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RUTGERS MARINE & COASTAL SCIENCES c.o.o.l. classroom

Step 3: Outside Influences
E.1) Wind Speed and Direction Activity

Ocean scientists not only need to know the direction of the wind - they need to know how fast the wind is moving, too. For instance, the speed of the wind can have a large impact on the currents in the ocean. Now that you are an expert at calculating the wind direction, let's learn how to plot the both the direction *and* speed of the wind.

Look at the Wind Speed & Direction Worksheet. The table at the top of the page contains a set of data about the wind over a six-day period. The first column shows the day the data was collected, the second column shows the wind speed in miles per hour, and the third column shows the direction in degrees that the wind is coming **from** each day. The fourth column will be used to record the direction in degrees that the wind is moving **towards** each day, which is the direction that will be graphed.

Now look at the blank graph on the worksheet below the table. The Y-axis shows a scale for the wind speed, and the X-axis shows time in days. Using a protractor, plot the data in the table onto the blank graph by following these steps:

1. Locate the zero mark on the Y-axis of the graph (hint: it is **not** at the bottom left corner).
2. Use the ruler on the protractor to measure the distance between zero and one of the 5's on the Y-axis. The distance you measure between the zero and 5 is equal to 5mph, and will be used as a scale to know how long to make the arrows for each day to show wind speed. Write down the following equation on your worksheet: 5mph = Z inches (Z = the distance between

Here is an example of how to use your distance scale to calculate the length of an arrow for wind speed:

If the wind speed for a certain day is 15 mph, and the distance you measured between zero and 5mph equals 0.5 inches, then you would draw an arrow that was 3 x 0.5 inches, or 1.5 inches.

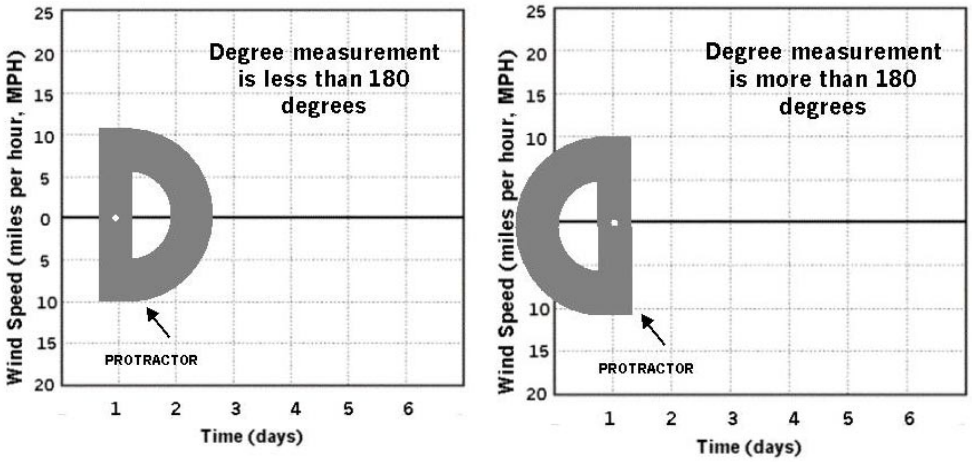
5 mph	=	0.5 inches
x 3		x 3
15 mph		1.5 inches

You would then draw an arrow 1.5 inches long for that day in whatever direction the wind was blowing.

Note: Unless the wind direction is exactly north or south (zero or 180 degrees), any arrow you draw to show wind speed will not reach all the way to the corresponding line on the Y-axis. For example, if the 15 mph wind has a direction of 225 degrees, then the arrow will fall short of reaching the 15 mph line on the Y-axis. Even though the wind speed is 15mph, and the arrow is the correct length, it doesn't reach the 15mph line because it is on an angle.

zero and one of the 5's on the Y-axis)

3. Use the scale to calculate the length of the arrow needed for the wind speed on Day 1 (see the example to the right).
4. Look at the wind direction measurement in the third column of the table for Day 1. Remember that this is the compass direction in degrees that the wind is coming **from**, and we need to graph the direction that the wind is moving **towards**. You will need to either add or subtract 180 degrees from this number to get the degree of direction that the wind is moving **towards** (see the instructions in the previous **Plotting Wind Direction** section). Once you have made the calculation, write the answer in the fourth column of the table for Day 1.
5. Find the point where the line for Day 1 from the X-axis intersects the zero line from the Y-axis. Place the center hole located on the zero degree line of the protractor on this point with the zero degree mark on the protractor pointing directly north, and the 180 degree mark on the protractor pointing directly south.
6. If you are using a full circle protractor, skip to Step 7. If you are using a semicircular protractor, choose one of the following steps:
   - If the degree of direction you calculated in Step 4 is less than 180, the curved part of the protractor should face towards the right side of the page (see illustration on left below).
   - If the degree of direction is more than 180, the curved part of the protractor should face towards the left side of the page (see illustration on right below). You will need to subtract 180 from the measured degree of direction, and use the answer to know how many degrees past the 180 mark on the protractor you need to go. (for example, 225 – 180 = 45, so you would need to measure 45 degrees past the 180 mark on the protractor as the curved side faces to the left on the page)



7. With your pencil, mark the location of the center hole at the base of the protractor, and then mark the graph where the protractor reads the degree measurement you calculated in Step 4.

8. Lift the protractor, and use the straight edge at the bottom or middle of it to line up the two points. Starting from the zero line on the Y-axis, draw a line between the two points the same length that you calculated in Step 3.
9. You should now have an arrow whose length matches the number you calculated in Step 3, and whose direction matches the degrees you calculated in Step 4.
10. Repeat Steps 3-8 with the data for Days 2-6.

Hypothesize about what the weather was like each day shown on the graph. Write your ideas in your notebook.
Describe how winds might affect the movement of ocean water.