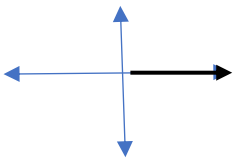
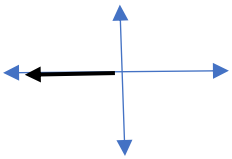
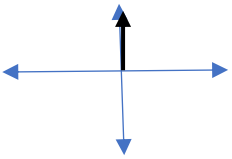
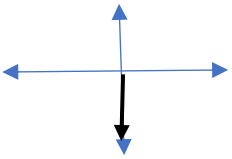
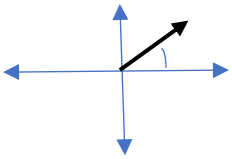
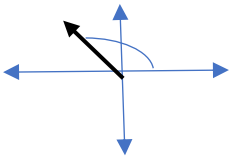
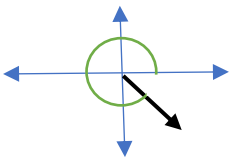
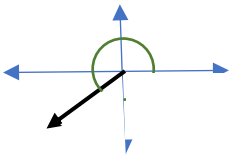
WILLIAM D. LAW, JR. LEARNING COMMONS

Vector Interpretations

Basic directional vectors are always of the form <horizontal change, vertical change>, or (x component, y component>. Keep in mind east is in the x direction, west is the -x direction, north is in the y direction and south is the -y direction.

Examples of moving 5 miles in each direction:

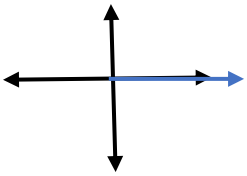
Direction	Graph	Vector Set-up
East 5→		<5,0>
West 5 →		<-5,0>
North 5 →		<0,5>
South 5 →		<0,-5>
Northeast 5 →		<5cos(45°), 5sin(45°)>
Northwest 5 →		<5cos(135°), 5sin(135°)>
Southeast 5 →		<5cos(315°), 5sin(315°)>
Southwest 5 →		<5cos(225°), 5sin(225°)>

Example:
You start at home and take a morning walk. You follow the path of:

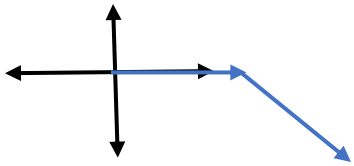
1) 5 miles east 2) 10 miles southeast 3) 3 miles south 4) 2 miles southwest

Let's draw the picture and break each step into components.

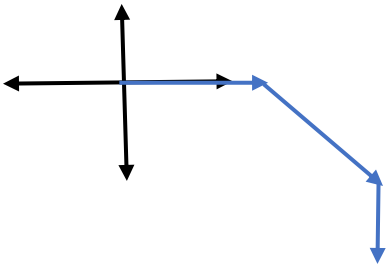
1) 5 miles east



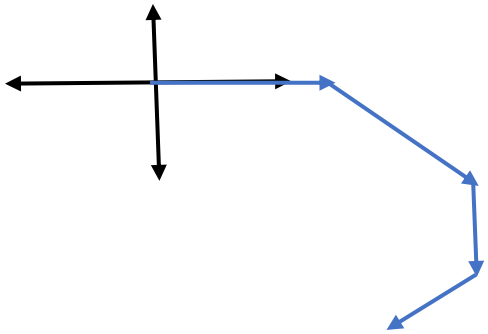
2) 10 miles southeast



3) 3 miles south



4) 2 miles southwest



a) How far did you walk: 5 + 10 + 3 + 2 = 20 miles
b) Displacement vector: see calculations in chart. Result: <10.657, -11.485>

	Horizontal component(x)	Vertical component(y)
5 miles east	5	0
10 miles southeast	10cos(315°)	10sin(315°)
3 miles south	0	-3
2 miles southwest	2cos(225°)	2sin(225°)
resultant	**10.657**	**-11.485**

c) Magnitude: $\sqrt{(10.657)^2 + (-11.485)^2}$= 15.67 miles from home if you walk back on a straight line.
d) What direction should you head to get back home? Angle comes from the resultant vector: $tan^{-1}\left(\frac{-11.485}{10.657}\right) = -47^o$.
This is our reference angle since $\frac{-\pi}{2} < x < \frac{\pi}{2}$. Since you are in the southeast quadrant you can see that you would have to head home at a northwest heading. Thus, your heading should be NW 43° since our heading is measured from the N/S line.