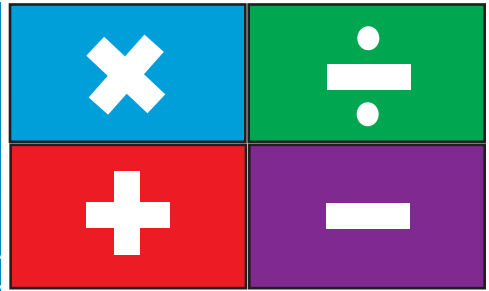


Math TODAY™ Student Edition



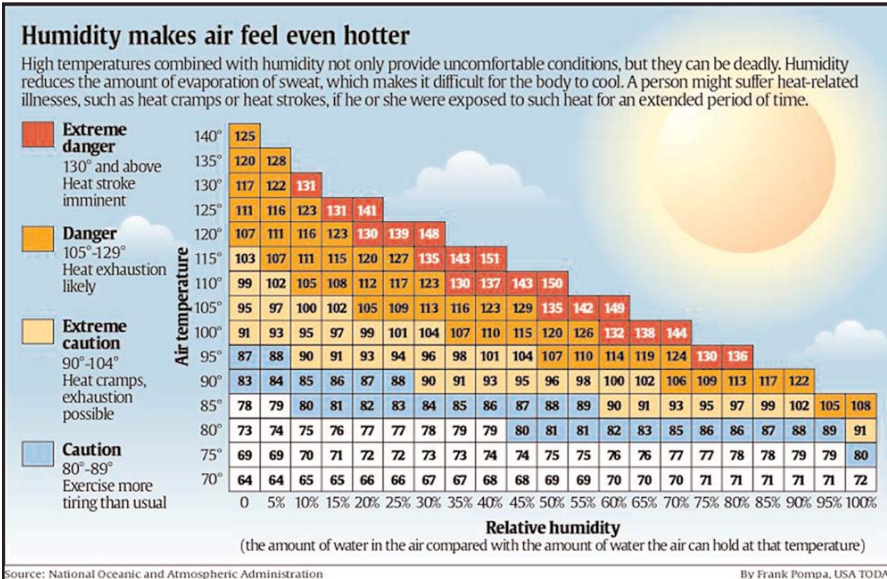
NO. 1 IN THE USA



Humidity makes air feel even hotter

Focus Questions:

- Why does 85°F feel hotter in Florida than 95°F feels in Arizona?
- How is the heat index calculated?
- At what temperatures and humidity levels can people no longer function?



Activity Overview:

In this activity you will analyze the data in the USA TODAY Infograph "Humidity makes air feel even hotter." You will note the range of heat indexes for the overall data as well as specific humidity levels and air temperatures. You will find the mean and median of the ranges. Given the formula for calculating the heat index, you will calculate apparent temperature for specific scenarios using the store feature of your handheld with a specified air temperature and humidity level.

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

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Procedure:

Activity 1

Step 1:

Carefully review the USA TODAY Infograph.

Step 2:

Note the maximum and minimum apparent temperatures and the range of temperatures for each actual air temperature (in the chart below).

Actual Air Temperature	Maximum Heat Index	Minimum Heat Index	Range of Heat Indexes
140°			
135°			
130°			
125°			
120°			
115°			
110°			
105°			
100°			
95°			
90°			
85°			
80°			
75°			
70°			

Data Source:

National Oceanic and Atmospheric Administration

Materials:

- TI-73 family, TI-83 Plus family or TI-84 Plus family

Additional Information:

- Tf - air temperature in Fahrenheit°
- AI - apparent temperature (Another name for the heat index.)
- RH - relative humidity
- In order for the Heat Index (Apparent Temperature) formula to work correctly, you must use the relative humidity in percent form. For example, if the relative humidity is **65%**, use **65** for RH in the formula, **not** 0.65.
- The \wedge is used for exponents on the handheld.
- Parenthesis with no operation is implied multiplication.
- The formula for the Heat Index is:

$$HI = -42.379 + 2.04901523 (Tf) + 10.14333127(RH) - 0.22475541(Tf) (RH) - 6.83783 \times 10^{-3}(Tf)^2 - 5.481717 \times 10^{-2} (RH)^2 + 1.22874 \times 10^{-3}(Tf)^2 (RH) + 8.5282 \times 10^{-4} (Tf) (RH)^2 - 1.99 \times 10^{-6}(Tf)^2 (RH)^2$$

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Activity 2

Step 1:

The formula to calculate the apparent temperature is long and cumbersome. It will help to use the handheld instead of performing the calculation by hand.

Step 2:

Start by storing all of the numbers from the formula. Carefully enter each number on the home screen of your handheld as written.

-42.379	Store in A
2.04901523	Store in B
10.14333127	Store in C
-0.22475541	Store in D
-6.83783x10 ⁻³	Store in E
-5.481717x10 ⁻²	Store in F
1.22874x10 ⁻³	Store in G
8.5282x10 ⁻⁴	Store in H
-1.99x10 ⁻⁶	Store in I

Step 3:

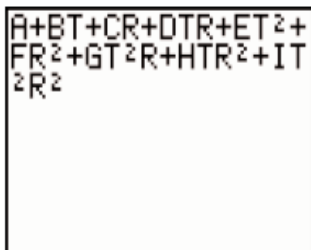
Store your air temperature in T and your relative humidity in R. Suppose there is a temperature of 90° Fahrenheit and relative humidity of 65%. Remember store 90 in T and 65 in R.

Step 4:

The Heat Index can now be calculated as follows (let the handheld do all of the work and type in the formula as written.):

$$A + BT + CR + DTR + ET^2 + FR^2 + GT^2R + HTR^2 + IT^2R^2$$

Your handheld screen should look something like this:



Step 5:

If you round your answer to three decimal places, you should get 102.678. Verify your answer on the graphic. Note: Your answer is one degree different than that of the graphic due to rounding.

Step 6:

In order to re-use your formula, store new values for T and R and hit 2nd enter on your handheld until the formula reappears. Then hit enter to find the heat index for your chosen values. You are now ready to complete the Assessment and Evaluation sheet.

Student Notes

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Assessment and Evaluation:

Activity 1

Q. What are the maximum and minimum heat indexes in the USA TODAY Infograph? What is the range of the data in the Infograph?

A. Max: _____ Min: _____ Range: _____

Q. What is the mean of the ranges for the heat indexes? What is the median of the ranges? Explain what this tells us about the effects of humidity on the heat index.

A. Mean: _____ Median: _____

Q. Which temperature has the greatest range? Which relative humidity has the greatest range?

A. Temperature: _____ Range: _____ Relative Humidity: _____ Range: _____

Q. Which temperature has the smallest range? Which relative humidity has the smallest range?

A. Temperature: _____ Range: _____ Relative Humidity: _____ Range: _____

Q. Give three different combinations that would produce a heat index of 91.

	Temperature (°F)	Relative Humidity (%)
1)		
2)		
3)		

Q. If you were a meteorologist for a local TV station, what warning level would you post if the predicted high temperature for the day were 95° with a predicted relative humidity of 45%?

A. _____

Activity 2

Q. Using the formula you stored in your handheld, find the heat index for an air temperature of 105° and a relative humidity of 50%. Round your answer to three decimal places. Remember, your answer may be slightly different from the chart.

A. Heat Index: _____

Q. Using the formula you stored in your handheld, find the heat index for an air temperature of 120° and a relative humidity of 85%. Round your answer to three decimal places. This answer is not in the chart.

A. Heat Index: _____