Hurricane Katrina

Date:_____

Subject: Science
Grade: 6-7
Time: 30 minutes

Topic: Reading Graphs
Designer: Sara Remsen

Stage 1 – Desired Results

Lesson Overview: This activity is intended to teach students to identify the maxima and minima of graphs and interpret their meaning. It is not difficult to *identify* such extrema (in other words, to pick out the "highest" and "lowest" points on a graph) and most likely none of your students will have difficulty with this part of the goal. Interpreting the meaning of these special points on a graph is more difficult, however, and this activity approaches the task by having students compare maxima and minima on several different graphs and relate them to a real world "story."

Standards Addressed:

CCSS.Math.Content.6.NS.C.8	Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
CCSS.Math.Content.6.EE.C.9	Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.
CCSS.Math.Content.7.RP.A.2	Recognize and represent proportional relationships between quantities.

Students will be able to:
- Read graph axes
- Interpret real events that take place over time
- Match graphs to the story
- Identify *and* interpret maxima and minima

Essential Questions:

- What is the meaning of a maximum or minimum value?
- How can identifying a maximum or minimum value provide more information about a story?
- How can we recognize maxima and minima for different variables?

Stage 2 – Lesson Plan

Lesson preparation

- Students should learn about weather and have some basic knowledge of hurricanes. It might help to relate Hurricane Katrina to the more recent Hurricane Sandy and ask how the students and their families were affected. They could also learn the characteristics of a Category 1, 2, 3, 4, or 5 hurricane.
- Students should learn about wind speed and barometric pressure, both of which are included in the activity. This is also a good time to learn about measuring and collecting weather data with thermometers, barometers, etc.
- Students should be able to read graph axes
- Students should be familiar with plotting points on a graph and with ordered pairs i.e. (0,0).
- No knowledge of slope is necessary

Procedure

1. Students will use computers/tablets for this activity (20-30 minutes)

2. As an extension, you can print out the graphs on the last two pages of this lesson plan. These graphs are similar but not identical to the graphs the students saw on the computer activity. The questions from the activity are also listed. (10-20 minutes)

3. Then, you can continue the activity by breaking students up into small groups and having them go over their answers with each other, or writing up a group answer sheet using the questions.

4. You can continue the discussion by asking students to make comparisons between the graphs and describe how they change relative to the behavior of the hurricane.

5. You can check out the NOAA National Hurricane Center (though it is hard to interpret information on the website): http://www.nhc.noaa.gov/

6. There is another (20-30 minutes) activity from NASA about climate change and hurricanes here: http://www.nasa.gov/pdf/450118main_Katrina_Student.pdf

7. You can also have the students relate what they know about Hurricane Katrina to what they know about Hurricane Sandy and discuss how we measure the "impact" of each Hurricane (although Hurricane Sandy turned into a tropical cyclone and differed in a few ways): http://cityroom.blogs.nytimes.com/2012/11/27/hurricane-sandy-vs-hurricane-katrina/?_r=0

8. You can also have students read news articles about Hurricane Katrina and discuss the ways people were affected and the relief effort that followed: http://topics.nytimes.com/top/reference/timestopics/subjects/h/hurricane_katrina/index.html

Further discussion questions

1. **How would you describe each graph? What do you notice about the graphs on August 26 at 12pm? What about August 31 at 12:00am.** Students should observe that as barometric pressure goes down, wind speed goes up, and vice versa. They should be able to read off data for the specific dates given.

2. **What do you think is the average wind speed in your town? How does that compare**

to the wind speeds of Hurricane Katrina?

Normal average wind speeds are usually between 5-10 mph, MUCH less than the winds during Hurricane Katrina. You can look up your town's current wind speed at http://www.wunderground.com/

3. **Ask students to explain why a hurricane slows down after hitting land (they should have learned this from the activity—e.g., see pages 5 and 9 of the activity).**

A hurricane slows because it is propelled by warm, moist air—this is why hurricanes form over tropical oceans, which are constantly evaporating. When a hurricane moves over warm, moist air, it gathers speed and strength. When it hits land—where there is usually cooler, drier air—it slows down and eventually dissipates.

4. **Given #3, ask students to explain which states are affected by hurricanes the most.**

Students should identify the states closest to water, and specifically closest to the tropics. This includes Florida, Louisiana, Georgia, South Carolina, North Carolina and other states all the way up the East Coast.
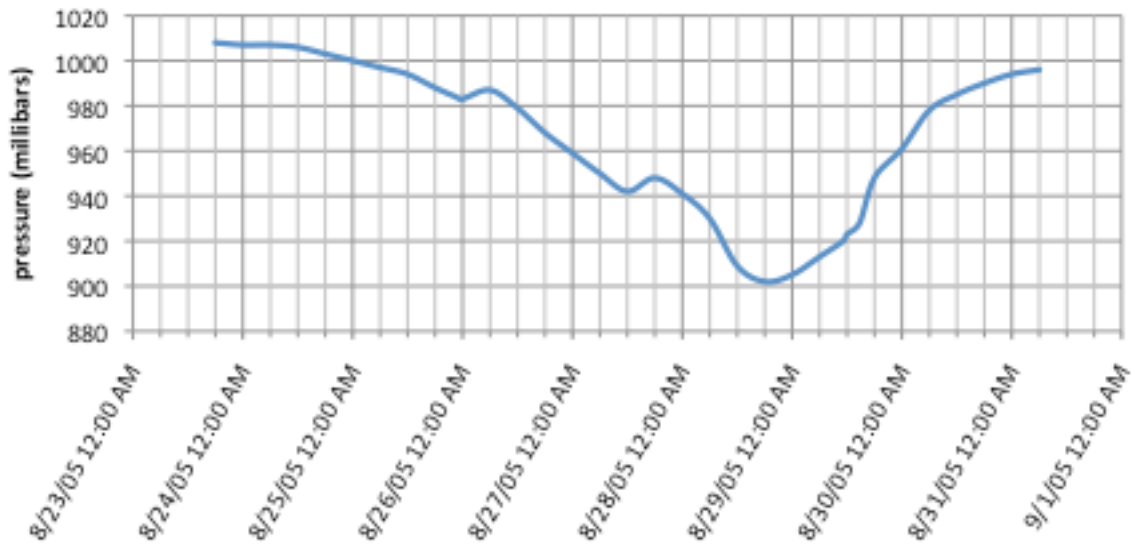
5. **Ask students to explain what variables scientists monitor to determine the "category" of a hurricane.**

Students should be able to look at the graphs and pick out the variables—wind speed is the determining factor. The hurricane category scale is used to give an estimate of the potential property damage and flooding expected along the coast from a hurricane landfall. However, storm surge values are highly dependent on the slope of the continental shelf in the landfall region. This is why the Jersey Shore was so badly affected by Sandy.
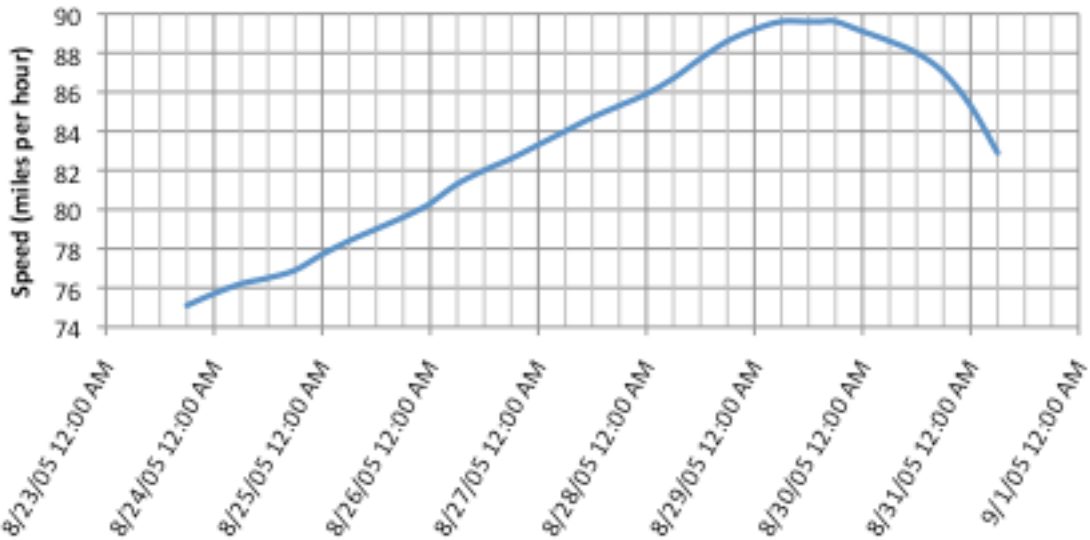
Resource Graphs and Questions

1. When did Katrina hit New Orleans?

2. What was the wind speed at that time?

3. When was the barometric pressure lowest?

4. Did the maximum wind speed coincide with the time when the hurricane was over New Orleans? If not, which came first?

5. Did the moment of maximum wind speed coincide with the barometric pressure minimum? If not, which came first?

Barometric pressure at center

Wind speed

Distance from New Orleans