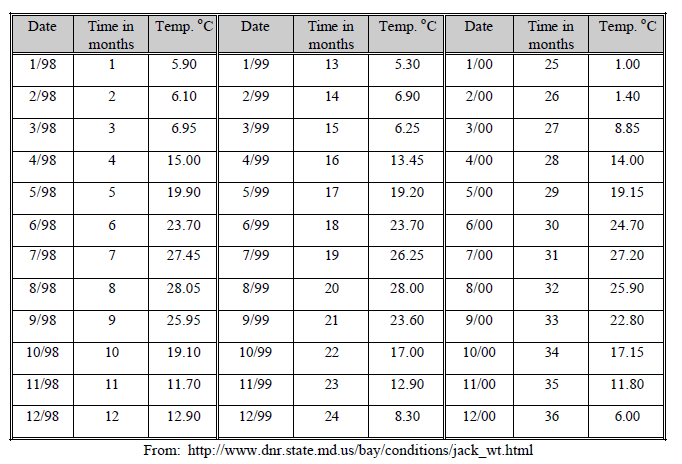
**Accel. Precalculus Name:**

**Sine Curve Regression**

Let’s examine the 1998-2000 surface water temperature record for Jack Bay on the lower

Patuxent River. These data are from the Maryland Department of Natural Resources.



Create a table in Desmos and enter the data.

What type of relationship is found? Is there anything unusual about January and February of the

year 2000?

Sketch and describe the graph.

What is the range in temperature? This is the difference between the maximum and minimum

values.

What is the time interval between maxima (or minima)?

What type of mathematical function can model the cyclic nature of the data above?

**Manually Fitting a Sine Function**

Using graphical analysis, we can estimate the four parameters (a, b, c, and d) in the general

equation for a sine function. This will allow us to plot a sine curve through the data points.

1. Finding the midline (y = d) or y-axis shift

In a new line in Desmos, go to Functions and choose the Stats menu. Choose mean and complete the command as follows: mean( ). Enter the value in the blank below. In a new line, add the midline to your Desmos graph.

d = \_\_\_\_\_\_\_\_\_\_\_

2. Estimate the period of the data

This is the time between adjacent maxima or adjacent minima. Convert the period, P, using the formula to angular frequency, b.

P = \_\_\_\_\_\_\_\_\_ b = 360/P = \_\_\_\_\_\_\_\_\_\_

3. Estimate the amplitude of the temperature

This is the difference between the maximum and minimum divided by two or the average

distance from the midline to maxima or minima.

a = \_\_\_\_\_\_\_\_\_\_\_

4. Estimate the x-axis shift

This is the time along the midline from the y-axis to the point where the curve would cross the

midline.

c = \_\_\_\_\_\_\_\_\_\_\_

5. In a new line in Desmos, type the general form (y=a sin (bx+c) + d) for a sinusoidal function and create sliders for a, b, c, and d. Set the sliders to the values you calculated above. If you need to adjust the scale of the sliders, click on the number at the end of the scale.

6. How well did your estimates fit the data? Do you need to make any adjustments to the values of a, b, c, and d? Record your final best-fit equation.

**Fitting a Sine Function Using the Sine Regression**

Begin by deleting everything EXCEPT your data table. In a new line in Desmos, type the following:  . This is the command to calculate the regression equation (line of best fit) for the data. Record the values listed below. Make sure you are in **degree mode** under settings.

a = \_\_\_\_\_\_\_\_\_\_ b = \_\_\_\_\_\_\_\_\_\_ c = \_\_\_\_\_\_\_\_\_\_ d = \_\_\_\_\_\_\_\_\_\_

How well does the regression equation agree with your manual fit equation?

Use the regression equation to predict the temperature in April of 2001.