Move Test ⇒ 22ND

So far we have only moved in 1-D. This unit we will move in two dimensions at the same time.

Vectors in 2-D

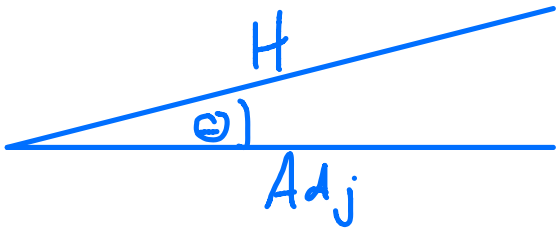
If a vector is at an angle, then we need to find its components in order to work with it.

We will use our Trig functions:

Sine - ratio of the opposite side over the hypotenuse

If I know H, I know Opp = $H \sin\theta$

Cosine - ratio of the adjacent side over the hypoteneuse.



If I know H, I know $Adj = H\cos\theta$

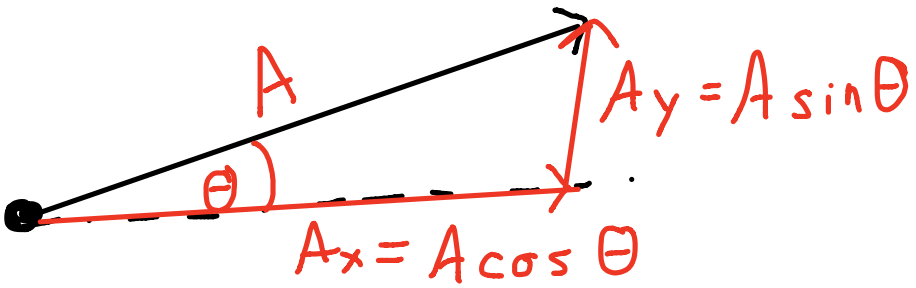
Tangent - ratio of opposite over the adjacent side.

If I know, opposite and adjacent I can find

$$\theta = \tan^{-1}\left(\frac{opp}{adj}\right)$$

↳ inverse tangent

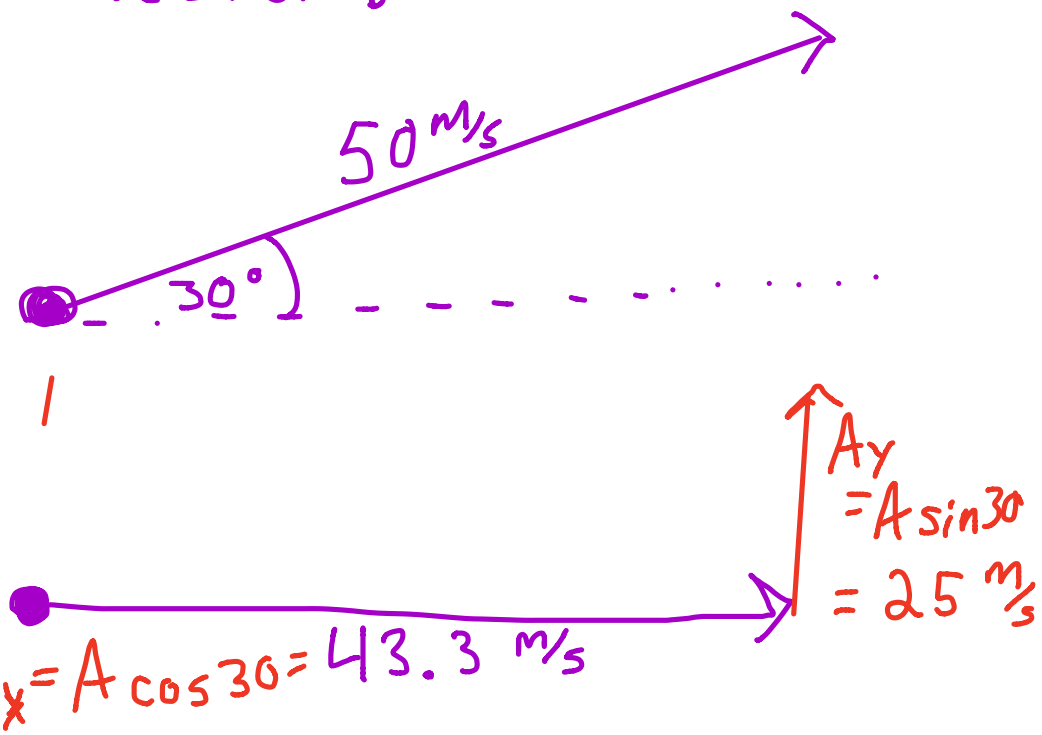
Let's break a vector into its components.



Basically a component is the length of the vector in that dimension.

We always use Sine to find y-components and Cosine to find x-components.

Find the components of this vector:



If we know the x and y components, we can find

the total magnitude and θ.

To add vectors that are $\perp$ use Pythagorean thearem.

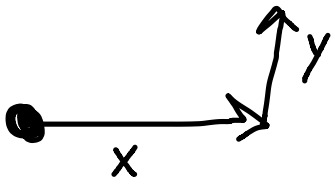
$$R = \sqrt{a^2 + b^2} = \sqrt{43.3^2 + 25^2}$$

$$= 50 \text{ m/s}$$

$$\theta = \tan^{-1}\left(\frac{\text{Y-comp}}{\text{X-comp}}\right) = \tan^{-1}\left(\frac{25}{43.3}\right)$$

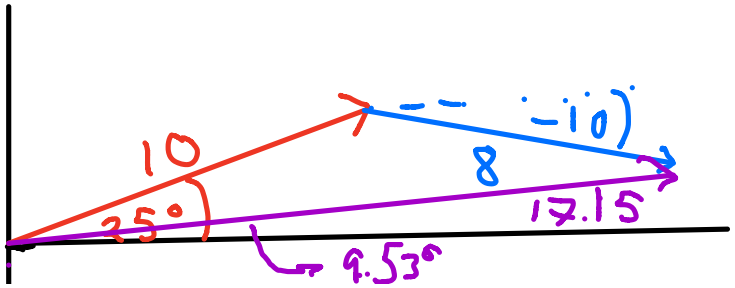
$$= 30°$$

Lets add vectors in 2-D!



use pythagorean theorem

If the vectors aren't $\perp$, we need to find their components, add their components, then use Pythagorean theorem.



$A_x = 10\cos 25 = 9.06$

$A_y = 10\sin 25 = 4.23$

$B_x = 8\cos(-10) = 7.88$

$B_y = 8\sin(-10) = -1.39$

To find the resultant:

$R_x = A_x + B_x = 16.91$

$R_y = A_y + B_y = 2.84$

$$R = \sqrt{R_x^2 + R_y^2} = \sqrt{16.91^2 + 2.84^2}$$

$$= 17.15$$

$$\theta = \tan^{-1}\left(\frac{R_y}{R_x}\right) = \tan^{-1}\left(\frac{2.84}{16.91}\right) = 9.53^\circ$$