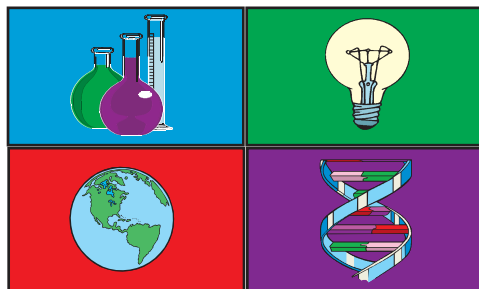# Science TODAY™
Student Edition
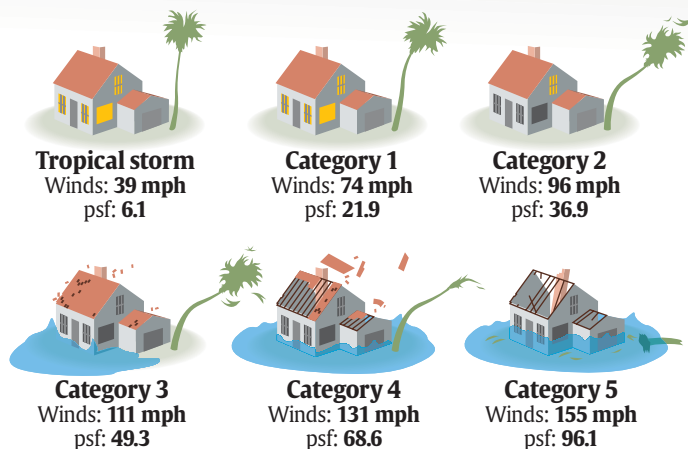
USA TODAY

NO. 1 IN THE USA

Hurricane damage zooms as wind speeds increase

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Damage levels from Hurricane Ivan correlate mainly to wind speed. For example a wind speed increase from a 74 mph Category 1 storm to a 111 mph Category 3 more than doubles the wind's force. Increasing wind speeds also create higher storm surge, which is water a hurricane pushes ashore.

Category wind speeds and pounds per square foot (psf) of wind pressure:

Tropical storm
Winds: **39 mph**
psf: **6.1**

Category 1
Winds: **74 mph**
psf: **21.9**

Category 2
Winds: **96 mph**
psf: **36.9**

Category 3
Winds: **111 mph**
psf: **49.3**

Category 4
Winds: **131 mph**
psf: **68.6**

Category 5
Winds: **155 mph**
psf: **96.1**

Note: Based on the formula in C. Donald Ahrens, *Meteorology Today:* Wind speed in miles per hour multiplied by itself and then by 0.004 gives wind's pressure in pounds per square foot. Figures are rounded to one decimal point.

Source: USA TODAY research

By Alejandro Gonzalez, USA TODAY

Focus Questions:

- How are tropical storms and hurricanes categorized?

- What is the mathematical relationship between wind speed and the destructive force of hurricanes?

- Based on a mathematical model, what would be the destructive force of storms with wind speeds that are not included in the data set?

Activity Overview:

The USA TODAY Infograph, "Hurricane damage zooms as wind speeds increase," provides data on the destructive forces of various categories of storms. An understanding of the power of nature can be gained from examining this data. You will develop an appreciation for why tropical storms and hurricanes can be so devastating when they make landfall, and why thousands of people evacuate their homes and cities when a severe storm approaches from the ocean.

To help you comprehend these amazing weather phenomena, you will explore questions such as: How do meteorologists categorize tropical storms and hurricanes? What is the relationship between the speed of the wind and the force the wind exerts? Can a person predict the potential damage from a tropical storm or hurricane by knowing the wind speed? In this activity, you will graph and analyze the characteristics of these tropical events.

This activity was created for use with Texas Instruments handheld technology.

Hurricane damage zooms as wind speeds increase

Procedure:

Step 1
Examine the USA TODAY Infograph, "Hurricane damage zooms as wind speeds increase," and enter the data in your graphing calculator. In L1, enter the category of the various storms. Use a "0" for the tropical storm, and 1-5 for the hurricane categories.

Step 2
In L2, enter the wind speeds for each storm category. For example, enter "39" in L2 adjacent to the "0" in L1, and so on. Note: The winds listed are the minimum wind speeds for each category of storm.

Step 3
Move your cursor to the heading of L3, making sure that L3 is highlighted. Key in the formula L2² x .004, then press ENTER. You should now have a list of data in L3. These values represent the pounds per square foot (psf) for their corresponding wind speeds.

Step 4
Create a scatterplot for the data. Plot L2 on the X-axis and L3 on the Y-axis.

Step 5
Press WINDOW and set the appropriate values for the X (independent) variable and for the Y (dependent) variable.

Step 6
Press GRAPH and describe the trend you see in the graph of your data.

Step 7
Use the calculator to create a power regression model.

Data Source:

USA TODAY research

Materials:

- TI-83 Plus family or TI-84 Plus family

Additional Information:

- USA TODAY.com

  ww.usatoday.com/weather/hurricane/whscale.htm

Hurricane damage zooms as wind speeds increase

Assessment and Evaluation:

1. In this activity, what were you asked to plot as the independent variable?

   _____

2. What were you asked to plot as the dependent variable?

   _____

3. Describe the shape of the graph after you have created a power regression model and graphed it.

   _____

4. Is there a constant slope for your graph? Explain your answer.

   _____

5. What would be the force of the wind in psf if the wind speed were 100 miles per hour?

   _____

6. What would be the force of the wind in psf if the wind speed were 200 miles per hour?

   _____

7. Compare the forces of the wind at 100 and 200 miles per hour. The wind speed has doubled. How much has the force increased?

   _____

Student Notes: