

Component Addition – More Practice

Every vector can be resolved into a pair of components which when combined are equivalent to the original vector. As such, the addition of two or more vectors can be accomplished by merely adding the components of all the individual vectors. This process is illustrated in the question #1 below. Note that the process involves the following steps:

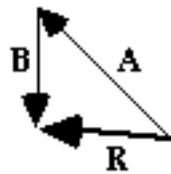
- i. Sketch a vector addition diagram (as an estimate).
- ii. Create a table to resolve the given vectors into components.
- iii. Add all components to determine the components of the resultant (**R**).
- iv. Use the Pythagorean theorem to determine the magnitude of the resultant (**R**).
- v. Use a trigonometric function to determine the direction of the resultant (**R**).

Consider the following five displacement vectors. Perform the indicated vector operations to determine the resultant.

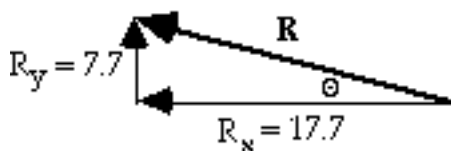
Vector	Magnitude (miles)	Direction (°)
A	25	45° N of W
B	10	South
C	20	30° E of S
D	35	15° S of W
E	15	30° N of E

1. $A + B = ???$

Graphical Estimate:



Vector	x-comp	y-comp
A	$25 \cos 135^\circ = -17.7 \text{ mi}$	$25 \sin 135^\circ = 17.7 \text{ mi}$
B	0 mi	-10 mi
R	-17.7 mi	7.7 mi



$$R = \sqrt{(7.7)^2 + (17.7)^2} = 19.3 \text{ mi}$$

$$\theta = \tan^{-1}(7.7 / 17.7) = 23.5^\circ \text{ N of W}$$

2. $B + C = ???$

3. $\mathbf{A} + \mathbf{B} + \mathbf{C} = ???$

4. $\mathbf{B} + \mathbf{D} + \mathbf{E} = ???$

5. $\mathbf{C} - \mathbf{A} = ???$

6. $\mathbf{E} - \mathbf{B} = ???$