Average Daily U.S. Temperature Analysis:
Fill in the following chart for the 12 average daily temperatures for the 15th day of every
month (January-December) of 2008 (since the archives for all of December 2009 are not
complete yet) for the United States City assigned to you.
See:  http://www.engr.udayton.edu/weather/citylistUS.htm

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Year</th>
<th>Data Point for time (t)</th>
<th>Average Daily Temperature (°F), T(t)</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>15</td>
<td>2008</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>15</td>
<td>2008</td>
<td>2</td>
<td></td>
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<tr>
<td>March</td>
<td>15</td>
<td>2008</td>
<td>3</td>
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<tr>
<td>April</td>
<td>15</td>
<td>2008</td>
<td>4</td>
<td></td>
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<tr>
<td>May</td>
<td>15</td>
<td>2008</td>
<td>5</td>
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<tr>
<td>June</td>
<td>15</td>
<td>2008</td>
<td>6</td>
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<tr>
<td>July</td>
<td>15</td>
<td>2008</td>
<td>7</td>
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<td>August</td>
<td>15</td>
<td>2008</td>
<td>8</td>
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<td>September</td>
<td>15</td>
<td>2008</td>
<td>9</td>
<td></td>
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<tr>
<td>October</td>
<td>15</td>
<td>2008</td>
<td>10</td>
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<tr>
<td>November</td>
<td>15</td>
<td>2008</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>15</td>
<td>2008</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

Load last two columns into $L_1$ & $L_2$, into your graphing calculators, respectively.

Turn ON your STAT PLOT to graph a scatterplot of $L_1$ & $L_2$ data in Plot1 with the
default “box” marker for the “points” from the ordered pairs.

Push ZOOM 9 to activate the ZoomStat feature to look at the “plotted” data points.

Alter the WINDOW settings as desired, to establish “buffers” as explained in class.

Perform a Sinusoidal Regression on $L_1$ & $L_2$ by using the following:

STAT > CALC (scroll down to option “C” [SinReg] and press enter)
That will post the SinReg command to the homescreen, and now you will need to follow
that command with 5 items (# of iterations, X-list variable, Y-list variable, period guess,
& $Y_1$ (to store the regression equation into $Y_1$ [the first equation in the Y= menu] for future graphing purposes), each separated by commas. Insert “3” for the # of iterations,
$L_1$ for the X-list variable , $L_2$ for the Y-list variable, and “12” for the period guess
(since the twelve months of a year determine the cyclical period by which our four seasons
“cycle”, and thus determined the number of data points for this sinusoidal analysis).
Remember that you get the \( Y_i \) “pasted in” from the list off \( Y= \) variables through the following : VARS \( \rightarrow \) \( \rightarrow \) ENTER \( \rightarrow \) 1.

Your home screen should look like : SinReg \( 3, L_1, L_2, 12, Y_i \)

Press Enter to perform the regression.

Interpret the regression equation, by answering the following questions:

Round all four of the values of \( a, b, c, \) & \( d \) [of \( y = a \cdot \sin(bx + c) + d \)] to 2 decimal places, and state the regression equation in the blank space below:

_____________________________________________

What is the relevance of the value for “\( a \)”?

What is the relevance of the value for “\( d \)”?

How are the “\( a \)” and “\( d \)” values inter-related?

From the “\( b \)” value, find the period of this model (sinusoidal regression).

Was it close to the guess you “seeded” the regression with?

Why is the period from the regression, the value that it is?
What is the significance of the “c” value? Find \( \frac{c}{b} \) and explain its relevance to this data set… Remember that \( y = a \cdot \sin(bx + c) + d \) is equivalent to \( y = a \cdot \sin(b(x + \frac{c}{b})) + d \).

Graph the regression equation you found with your graphing calculator on the provided graph paper below:

![Graph paper](image)

Could you alter the SINE regression equation to be a COSINE equation, from what you know about the relationship between the sine and cosine functions (I am referring to their “out of” phase relationship here…)?

What would that equation be?

__________________________________________________________________________

Why do you think that the regression equation didn’t perfectly “fit” the data?
Average Daily World Temperature Analysis:
Fill in the following chart for the 24 Hour Average Temperature data you retrieve for the 12 months (January-December) of several of the last years for the World City that you pick. Remember that Florence, Italy, cannot be picked yet (because that is Mr. Everest’s city, that was used as an example) and see the edublog @: http://reverest.edublogs.org to make sure the city you want, hasn’t been taken yet. Remember to post your initials and world city on the blog, so you all get different cities)
See: http://www.worldclimate.com for getting your data, once you have deduced that “your city” is available for analysis…

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<td></td>
</tr>
</tbody>
</table>

Load last two columns into \( L_3 \) & \( L_4 \), into your graphing calculators, respectively.

Turn OFF your STAT PLOT for the \( L_1 \) & \( L_2 \) data from the U.S. city temperature analysis in Plot1.
Turn ON your STAT PLOT to graph a scatterplot of \( L_3 \) & \( L_4 \) data in Plot2 with the default “box” marker for the “points” from the ordered pairs.

Push ZOOM 9 to activate the ZoomStat feature to look at the “plotted” data points.

Alter the WINDOW settings as desired, to establish “buffers” as explained in class.

Perform a Sinusoidal Regression on \( L_3 \) & \( L_4 \) by using the following:

STAT > CALC (scroll down to option “C” [SinReg] and press enter)
That will post the SinReg command to the homescreen, and now you will need to follow that command with 5 items (# of iterations, X-list variable, Y-list variable, period guess, & \( Y_2 \) (to store the regression equation into \( Y_2 \) [the third equation in the Y= menu] for future graphing purposes), each separated by commas. Insert “3” for the # of iterations,
For the X-list variable, \( L_3 \) for the Y-list variable, and “12” for the period guess (since the twelve months of a year determine the cyclical period by which our four seasons “cycle”, and thus determined the number of data points for this sinusoidal analysis). Remember that you get the \( Y_2 \) “pasted in” from the list off Y= variables through the following: VARS > \( \downarrow \) > ENTER > 2.

Your home screen should look like: SinReg 3, \( L_3 \), \( L_4 \), 12, \( Y_2 \).

Press Enter to perform the regression.

Interpret the regression equation, by answering the following questions:

Round all four of the values of \( a \), \( b \), \( c \), & \( d \) [of \( y = a \cdot \sin(bx + c) + d \)] to 2 decimal places, and state the regression equation in the blank space below:

\[ \text{________________________________________} \]

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Could you alter the SINE regression equation to be a COSINE equation, from what you know about the relationship between the sine and cosine functions (I am referring to their “out of” phase relationship here...)?

What would that equation be?

Why do you think that the regression equation didn’t perfectly “fit” the data?

Did you expect the fit from the World Temperature Data to be a better or worse fit than the U.S City Data? [Hint: Consider the time period over which the data was collected for each analysis before reflecting & commenting.]