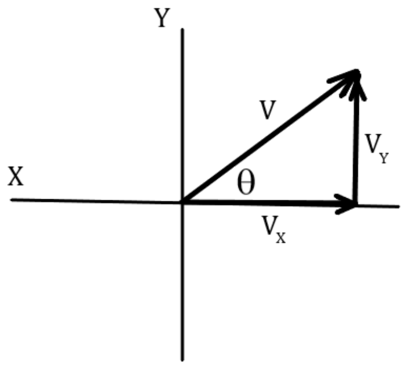
Vector Skills



This vector has a magnitude V and an angle θ.
Finding the X and Y components of a vector is useful.

Remember: SOH CAH TOA

$\sin\theta = \text{opp/hyp}$ $\cos\theta = \text{adj/hyp}$ $\tan\theta = \text{opp/adj}$

For this vector:

$\sin\theta = \text{opp/hyp}$ $\cos\theta = \text{adj/hyp}$

$\sin\theta = V_y/V$ $\cos\theta = V_x/V$

$V_y = V\sin\theta$ $Vx = V\cos\theta$

If you want to find the resultant of the sum of vectors, the "Component Method" of adding vectors is best:

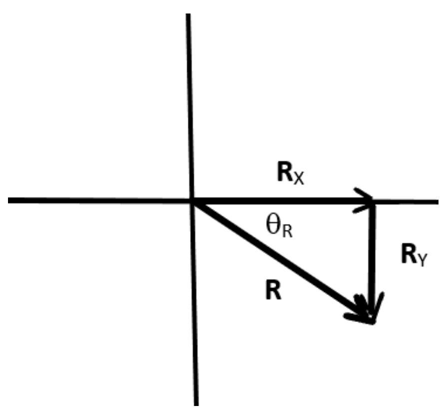
Imagine that you have three vectors (**A**, **B**, **C**) and you want to find the resultant (**R**) of the sum of **A**, **B**, **and C.**
First, break each vector up into its X and Y components. Each vector has its own angle that it makes with the X axis (θ_A, θ_B, θ_C). If the angle has a negative X component, then use the angle that the vector makes with the negative side of the X-axis (this is not the only way to deal with this situation).

If the component is pointing in the positive X, or positive Y direction, then use a positive value for its component when you add the components.
If the component is pointing in the negative X, or negative Y direction, then use a negative value for its component when you add the components.
Add all of the X components together. This gives you the resultant's X component ($\mathbf{R}_X$).
Add all of the Y components together. This gives you the resultant's Y component ($\mathbf{R}_Y$).
(A table is useful for this):

Vector	X components	Y components
A	(+/-) $\mathbf{A} \cos \theta_A$	(+/-) $\mathbf{A} \sin \theta_A$
B	(+/-) $\mathbf{B} \cos \theta_B$	(+/-) $\mathbf{B} \sin \theta_B$
C	(+/-) $\mathbf{C} \cos \theta_C$	(+/-) $\mathbf{C} \sin \theta_C$
R	$\mathbf{R}_X$	$\mathbf{R}_Y$

To get $\mathbf{R}_X$ and $\mathbf{R}_Y$, add the components above them in the table.

It is useful to now draw the resultant vector.



To get the magnitude of the resultant vector, use the Pythagorean theorem:

$$\mathbf{R}^2 = (\mathbf{R}_X)^2 + (\mathbf{R}_Y)^2$$

$$\mathbf{R} = \text{square root of } \mathbf{(}\ (\mathbf{R}_X)^2 + (\mathbf{R}_Y)^2\ \mathbf{)}$$

To get the angle (θ_R), that the resultant vector makes with the X-axis, use the inverse tangent of the opposite /adjacent:

$$\theta_R = \tan^{-1} (|\mathbf{R}_Y| / |\mathbf{R}_X|)$$

$|\mathbf{R}_Y|$ is the absolute value of $\mathbf{R}_Y$
$|\mathbf{R}_X|$ is the absolute value of $\mathbf{R}_X$

Finding (θ_R) this way gives you the angle that the resultant vector makes with the nearest side of the X-axis (the positive side or the negative side).

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