Physics 20 Chapter 2 - Vectors

Adding Non-Right Angle Vectors & Vector Problems

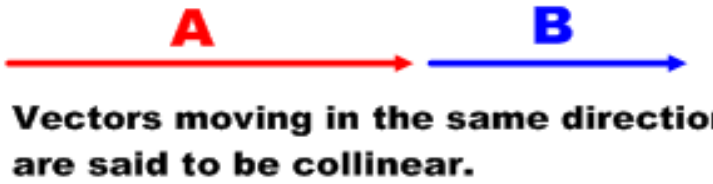
Review: Vector Resultants and Components

ex) Joel ran 5.26 m directly left and then forward 1.27 m What was Joel's resultant displacement?

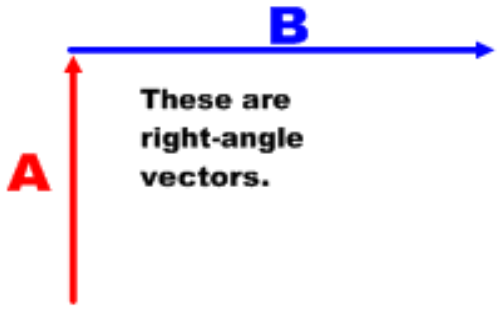
ex) While playing basketball, Mr.P streaks for the basket at an angle of 60° N of W and with a speed of 4.30 m/s. What are the components of Mr.P's velocity?

Non-right Angle Vectors

Up until now, we've only looked at adding vectors which were perpendicular or parallel to one another:

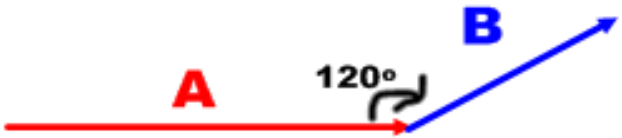


Vectors moving in the same direction are said to be collinear.



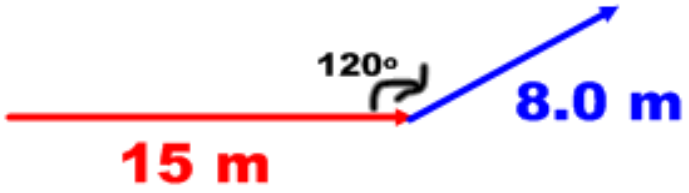
These are right-angle vectors.

But what about non-right angle vectors (also called non-collinear vectors)?

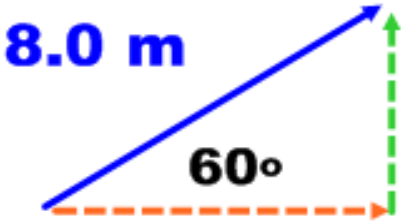


We can add vectors such as this in one of two ways...

Method 1: Using Trig Ratios



Step 1: Break each vector into its x and y components.



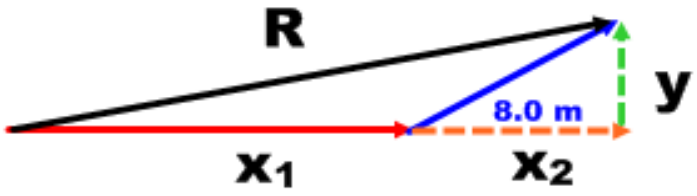
Step 2: Add the vectors going in the x and y direction.

x_{tot} =

y_{tot} =

Step 3: Using the new x and y components, find the new resultant.

Step 4: Redraw the diagram.



Note how the vector components make a grand ol' triangle!

Practice:

ex) Mr.P walked a pet pot-bellied pig for a distance of 6.4 m 30° S of E. He then stopped and walked 1.5 m 23° W of S. What was his resultant distance?

Vector Problems

Now let's have some fun!!!

ex) A swimmer whose swimming velocity in still water is 1.50 m/s travels north across a river. The river current is flowing 2.0 m/s East. What is the resultant velocity of the swimmer?

ex) A canoe is paddling across a stream which is 25 m wide. The stream has a current of 3.2 m/s East. If the canoe paddles directly North with a velocity of 4.0 m/s, how far downstream will it end up?

Secret Canoe Thing

Draw two diagrams, one for velocity and one for displacement. The angle is the same in both diagrams.

ex) Augustous Gloop wants to swim across a river of chocolate to a point directly North across from his starting point.

a) If Augustous can swim at 20 m/s and the river has a current of 1.5 m/s West, what direction must he start off at?

b) If the river is 6.75 m wide, how long will it take until Augustous crosses the river?