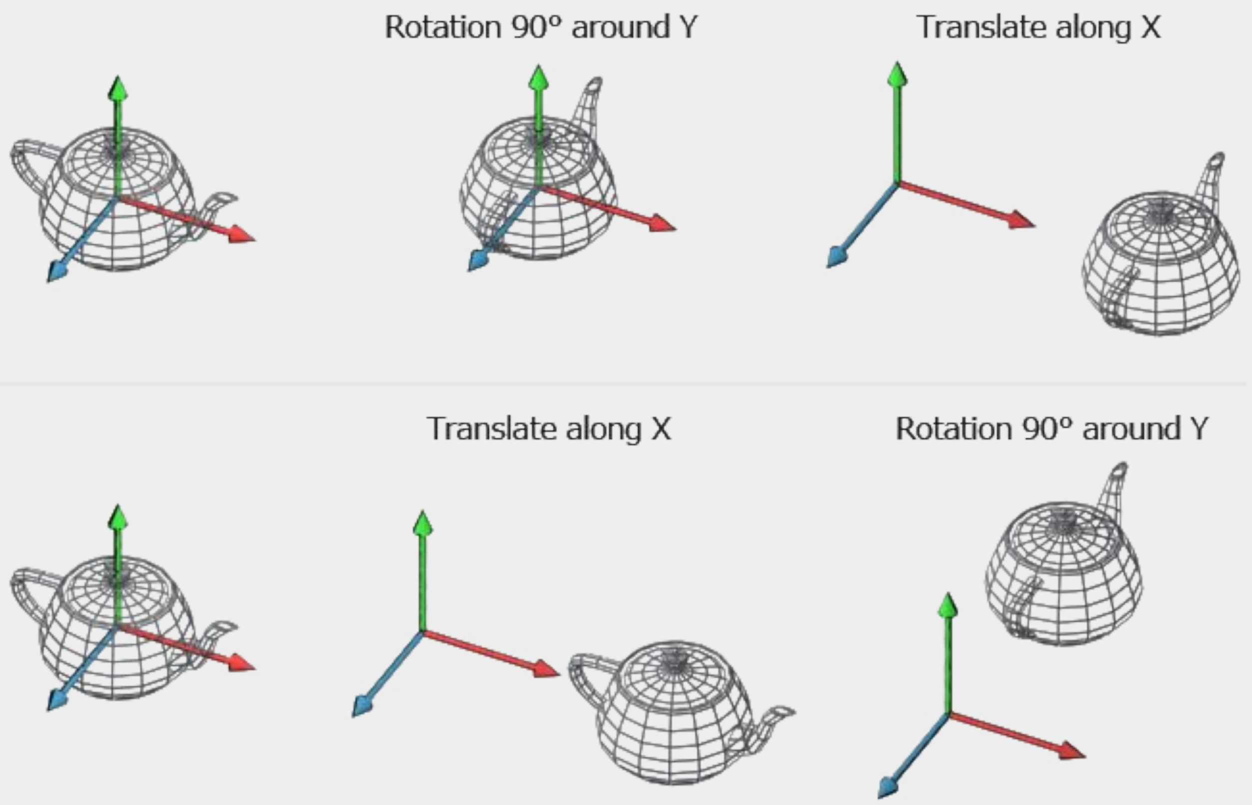
DISTANCE FORMULA

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



SCALE/ROTATION/TRANSLATION

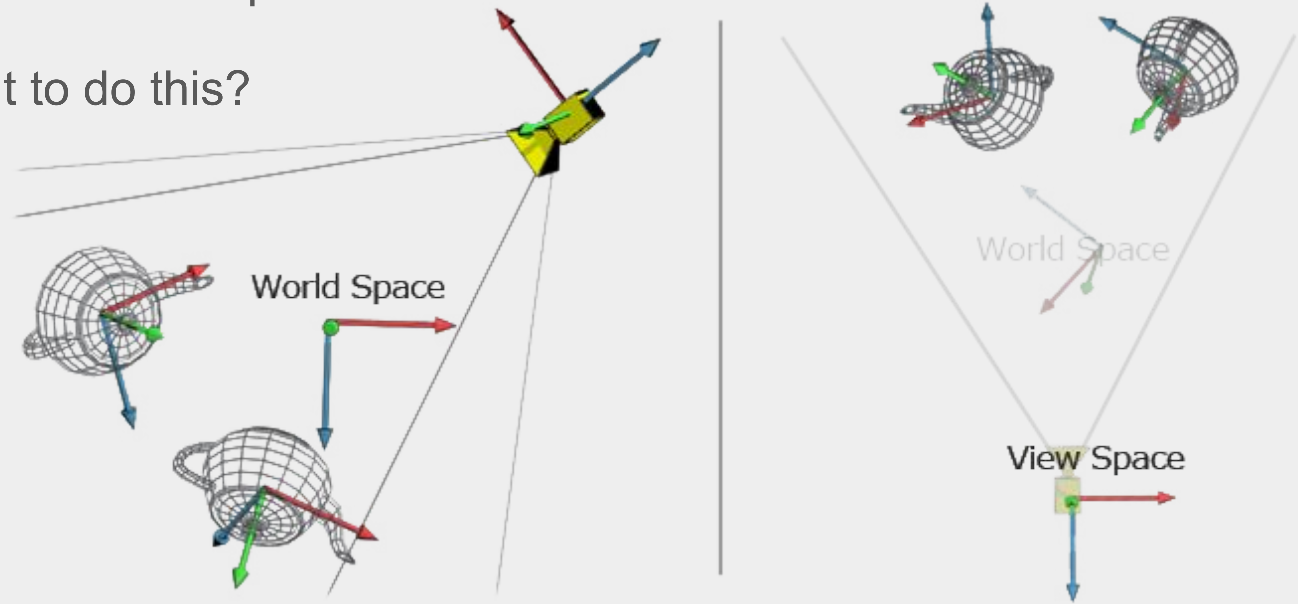
Order matters!



MATRICES

Matrices are a fancy way to hold multiple vectors together. If you want to take the scale, rotation, and translation (position) of an object and *transform* it from one space to another, you'd use a special *transformation matrix.*

Why might you want to do this?



EXERCISE

Matrix Transformation

NEXT UP

Hardware