Addition and Resolution of Vector Components

Content

Every vector can be divided into two parts or components. We consider the vector as the hypotenuse (longest side) of a right-angle triangle. The x-component, horizontal, and the y-component, vertical, are then calculated using trigonometry. Likewise, the x-component and the y-component can be combined which is called the resultant vector.

x-component

y-component

Example

Kylie goes for a walk on a sunny day. She stats by walking East for 50m then turns left and walks North for 120m. What is her final displacement from her starting position?

* To solve this, we will first draw a diagram of Kylie’s path:

Finish

Final displacement: c= ?m m

b=120m

a=50m

Start

* Now it is clear to see we only need Pythagoras’ Theorem to calculate the magnitude of her displacement:
* So Kylie is 130m away from where she started her walk.

Since we have her distance from the starting point we now just need to calculate , the
angle, so we can determine her direction. We will use the ratio.

So Kylie is displaced 130 meters in a direction 67 East of North from where she stared.

Example

A plane flew from Sydney to Melbourne in a direct line. The distance between Sydney and Melbourne is 729km and the direction of Melbourne from Sydney is 55 West of South. What is the final displacement in x and the final displacement in y of the plane in metres?

* Again, first step is to draw a diagram of the problem, converting all km to m.

Melbourne

Sydney

Displacement: 729, 000m

Displacement in y= ?m

Displacement in x= ?m

55

* Now we can use the trigonometric identities to calculate the x and y components. Lets start with the x component:

So the plane is roughly displaced left in the x-direction, or the x-component of the displacement is .

* We repeat this process to calculate the y-component:
* So the plane is roughly displaced 418km downwards in the y-direction, or the y-component of the displacement is -418km.