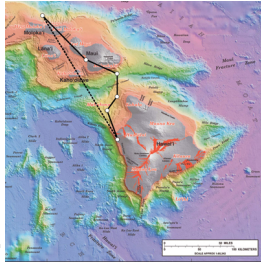


4.2 Vector Addition: Motion Problems

4.2 I can add and subtract vectors graphically.

4.3 I can add and subtract vectors using the component method.



$\langle x, y, z \rangle$

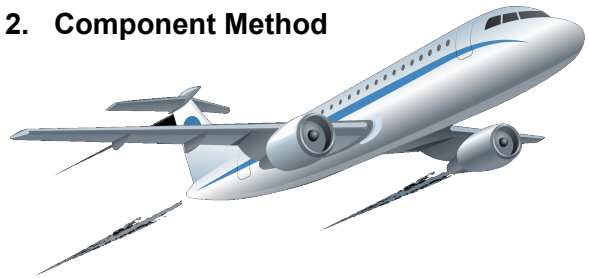
Every vector can be broken into 2 components

To add vectors graphically, we use the head-to-tail technique.



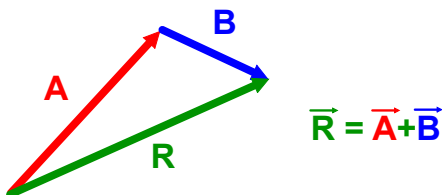
2 Methods of Adding Vectors

1. Graphical Method
 - « Head-to-Tail Addition
2. Component Method



Graphical Method: Head-to-Tail Addition

Adding vectors graphically: Place the tail of the second at the head of the first. The sum points from the tail of the first to the head of the last.



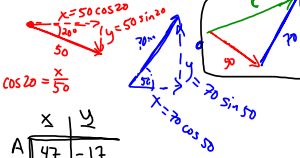
Component Method

Adding Vectors Using Components:

1. Find the components of each vector to be added.
2. Add the x- and y-components separately.
3. Find the resultant vector.

Adding Vectors

A vector A has a magnitude of 50.0 m and points in a direction 20.0° below the positive x axis. A second vector B has a magnitude of 70.0 m and points in a direction 50.0° above the positive x axis. (a) Sketch the vectors A, B, and C = A + B. (b) Find the magnitude and direction of vector C.



	x	y
A	47	-17
B	45	54
C	92	37

$$C = \sqrt{92^2 + 37^2} = 99 \text{ m}$$

$$\theta = \tan^{-1}\left(\frac{37}{92}\right) = 22^\circ$$

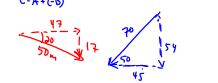
above +x axis

Subtracting Vectors

The negative of a vector is represented by an arrow of the same length as the original vector, but pointing in the opposite direction.

Adding Vectors

A vector A has a magnitude of 50.0 m and points in a direction 20.0° below the positive x axis. A second vector B has a magnitude of 70.0 m and points in a direction 50.0° above the positive x axis. (a) Sketch the vectors A, B, and C = A - B. (b) Find the magnitude and direction of vector C.



	x	y
A	47	-17
B	45	54
C	2	-71

$$C = \sqrt{2^2 + 71^2}$$

$$\theta = \tan^{-1}\left(\frac{71}{2}\right) = 88^\circ$$

below +x axis

Treasure Map



	x	y
A	0	5
B	3	0
C	2.8	-2.8
D	5.8	2.2

$$\Delta x = \sqrt{5.8^2 + 2.2^2} = 6.2 \text{ paces}$$

$$\theta = \tan^{-1}\left(\frac{2.2}{5.8}\right) = 21^\circ \text{ N of E}$$

HOMework
4.2 Problems (1-4)