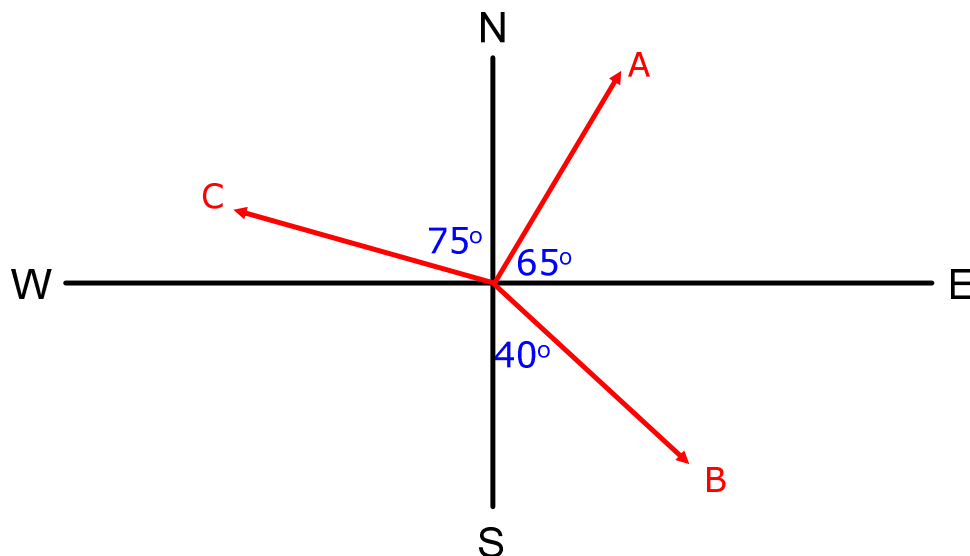


**PHYSICS****ADDING VECTORS IN 2-D (At an Angle)**

Not all vectors lie along the N,S,E,W lines. Some vectors are at an angle between these compass lines. *Ex [N20°E]*



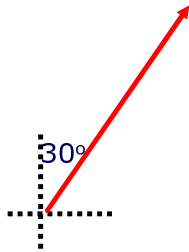
**NOTE:** North and South are the "Primary Directions". All directions should start with either North or South.

Ex: [N20°E] is preferred to [E70°N]

**PHYSICS****ADDING VECTORS IN 2-D (At an Angle)**Reducing an Angled Vector into its Components

In order to add angled vectors we will break them down into their more familiar components with trigonometry.

Ex: Reduce the vector 10 km [N30°E] into its components.

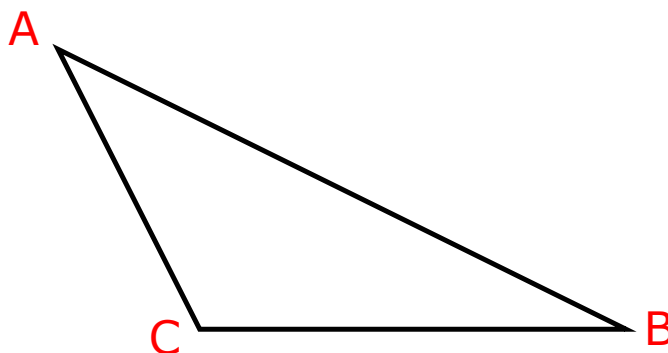


Now that the vector has been reduced, we can add them up like we did in previous lessons.

**PHYSICS****ADDING VECTORS IN 2-D (At an Angle)**Sine and Cosine Law

In order to add angled vectors that will produce a non-right angled triangle, we can use Sine and Cosine Law

**Recall:**



Find  $c$  and  $A$  in the above triangle given the following conditions:

$$a = 10$$

$$b = 20$$

$$C = 120^\circ$$

**PHYSICS****ADDING VECTORS IN 2-D (At an Angle)**

Ex: A person walks 15 km [N40°E] then turns to walk 5 km [E].  
Find the resultant displacement.

Ex: A person walks 20 km [S35°W] then turns to walk  
10 km [N15°W]. Find the resultant displacement.

**PHYSICS****HOMEWORK**ADDING VECTORS in 2D

1. One day, Erica and her sister leave from the dock in front of their cottage and travel 0.65 km [E] and then 0.45 km [S] where they stop by a big rock surrounded by water. What was their resultant displacement?
  
2. Mr. Caslick's physics class is going to Cedar Point for a day of physics fun. To get there, they travelled 205 km [S] to the 401 and then 56 km [W] and finally, 22 km [N]. What was their resultant displacement?
  
3. One day, the Vice Principal was walking around the school looking for potential troublemakers. She walks 30 m [W] down the math hallway, 40 m [N] and passes by the office on her way towards the library. Then she makes a right and walks 20 m [E] towards the gym. What is her resultant displacement?
  
4. Shawn and Aliesha are hiking with their geography class. They hike, 550 m [W], then 630 m [W 40° N]. What is their resultant displacement?
  
5. An airplane, on its way to Mexico for March break, flies 2000 km due South and then turns and flies another 1750 km [S 30° W] in 4 hours.
  - a. What is the distance travelled?
  - b. What is the resultant displacement?
  - c. What is the speed of the plane?
  - d. What is the velocity of the plane?