Physics Name_____

How do you get there from here? - a vector problem

To be sure to arrive at the right place a pilot must know how the wind will affect a flight. The Slide Flight Computer allows the pilot to quickly determine any necessary course corrections needed for the flight. The Slide Computer does a vector calculation for the pilot. In this exercise you will learn how to use the Slide Computer to determine the true heading and ground speed of the plane. In the process you will see how the wind affects the flight and how manipulation of vectors helps the pilot to plan a flight.

The first flight will be from Stevens Point to Superior. Our plane has a true air speed of 140 miles per hour (mph). The true course heading with no wind is 320°. The wind is from the west, 265°, at 35 mph.

Step 1. Rotate the inner ring of the computer until the wind direction, 265, is under the true index arrowhead.

Step 2. Set the center dot on one of the darker circles. Any of the darker circles will work, but to follow our sample problem use the 100 line.

Step 3. Put a small, light pencil dot on the plastic screen, 35 units, the wind speed, up from the center dot. For this problem the dot would be at 135.

Step 4. Rotate the ring until the true course heading, 320, is under the true index arrowhead.

Step 5. Move the slide card until the dot you drew is on the true air speed line, in this problem 140 mph.

Step 6. The ground speed is under the center dot. For our example the actual ground speed is 117 mph. This is the speed the pilot uses to calculate flight time. It is also used to determine the amount of fuel needed for the flight.

Step 7. The wind correction angle is marked by the pencil dot. The angle is the number of the degrees the pencil mark is to the left or right of the centerline. If the dot is to the left, as in this example, the value is subtracted from the true course heading. If the dot is to the right the correction factor is added to the true course heading. For this example the dot is 12° to the left. The actual course heading is 12° less than the true course heading, or 308°.

To reach Superior our pilot would leave Stevens Point at a heading of 308°. The wind will blow the plane so it follows the true course of 320° needed to arrive in Superior. Since the plane is heading generally into the wind the speed is reduced from an air speed of 140 mph, to an actual ground speed of 116 mph. If Superior is 250 miles from Stevens Point, it will take 250 miles/117 mph, or 2.15 hours, 2 hours and about 9 minutes, for the flight. If the plane does not arrive within the allotted time frame the FAA will start to search for the plane!! You can see it is important to be able to complete these calculations correctly. Since wind speeds vary with altitude, the pilot will complete the calculations at several altitudes to determine the best and most economical flight plan.

Step 8. *Erase* the lightly drawn pencil dot.

Complete the following four problems using the slide computer. Fill in the chart to show the "flight plans" for each problem.

Table for problems 1-4.

Information	Problem 1	Problem 2	Problem 3	Problem 4
True course heading	124 degrees	295 degrees	37 degrees	216 degrees
Distance	427 miles	375 miles	298 miles	338 miles
Wind speed	28 mph	32 mph	47 mph	24 mph
Wind direction	112 degrees	195 degrees	210 degrees	312 degrees
True air speed	145 mph	210 mph	175 mph	160 mph
Ground speed				
Wind correction angle (L or R)				
[redacted] course heading Corrected				
Flight time				

Vector sketch: