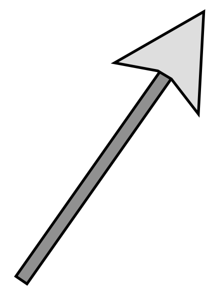
Math Review -- Conceptual Questions

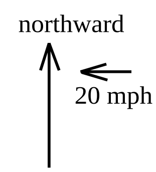
1.) Is three plus four always equal to seven? Explain.

2.) You're bored. You find yourself casually perusing the math book your parents keep for guests on their living room table (. . . hey, it could happen . . .). You come across a spectacularly intriguing vector in the book. You're not doing much, so you decide to call your friend, Hilda, to let her know about this amazing vector you've just met. She gets excited and, being the pushy sort, wants to know more about the vector. Where's it from? How big is it? What's it look like? There are two fairly standard ways you could describe your vector so that Hilda could recreate it for herself. *For each approach*, what information would you have to provide for her to do so?

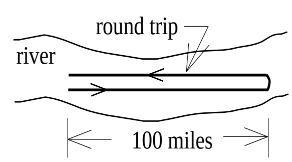


3.) Why is it easy to add vectors in *unit vector notation* and not generally easy to add vectors in *polar notation*?

4.) You are flying an airplane. There is a 20 mph breeze blowing to the west. What information do you need to determine the direction you must nose your plane if its resultant motion is to be directly northward, and with that information, how could you solve the problem?



5.) You're in a motorboat. On flat (stationary) water, the boat's maximum speed is v_o. The river you are traveling on flows with speed $v_o/2$. You have to travel 100 miles up the river and 100 miles back down to your start position. If you made the round trip on flat water, it would take t hours to do the round trip. On this river, the round trip will take: (a) the same, (b) more, or (c) less time? Explain.



6.) You are given the *dot product* and *cross product* for the same two vectors. What clever thing could you do to determine the angle between the two vectors?

7.) You are given the *cross product* between a known vector $\boldsymbol{A}$ and a vector $\boldsymbol{B}$ whose magnitude you know but whose direction you don't know. From this, what can you tell about the direction of the unknown vector? Explain.

8.) You are told that the *cross product* between two vectors is zero. What do you know about the two vectors?

9.) What does the direction of a *cross product* tell you?

10.) What is *always* true about the direction of a *cross product*?

11.) What does a *cross product* really do for you?

12.) You are told the *dot product* between two vectors is zero. What do you know about the two vectors?

13.) What does a *dot product* really do for you?

14.) Why would you laugh in the face (ha ha) of someone who asked what the direction of a *dot product* tells you?

15.) Can a dot product be negative? If so, what would a negative *dot product* mean?

16.) You can dot a vector into the results of a *cross product*, but you can't cross a vector into the results of a *dot product*. Why not?

17.) You decide to convert vector ***A*** from unit vector notation to polar notation. You use your calculator to do the deed and you get a magnitude and an angle. Are you sure the magnitude and angle you get from your calculator are appropriate for the vector you are trying to characterize?

18.) What's wrong with the notation $\mathbf{A} = -3 \angle 25^o$?

19.) In converting from polar notation to unit vector notation, the expression $\mathbf{A} = A\cos\theta\,\mathbf{i} + A\sin\theta\,\mathbf{j}$, where θ is the angle between the *+x axis* and the vector, works just fine. What's wrong with using it?

20.) Assume you have a vector characterized in unit vector notation. You want to create a second vector that is equal to *minus* that first vector. How would you do that? If, instead, the original vector had been characterized in polar notation, how would you do that?