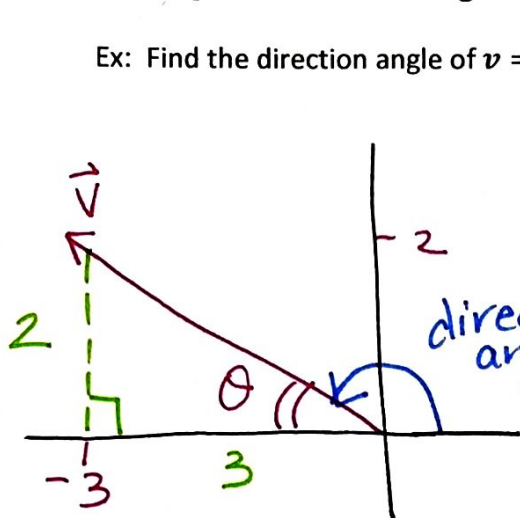


6.3 Vector Combination Using Component Form

Finding the Direction Angle in Standard Position

Ex: Find the direction angle of $v = \langle -3, 2 \rangle$



ccw from positive x-axis

\tan^{-1}

$\tan \theta = \frac{2}{3} \leftarrow |y| \text{ coord.}$

$\leftarrow |x| \text{ coord.}$

$\theta = \tan^{-1}\left(\frac{2}{3}\right)$

$\theta = 33.7^\circ$

Direction $\angle = 180 - 33.7 = 146.3^\circ$

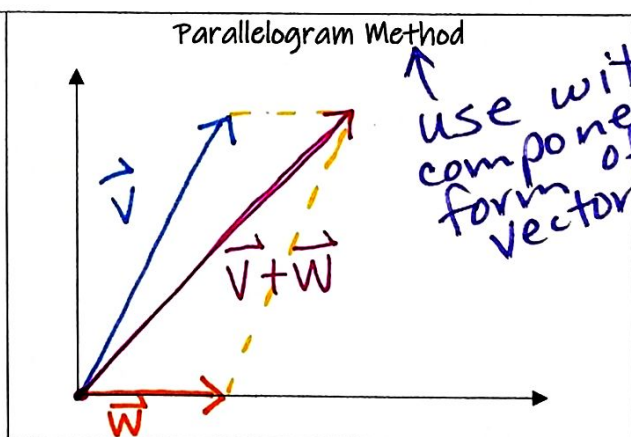
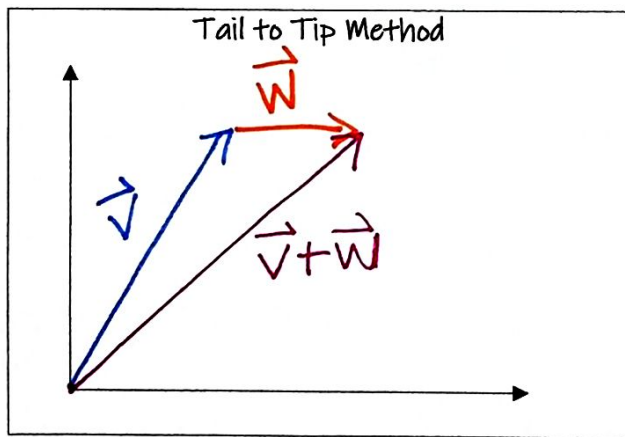
The magnitude of a vector can represent several different quantities, including:

force (Newtons, pounds, kg)
velocity / speed
distance

To combine vectors (forces/velocities)

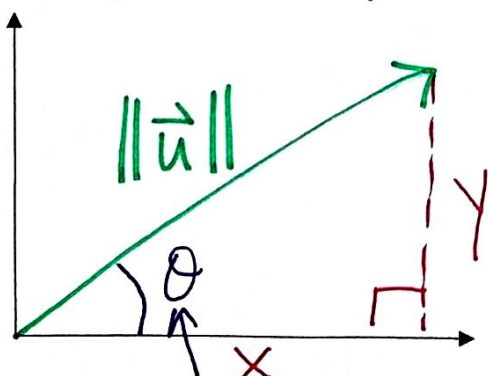
➔ add their components
 $\langle x, y \rangle$

The sum of 2 or more vectors = resultant vector



use with component form of vectors

Writing a vector in component form given magnitude and direction:



$$\cos \theta = \frac{x}{\|\vec{u}\|}$$

$$\sin \theta = \frac{y}{\|\vec{u}\|}$$

$$x = \|\vec{u}\| \cos \theta$$

$$y = \|\vec{u}\| \sin \theta$$

$$\vec{u} = \langle \|\vec{u}\| \cos \theta, \|\vec{u}\| \sin \theta \rangle$$

angle in standard position

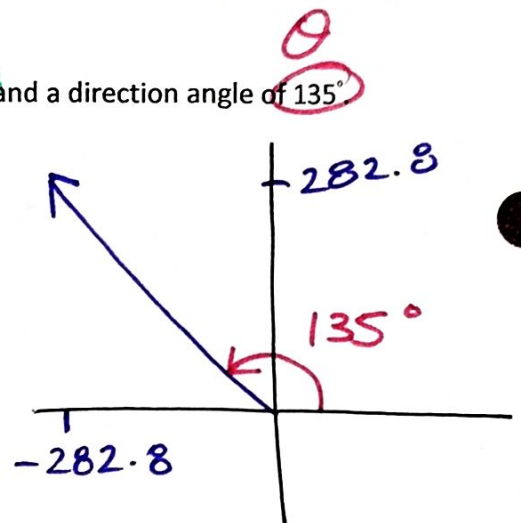
Component Form of a Vector

Ex: Write the component form of vector \vec{v} with magnitude 400 N and a direction angle of 135°

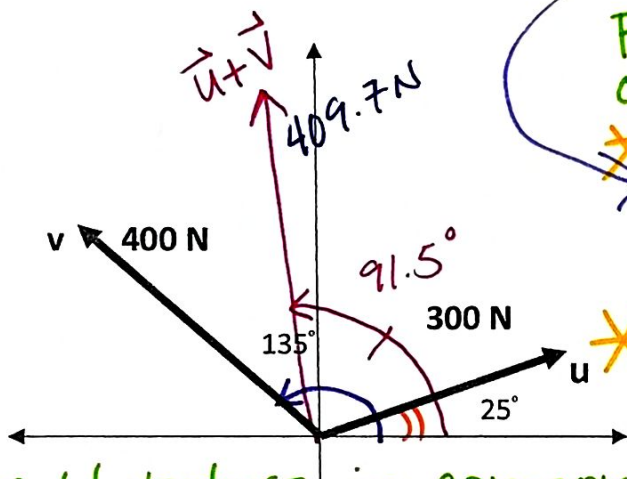
$$\vec{v} = \langle \|\vec{v}\| \cos \theta, \|\vec{v}\| \sin \theta \rangle$$

$$= \langle 400 \cos 135, 400 \sin 135 \rangle$$

$$\vec{v} = \langle -282.8, 282.8 \rangle$$



Ex: Find the resultant force and direction for $\vec{u} + \vec{v}$.



Find the component form of each vector.

$$\vec{v} = \langle -282.8, 282.8 \rangle$$

$$\vec{u} = \langle 300 \cos 25, 300 \sin 25 \rangle$$

$$\vec{u} = \langle 271.9, 126.8 \rangle$$

Add vectors in component form.

$$\vec{u} + \vec{v} = \langle 271.9 + (-282.8), 126.8 + 282.8 \rangle$$

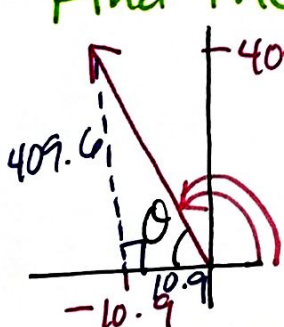
$$\vec{u} + \vec{v} = \langle -10.9, 409.6 \rangle$$

Find the magnitude to find force.

$$\|\vec{u} + \vec{v}\| = \sqrt{(-10.9)^2 + (409.6)^2}$$

$$\|\vec{u} + \vec{v}\| = 409.7\text{ N} \leftarrow \text{Resultant force}$$

Find the direction angle.



$$\tan \theta = \frac{409.6}{10.9}$$

$$\theta = \tan^{-1} \left(\frac{409.6}{10.9} \right)$$

$$\theta = 88.5^\circ$$

Direction Angle
 $180 - 88.5$

$$= 91.5^\circ$$