Lesson Overview: The goal of this lesson is to teach students how to plot a course. This lesson connects to many concepts in the current Geometry curriculum, including measurement, the distance formula and unit conversion.

Sources Consulted: The resources used to develop this lesson plan include notes and materials from the Mathematics & Navigation Teacher Institute. I also consulted the Navigation Education Materials found on The Institute of Navigation website (http://www.ion.org/satdiv/education.cfm) and the Great Lakes Maritime Transportation (http://wupcenter.mtu.edu/education/great_lakes_maritime/resources.htm).

Materials Needed: charts of West Grand Traverse Bay #14913 (10), rulers (10), GPS units (10), rolling plotters (10), spreaders (10)

New Vocabulary (definitions from dictionary.com):
Heading – the compass direction toward which a traveler or vehicle is or should be moving; course.

Focus Question: How would you determine the distance and course between two places while traveling on a boat?

Learning Objectives: After completing this lesson, students will be able to plot a course on a nautical chart, determine the heading using the nautical chart and a rolling plotter, find the distance using a spreader, and determine the time of the trip using the distance formula. Students will also use unit conversion.

State Benchmarks Addressed:
A1.2.1 – Write equations and inequalities with one or two variables to represent mathematical or applied situations, and solve.
L2.3.1 – Convert units of measurement within and between systems; explain how arithmetic operations on measurement affect units, and carry units through calculations correctly.

Classroom or Field Activities:
After introducing the lesson with the focus question and learning objectives, the day before the sail, the teacher will demonstrate how to plot a course, calculate a heading, and find the distance and time for the trip. The next day, the students will travel to West Grand Traverse Bay for a trip on the Tall Ship Manitou (http://www.tallshipsailing.com/). The Manitou as described on their website is “. . . a replica of an 1800’s “coasting” cargo schooner, similar to those that sailed the Great Lakes and the Atlantic Ocean. Specifically designed for passenger service, her hull was constructed in Portsmouth, New Hampshire in 1983 and finished by Vermont carpenters on Lake Champlain. With a 62 passenger
capacity, there is plenty of space for sitting and moving around the decks while under sail. Her overall length of 114 feet, beam of 21 feet, and displacement of nearly 100 tons ensures a comfortable, relaxing motion.

Before leaving shore, the students will plot a course from the Tall Ship Pier to the green buoy (GC”7”) located near Marion/Power Island. The students will then plot a course from this buoy to the green buoy (GC”1”) located near the entrance of Bowers Harbor. For both of these courses, students will calculate the heading and distance and also calculate the time to travel to each buoy. Each group will have a nautical chart of West Grand Traverse Bay, a rolling plotter, a spreader and a ruler.

Assessment:

Assessment will be done informally during the voyage. Students will be asked to justify their measurements. A consensus heading will be agreed upon. Groups will compete to see who has the most accurate distance and time estimates. Groups will be graded upon the accuracy of their predictions.