**Precalculus- Modeling Using Sinusoidal Functions**

*Objective-Students will be able to perform transformations on a sinusoidal wave to model real world data.*

The real-life data at right gives the daily average maximum temperatures in Milwaukee from 1971-2000.

Use a chromebook to access this data on desmos.com by going to:

<https://www.desmos.com/calculator/nofrfmhp8w>

**Our goal is to fit a sinusoidal wave to this data to model the maximum temperature throughout the year.**

1. Spend a couple of minutes guessing and checking values of a, b, c, and d in the function y = asin(b(x+c))+d or y = acos(b(x+c))+d that fit this data.

What was your best guess? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2. Mathematically Creating A Better Model**

a. How can we use the data to calculate the amplitude?

b. How can we use the data to calculate the vertical shift necessary?

c. What period makes sense for yearly weather data? What value of b will give us this period?

d. The last component we need to calculate is the phase shift. Graph your function using the values we found in 2a-2c. How can we calculate how far we would need to shift our wave for it to work?

*What equation did you come up with? How does it compare to other groups?*

e. Can you write BOTH a sine and cosine wave that models this data?

**3. Making Predictions Using our Model**

a. Use your model to predict the maximum temperature in Milwaukee on the 5th of January.

b. Predict what day of the year will have the coldest maximum temperature in Milwaukee.

c. Predict what day of the year will have the warmest maximum temperature in Milwaukee.

**4. A Better Model?**

a. How would we use our graphing calculator to create the “best” sine wave to fit our data? (You don’t have to actually do this, just explain how it can be done.)