Two different “types” of measurements in science (especially in physics)

 Scalars:

   Examples:

 Vectors:

   Examples:

 Obtaining NET vectors (works for all types of vectors; forces, displacements, velocities, accelerations, etc). This NET vector is also called the RESULTANT.

 Three different scenarios that we see in physics

(a) Co-linear

Tail wind:
(a) Co-linear (continued)

Head wind

Our grid:

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-5 -4 -3 -2 -1 0 1 2 3 4 5
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quadrant II  quadrant I

(-,+)  (+,+)

quadrant III  quadrant IV

(-,-)  (+,-)
(b) Adding Perpendicular ($\perp$) vectors for find the net vector

Combining graphing and trigonometry to

1. Put vectors on grid
2. Pythagorean theorem to find magnitude
3. Arctan($\theta$) to find angle

*(make sure calculator is in degree mode)*

Hypotenuse vector is called the RESULTANT

Practice: A plane moves north at 150 mph and encounters a 50 mph wind from due west. Find the resultant velocity vector (magnitude and direction).

Another practice:

Starting from my house, I walk 100 meters East and then walk 150 meters South. Where is my new position relative to my house?
(c) adding two non-colinear, non-perpendicular vectors:

We’ll get to these shortly after we do vector resolution below…

Vector Resolution…Making two vectors from one (this is opposite of vector addition). The two vectors are called COMPONENTS and represent vectors along the x and y axes.

1. draw vector
2. draw a perpendicular down
3. draw a perpendicular across
4. use cosine and sine to find the components

Practice. You have a plane traveling at 200 mph at 40 N of W (140 degrees). Find the two components of this vector.

Additional practice: You normally run 5 miles on a direct path to your favorite McDonalds. Let’s say that one day, you decide to vary your route by running the legs of the right triangle formed instead. How far do you run now?
Adding two non-colinear, non-perpendicular vectors:

FROM the top of p. 4

We have an object undergoing two velocities vectors (or it can be any other types of vectors such as force, acceleration, displacement, etc.). These two vectors are non-perpendicular and non-colinear.

Let’s say we have a plane moving 200 mph 20 degrees N of W (160 degrees) and a wind pushing the same plane at 50 mph at 40 degrees N of E (40 degrees). Find the Resultant (the one vector made from these two).
Additional Practice:
Here’s another type of problem you might encounter… You take a plane trip to Dallas. Unfortunately for you, it involves three different flights and layovers.
  a) 800 miles due East from Lawrence to Charleston, WV
  b) 900 miles from Charleston, WV to New Orleans, LA (245 degrees)
  c) 500 miles from New Orleans, LA to Dallas, TX (160 degrees)

What is the overall displacement (Lawrence to Dallas)?