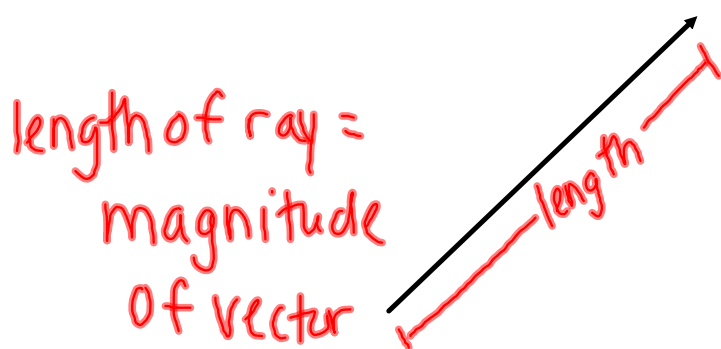
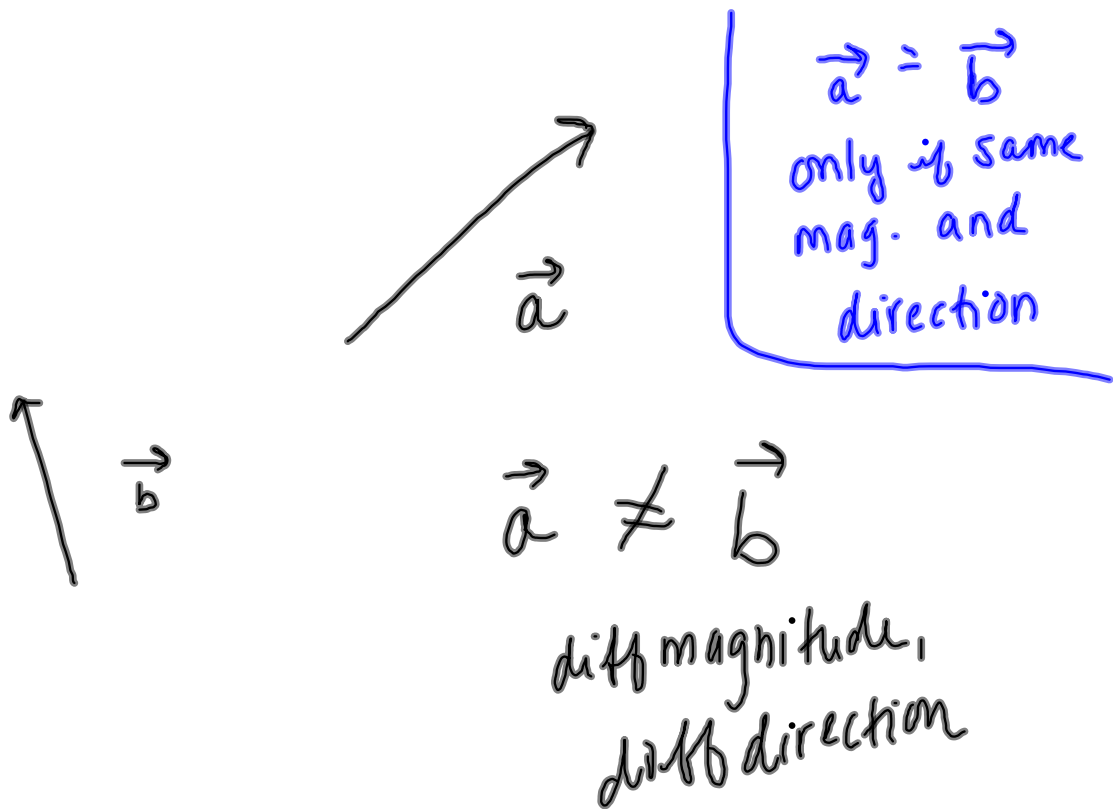


Vectors are represented by a ray.



direction of ray =
direction of
vector



Multiplication:

- Vector by vector (NOT this year)
- Vector by scalar

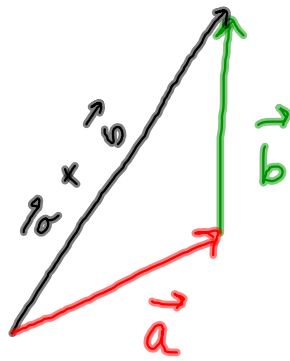
$$\vec{a} \cdot 2$$

$$\vec{a} \cdot 2 = 2\vec{a}$$

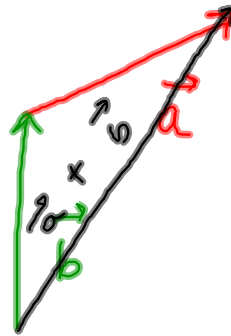
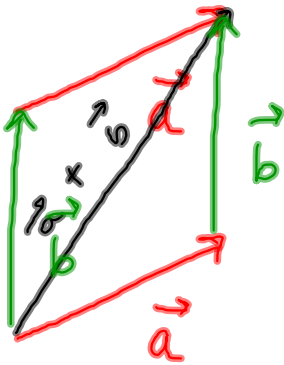
$$\vec{a} \cdot \frac{1}{2} = 0.5\vec{a}$$

$$\vec{a} \text{ what is } -\vec{a} = \downarrow -\vec{a}$$

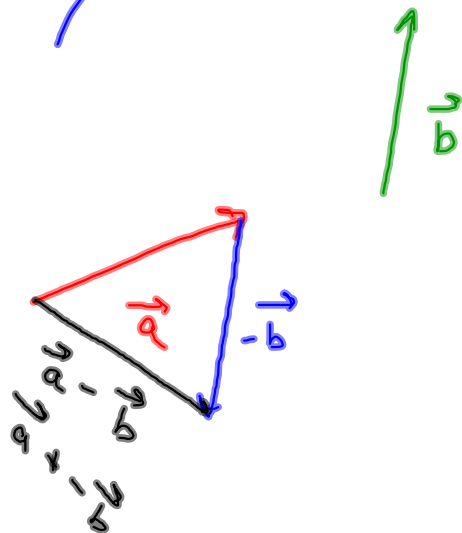
Vector Addition



$$\vec{a} + \vec{b} = ?$$

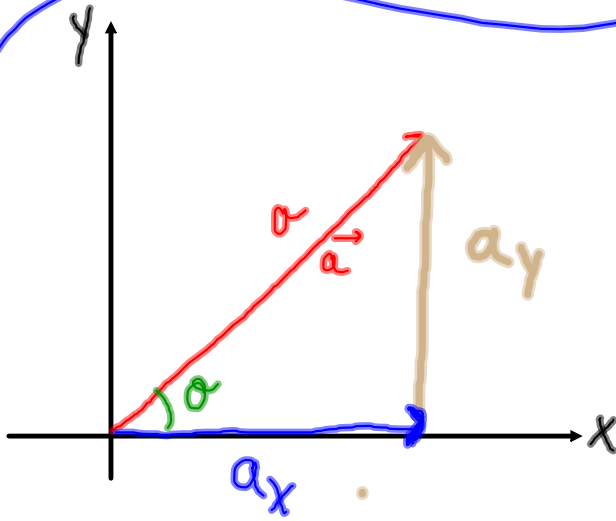


Vector Subtraction



$$\vec{a} - \vec{b} = ?$$
$$\vec{a} + -\vec{b} \therefore ?$$

Algebra of Vectors



Resolving
into components

θ = direction

a = magnitude

a_x = X component
of \vec{a}

a_y = Y component
of \vec{a}

SOH CAH TOA

If we know a and θ

↑ ↑
hypotenuse direction

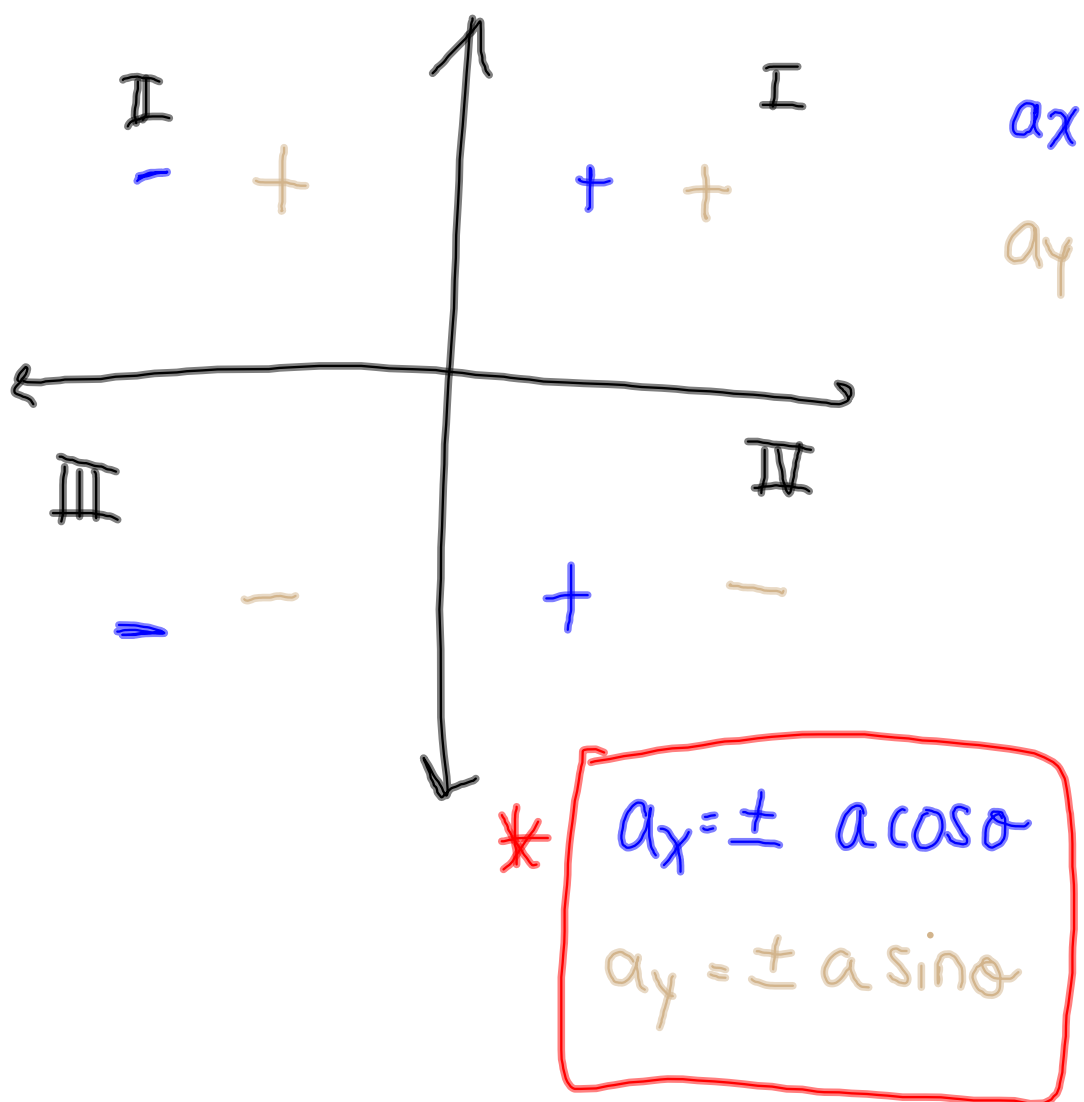
Find a_x and a_y

$$\cos \theta = \frac{\text{adj}}{\text{hyp}} = \frac{a_x}{a}$$

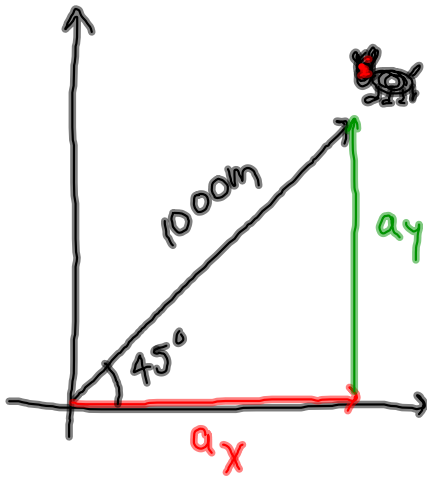
$$a_x = a \cos \theta$$

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{a_y}{a}$$

$$a_y = a \sin \theta$$



A bear walks 1000 m at 45 degrees NE. Find the x and y components of its displacement.



$$a_x = 1000 \cos 45$$

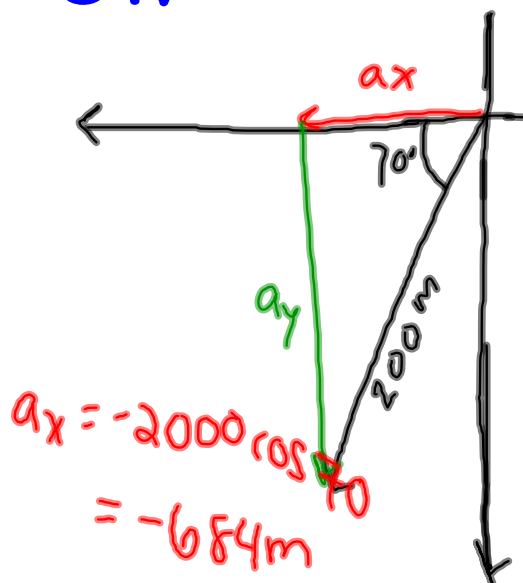
$$a_x = 707.1 \text{ m}$$

$$a_y = 1000 \sin 45$$

$$a_y = 707.1 \text{ m}$$

A pony gallops
2000 m at 70°
SW

Find the x and y displacement of her galloping. (Additional info: This is a My Little Pony with a glitter mane and pink toenails :))



$$a_y = -2000 \sin 70$$
$$a_y = -1879.4\text{m}$$