How to add vectors on the Ti-89

In general, 2D vectors may be expressed either as a magnitude and direction (mag∠dir) or as rectangular coordinates [x,y]. The easiest way to do this with your calculator is to use the Ti-89's ability to add complex numbers. Complex numbers, like 2D vectors, can be written either in polar form, (r,θ), or component form, a + bi (where a is the real part and b is the imaginary part).

How do you add vectors on the Ti-89?

Suppose you have 5 N at 53.1° and 6 N at -45° with respect to the same axis. To add them together, note that ∠ is just 2^{nd} EE on the keypad, and type in

(5∠53.1)+(6∠-45)

and hit enter. Depending on the mode your calculator is in, you'll either get

(7.24886∠-1.93039)

or

7.24471-.244217·**i**

The first answer gives you the magnitude (7.24886 N) and direction (-1.93° with respect to the axis you've chosen) of the resultant. The second answer gives you the *x*- and *y*-components, 7.2447 N and –0.244217 N, respectively.

How do I change from one mode to another?

Because you're using the Ti-89's facility to add complex numbers, you change:

MODE → Complex Format → Polar gives you the (mag∠dir) format, while

MODE → Complex Format → Real or Rectangular gives you the a+bi format, where a and b are the *x*- and *y*-components

What's the annoying part?

If you are adding 5.0 N at 53.1° west of north and 8.0 N due south, you have to use the same axis to reference your angles to. Then your answer uses the same axis as a reference.

For example, you could use true north as a reference. Then the above problem becomes

$$(5\angle -53.1) + (8\angle 180)$$

with the result

$$(6.4005\angle -141.339)$$

and your final answer would be 6.4 N at 51.3° south of west.

Alternatively, you could use standard position:

$$(5\angle 143.1)+(8\angle -90)$$

to get

$$(6.4005\angle -128.661)$$

but when you convert that to a compass heading, you'll notice that the result is still 6.4 N at 51.3° south of west.

So, the actual axis you use doesn't matter, but must be **consistent** and your answer must be in the same coordinate system as the original problem.