Vector Notes

Definition

Vectors are used to represent various physical ideas / Quantities

All Vectors Have

A vector is defined by TWO quantities
- Magnitude (Size or Strength → Needs units)
- Direction (Where it is pointing) (Angle / Reference)

A vector can move and still be the same vector as long as the magnitude AND direction don't change.

How to Represent Vectors

Vectors are drawn as arrows.

 a vector

Vectors have names. Looks like $\vec{A}$ or **A** for "vector A"

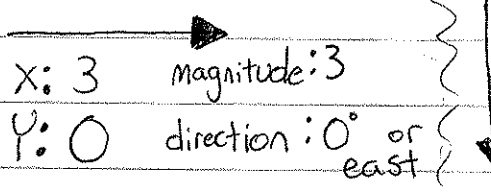
Examples

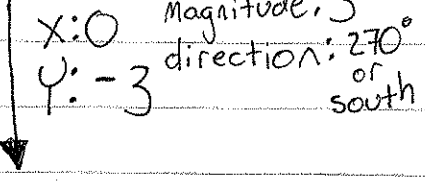
Some things which are vectors:

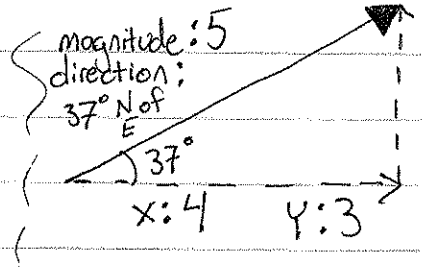
Displacement	Forces
Velocity	Fields
Acceleration	

Components

You want to picture *EVERY* vector on a graphing (X, Y) axis. Each vector has an "X" (horizontal) & "Y" (Vertical) component





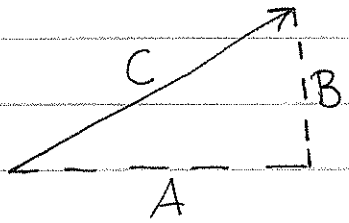


Tools

To use components use triangle tools
- Pythagorean Theorem
- Trigonometry

Pyth.

Pythagorean Theorem: $A^2 + B^2 = C^2$



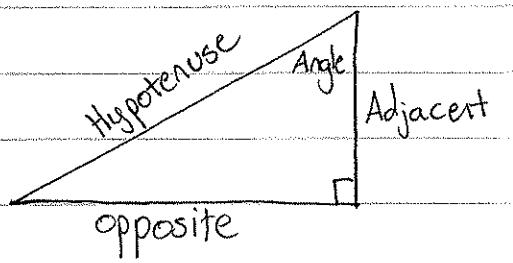
Trigonometry

Trigonometry

sine (of an angle) $= \frac{\text{opposite}}{\text{Hypotenuse}}$

cosine (of an angle) $= \frac{\text{Adjacent}}{\text{Hypotenuse}}$

TANgent (of an angle) $= \frac{\text{Opposite}}{\text{Adjacent}}$

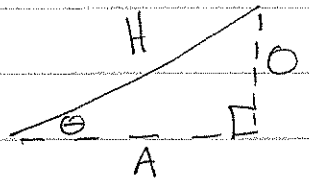


in other words...

SOH - CAH - TOA

$\sin\theta = \frac{O}{H}$ $\cos\theta = \frac{A}{H}$ $TAN\theta = \frac{O}{A}$

can use ~~Trig~~ Algebra to solve for $\sin\theta$, O, or H



Solving for Angles

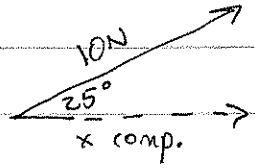
Use $\sin^{-1}$, $\cos^{-1}$, TAN^{-1} to solve for ANGLES

Example

Example: What is the x-component of a 10 N vector directed 25° N of E?

ANSWER:

9.06 N



x comp is ADJACENT to the angle so, since the magnitude is ALWAYS the hypotenuse

$\cos 25^\circ = \frac{x}{10}$

$10\cos 25^\circ = x$

$10(0.906) = x$

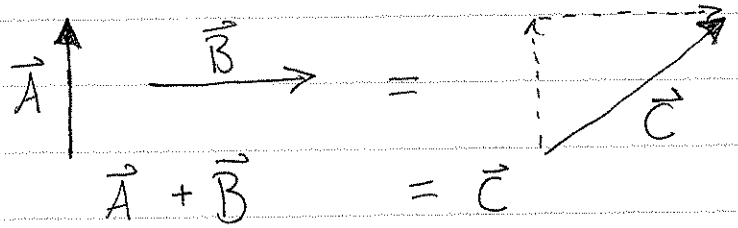
$9.06 = x$

Vector Addition

Terms

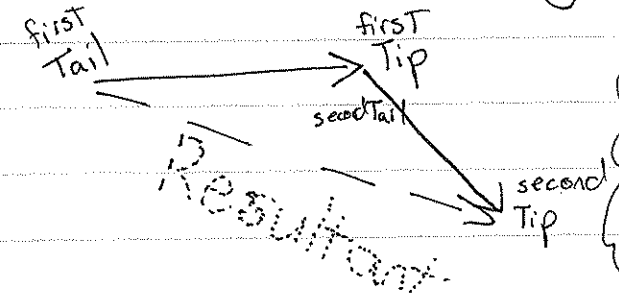
When you add vectors $\vec{A}$ & $\vec{B}$ you get a new vector which is known as the <u>resultant</u>
The RESULTANT is the thing you want!

If you add a vector that points <u>right</u> and a vector that points <u>up</u> your resultant should point <u>up & right</u>. (DUH)



Graphically (Tail to tip)

To add vectors you lay them "Tail to Tip (Head)"



The resultant goes from <u>The first tail</u> to the <u>second tip</u>

Adding with components

To add vectors using components, Break the vectors being added into X & Y components. Add the X components; Add the Y components; What you end up with are the X & Y components of the resultant.

if $\vec{A} + \vec{B} = \vec{C}$

then

$\vec{A}_x + \vec{B}_x = \vec{C}_x$

$\vec{A}_y + \vec{B}_y = \vec{C}_y$