

Studying for the Vector Quiz.

1. Make sure that you understand that vectors describe quantities that have both a magnitude and direction. Examples include position, displacement, velocity, acceleration, and force.
2. Make sure you understand that there are three ways to represent any vector quantity:
 - a. Arrows (a scale drawing)
 - b. Components
 - c. Magnitude and Direction
3. Be able to convert from one representation to the other two representations.
 - a. Study the worksheet "From Magnitude and Direction to Components and From Components to Magnitude and Direction."
4. Be able to add two or more vectors graphically.
 - a. Draw the first vector to scale using your protractor and a ruler.
 - b. Place the tail of the second vector at the new origin (at the tip of the first vector.) Draw the second vector to scale.
 - c. Continue drawing vectors until all vectors are drawn.
 - d. The resultant vector goes from the tail of the first vector to the tip of the last vector. Draw the resultant vector and then measure it with a ruler and protractor.
5. Be able to add two or more vectors analytically.
 - a. Break each vector into its x and y components (using trig)
 - b. Make sure that all x and y components have appropriate positive and negative signs.
 - c. Add all x components together to find the net X.
 - d. Add all y components together to find the net Y.
 - e. Use the X and the Y to draw a new vector, the resultant vector.
 - f. Use the Pythagorean theorem and \tan^{-1} to calculate the magnitude and direction of the resultant vector.

Vector skills checklist

- Draw vectors as arrows, and include the arrowhead, to remind you of direction
- Measure angles counterclockwise from positive x-axis (if measured clockwise, it is a negative angle).
- Or, give a reference direction (25° N of W). This means start at West, and go 25° North from there
- Recognize the sign of each component (x and y) by drawing the vector accurately

Graphical addition of vectors:

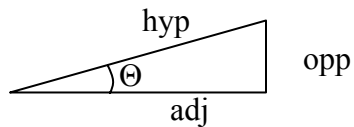
- Draw each vector to scale, using protractor and ruler
- Start each vector from the tip of the previous vector. (tip-to-tail method)
- Resultant is the vector which connects the tail of the first vector to the tip of the last one.
- Measure this one again with ruler and protractor

Analytical addition of vectors:

- Break each individual vector into components
- Add all the X components together, and all the Y components together.
- You get $(\Sigma x, \Sigma y)$. This is your resultant vector, in components
- Change back to Polar notation for your final answer.

Changing polar to components

- If you always measure angles from the horizontal, the following will always be true



- $a = \text{hyp} \cos\Theta$
- $o = \text{hyp} \sin\Theta$

Changing components to polar

- Resultant magnitude: $R = \sqrt{\Sigma X^2 + \Sigma Y^2}$
- Angle $\Theta = \tan^{-1}\left(\frac{y}{x}\right)$