Introduction to Vectors Assignment

Alpine Academy Geometry

Due March 3, 2017

Vectors are useful tools that are generally applied to science and engineering fields to represent physical phenomena. Unlike the quantities we are used to dealing with in algebra and geometry which are just numbers, vector quantities have both a magnitude and a direction.

1. To begin, check out this link for some introductory notes on vectors: <http://mathinsight.org/vector_introduction>

Take some notes (which you will hand in). You only need to write down the information you think is most important. I will highlight the fact that adding vector is most relevant for the applications we have seen in the trigonometry unit so far. To add vectors, we must position them head-to-tail, and we can add them by breaking them into horizontal and vertical components.

1. Next, check out this video to learn about how we break vectors into components: <https://www.khanacademy.org/math/precalculus/vectors-precalc/vector-basic/v/example-finding-components-of-a-vector>
2. Complete the following problems:
   1. Hector is walking his dog (Fido) around the neighborhood. Upon arriving at Fidella's house (a friend of Fido's), Fido turns part mule and refuses to continue on the walk. Hector yanks on the chain with a 67.0 N force at an angle of 30.0° above the horizontal. Determine the horizontal and vertical components of the tension force.
   2. Jerome and Michael, linebackers for South’s varsity football team, delivered a big hit to the halfback in last weekend’s game. Striking the halfback simultaneously from different directions with the following forces:

FJerome = 1230 N at 53°

FMichael = 1450 at 107°

Determine the resultant force applied by Jerome and Michael to the halfback. (The directions of the two forces are stated as counter-clockwise angles of rotation with East.)

NOTE: If you get stuck on these problems, come see Mrs. Anderson, or check out the resources available at <http://www.physicsclassroom.com/calcpad/vecforce/problems>

1. Finally, we can revisit two examples that use trigonometry with vectors.
   1. While floating down a river with a 2.75 mi/h current, Alicia decides  
      to swim directly toward the river bank. She can swim 0.75 mi/h in still water. What is the actual speed at which she moves toward the bank? At what angle will she approach the bank, measured with respect to the bank?

NOTE: For the next two problems, you can use two different methods to solve them. You can either break the vectors into components, or use the Law of Sines and Law of Cosines once you draw out your vector diagram.

* 1. Poland’s world champion rower Monika Kowalska is in a stream flowing north to south at 3 km/h. She is rowing northeast at a rate of 4.5 km/h. At what speed is she moving? In which direction (bearing) is she actually moving?
  2. Giovanni is flying his Cessna airplane on a heading as shown. His instrument panel shows an air speed of 130 mi/h. (Air speed is the speed in still air without wind.) However, there is a 20 mi/h crosswind. What is the resulting speed of the plane?