

Heat Watch



Weather agency looks into heat warnings

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USA TODAY

The National Weather Service begins testing today on a system of heat-stress advisories to provide earlier warnings for people vulnerable to heat and humidity. The system has three categories:

- ▶ Heat watch, when heat-stress conditions are expected in the next 24 to 48 hours.
- ▶ Heat advisory, when higher levels of discomfort are expected within 24 hours.

▶ Excessive heat warning, when the danger requires such steps as seeking air-conditioned buildings, drinking extra water and avoiding outdoor activities.

The tests are being conducted in Louisiana, Arkansas, Mississippi and Tennessee. Officials said it could be expanded nationally. The weather service will continue to use the heat index, a number based on a combination of temperature and humidity. Alerts are triggered when the index is likely to reach 105 degrees by day and 80 at night over 48 hours.

Activity 1: Make a scatter plot for air temperatures from 70°F through 140°F and the corresponding heat index levels at 0% relative humidity.

- Enter the data from USA TODAY's "Humidity makes air feel hotter" in two lists, L1 and L2.
- Press $\boxed{2nd} \boxed{Y=}$ and adjust the settings for a scatter plot.
- Press \boxed{WINDOW} and set the appropriate window values for your data.
- Press \boxed{GRAPH}
- Look at your graph on the handheld and describe the relationship between the data points. Which type of equation (model) do you think would best fit the graph? Try the following equations when making your decision.
 - Linear equation: $y = ax + b$
 - Quadratic: $y = ax^2 + bx + c$
 - Cubic: $y = ax^3 + bx^2 + c$
- When you have decided which model would best represent the data, use the TI handheld to determine the regression model and record your result.

- Now answer the question:
What is the air temperature at 0% relative humidity when the heat index is 105°F?

Data Source:

National Oceanic and Atmospheric Administration

Materials:

- TI-83 Plus Silver Edition or TI-83 Plus

Additional Information:

NOAA

- National Oceanic and Atmospheric Administration (www.noaa.gov)

USA TODAY.com

- USA TODAY Weather (<http://asp.usatoday.com/weather/weatherfront.aspx>)

Heat Watch

Activity 2: Create a scatter plot for air temperatures from 70°F through 110°F and the corresponding heat index levels for those temperatures at 50% relative humidity.

- Enter the data from USA TODAY's "Humidity makes air feel hotter" in two lists, L3 and L4.

- Follow the same procedure as in Activity 1 to create the scatter plot and the regression model. Record your regression model.

- What is the air temperature when the relative humidity is 50% and the heat index is 105°F?

- What is the minimum air temperature when the Extreme danger category is reached if the relative humidity is 50%?

Activity 3: Create a scatter plot for air temperatures from 70°F through 85°F and the corresponding heat index levels for those temperatures at 100% relative humidity.

- Follow the same procedure from Activity 1 to create the scatter plot and the regression model. Record your regression model below.

- If the relative humidity is 100% and the heat index is 105°F, what is the air temperature?

Activity 4: Write a summary of your observations from Activities 1-3 about the relationship between heat index, air temperature and relative humidity levels.

Student Notes:

Heat Watch

Activity 5: Make a scatter plot of relative humidity levels from 0% through 100% and heat index values for those relative humidity levels at 85°F air temperature.

- Use the same procedure as above to create the plot. When you look at the plot of the data there are two different pieces that form the plot. You need to choose the data points for each piece and create two distinct mathematical models.
- Describe this plot using a piecewise function to join the two distinct mathematical models.
- Press $\boxed{Y=}$ and enter your piecewise function.
- Remember to change your window for the data and press $\boxed{\text{GRAPH}}$.

Student Presentation with TI InterActive!™

Activity 1

- Open a TI InterActive! document and title the page **Heat Watch**. Include your name and date.
- Click on List  to open the Data Editor and enter the data for air temperatures from 70°F through 140°F and the corresponding heat index values at 0% relative humidity.
- Double click on **L1** and change the name to **air_temp**. Double click on **L2** and change the name to **heat_index**.
- Click on **air_temp** and while holding the control key on the keyboard click on **heat_index**. Click on **Data** in the top toolbar and choose **Plot Data**. This will create a scatter plot of heat index vs. air temperature.
- Select the Save to Document icon  in the Graph window.
- Click the Save to Document icon  in the Data Editor window.
- Double click on the graph and select Format . Click on the Labels tab in the Format window and title your graph. Include labels for the horizontal and vertical axes.
- Click on OK and the Save to Document .
- Double click on the lists. Click on **air_temp** and while holding the control key on the keyboard click on **heat_index**. Select **Stat Calculation Tool**  and choose the Calculation Type as **Linear Regression (ax + b)**. Change the name of the regression equation to **f(x)**. Click on **Calculate**. Title the equation **air temp-heat index**. Click on Save Results to paste the results into your document. Remember to save the list of the data and the scatter plot to your TI InterActive! document. Also make sure that the lists and the equation are pasted in the document *before* the graph, so that those components will appear in the graph.

Student Notes:

When using TI InterActive! you can change the font and color that you are using when labeling graphs.

Right click on any object that you save to your document and select floating with text around. This will allow you to move the object around in the document.

Copy the focus questions to your document and then answer each question after you have completed the data entry and regression models. Having all parts of the problem (data, graph and answers) together will help support your findings.

Heat Watch

- Double click the graph and in the Function window choose the $f(x)$ tab. Enter $f(x)$ in the open space. Click the small box at the far left where you entered $f(x)$. Click Save to Document in the Graph window. How well does your equation fit the data?

- Double click your graph and in the Function Window choose $f(x)$ tab. Now enter 105 in the next open space and click the small box. To find the intersection choose  and calculate. What is the air temperature at 0% humidity when the heat index is 105°F?

- Click the Show Label box, press Copy, then press Calculate again. Note that the point of intersection is now labeled. Now save this TI InterActive! document to a folder or print your results.

Activity 2

- Open a new TI InterActive! document and use the same directions as above to create a report on the following questions.

What is the air temperature at 50% humidity when the heat index is 105°F?

What is the air temperature at 50% humidity when the heat index is 105°F? If the relative humidity is 100% and the heat index is 105°F what is the air temperature?

Write a summary of your observations from Activities 1 and 2 about air temperature, heat index and relative humidity. Use the suggested Internet resources for additional information about this topic.

Student Notes:

Find articles related to temperature and the heat index in USA TODAY and include this information in your summary document.