Lesson 2: Wave Speed and Wind Height on Lake Superior

Target Audience: Intro to Algebra (grades 9-12)

Time Required: 1 class period (50 minutes)

Lesson Overview: Students will gather data (wave height and wind speed) from one of MTU’s collection buoys on Lake Superior. They will then use this data to complete a chart, create a scatter-plot, and answer questions regarding the data they collected. The purpose of this lesson is to provide students with an opportunity to practice their data collection skills and graphing in a real world situation.

Sources Consulted:
Roblee, R. Stephen, Captain R/V Agassiz. Navigation activities both on the Agassiz and in the classroom, Mathematics & Navigation Teacher Institute, Summer 2011


Materials Needed:
Computer
Pencil/Paper

New Vocabulary:
Buoy – anchored float used for marking a position on the water as well as hazards in boating
Knot – unit of speed equal to one nautical mile/hour
Nautical Mile (nm) – one minute of latitude; approx. 6076 ft; 1.15 statute miles

Focus Question: Does wind speed have an effect on wave height in Lake Superior and if so, what is the relationship?

Learning Objectives: Students will be able to
1. collect data from a chart on a reputable website
2. complete a chart and create a graph using data collected
3. answer questions based on the data collected
Michigan Standards Addressed:
L1.2.4 – Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media.
A2.1.1 – Recognize whether a relationship (given in contextual, symbolic, tabular, or graphical form) is a function; and identify its domain and range.
A2.3.1 – Identify a function as a member of a family of functions based on its symbolic or graphical representation; recognize that different families of functions have different asymptotic behavior at infinity, and describe these behaviors.
A2.4.1 – Identify the family of function best suited for modeling a given real-world situation.
A2.4.2 – Adapt the general symbolic form of a function to one that fits the specifications of a given situation by using the information to replace arbitrary constants and with numbers.
A2.4.3 – Using the adapted general symbolic form, draw reasonable conclusions about the situation being modeled.

Classroom Activities:
1. Students will break into groups, with each group needed a computer and a copy of the Wind Speed and Wave Height on Lake Superior (included).
2. Students will be provided with the website for MTU’s data collection buoys which are located at the upper and lower entrances to the Keweenaw Waterway.
3. Students will be shown how to check data on this website, including where to find the wave height and wind speed at a particular time on a particular date for one of the two buoys.
4. Each student group will be given a particular time as well as a particular set of dates for which they need to collect the wave height and wind speed for the South Keweenaw Peninsula buoy (42025). This data will be gathered and recorded.
5. Students will then take the data they have collected to create a scatter-plot of points. Students will have to label their axes and determine how to scale their axes.
6. Students will then answer questions based on the data they collected and the graph they have created.

Assessment:
See Wind Speed and Wave Height on Lake Superior (below)
Wind Speed and Wave Height on Lake Superior

Data Time: ____________  Data Dates: ________________

South Keweenaw Peninsula Buoy (42025)
http://uglos.engin.umich.edu/station_page.php?station=45025

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<th>Date (mm/dd)</th>
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<tbody>
<tr>
<td>Wave Height (meters)</td>
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<tr>
<td>Wind Speed (knots)</td>
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Which of the following makes sense and why?
   a. Wave height helps determine wind speed.
   b. Wind speed helps determine wave height.

What could cause error in the data collected by the buoy?

What do you think would happen if the wind was blowing at 50 knots?

Based on the information above, when you go to graph your data what should go on the x-axis? What should go on the y-axis? Why?
Use the grid below to create a graph of the data you collected in your table. Make sure your graph has a title, labels on the x-axis, labels on the y-axis, and shows the scale you used for each axis.