

**Milestone Outcomes: To find a function that models temperature data.**

**1. Code the dates.**

- Not only do we want to find a function that models the data you collected in part 1, but we also want to be able to make predictions of future temperatures. This would be difficult if the x-values are a meaningless list of numbers from 0 to 71.
- What you will do is “code” the data by dividing the numbers in column A by 12, thus creating a code where the whole number part of the date code is the decade since 1950 (0 = 1950, 1 = 1960, 2 = 1970, 3 = 1980, etc.) and the decimal part represents the month (0/12 = Jan, 1/12 = Feb, 2/12 = Mar, 3/12 = Apr, 4/12 = May, ..., 11/12 = Dec).
- So, start a new Excel workbook and fill column A with the numbers from 0 to 71. Type in the following formula into cell B1: **=A1/12**
- Fill this formula down so column B looks like the screenshot on the right.
- Copy your temperature data from Deliverable #4 into column C. Create a new scatterplot using columns B and C. Scale the x-axis to go from 0 to 6 counting by 0.5. Customize the graph’s fonts and colors.

A	B
0	0
1	0.0833333
2	0.1666667
3	0.25
4	0.3333333
5	0.4166667
6	0.5
7	0.5833333
8	0.6666667
9	0.75
10	0.8333333
11	0.9166667
12	1
13	1.0833333
14	1.1666667
15	1.25
16	1.3333333

**2. Calculate a function to model the data.**

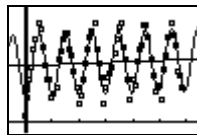
- Similar to deliverable #3, you want to model the data first by finding the linear trend, and then subtracting it from the data, finding the sinusoidal regression model and then adding the sine function to the linear function.
- First, we need to get the coded date values into the calculator. To easily get the sequence of numbers from 0 to 71 all divided by 12 into L1, type in the following:  
seq(X/12,X,0,71)→L1 [seq is under 2nd[STAT], and → is from the STO key]

```

NAME: OPS MATH
1:SortA(
2:SortD(
3:dim(
4:Fill(
5:seq(
6:cumSum(
7:List(
    
```

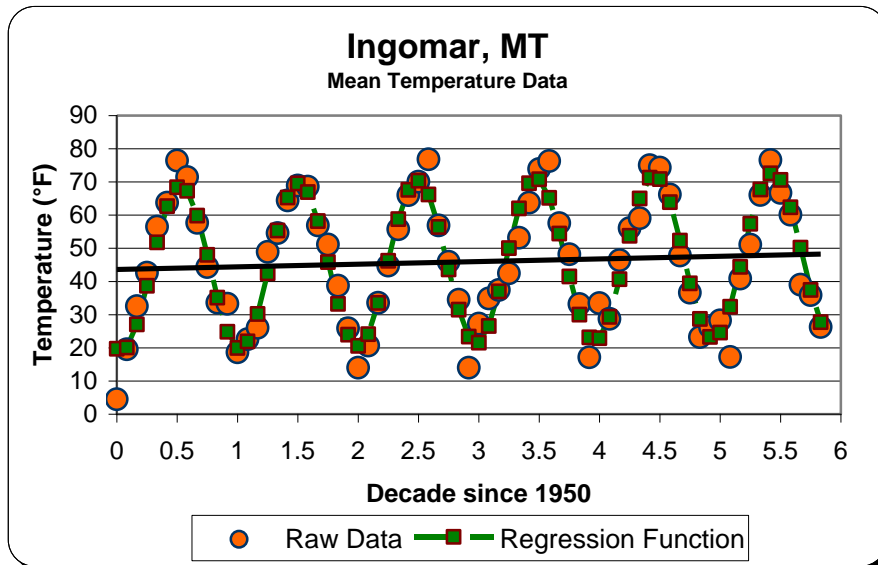
```

Seq(X/12,X,0,71)
→L1
    
```



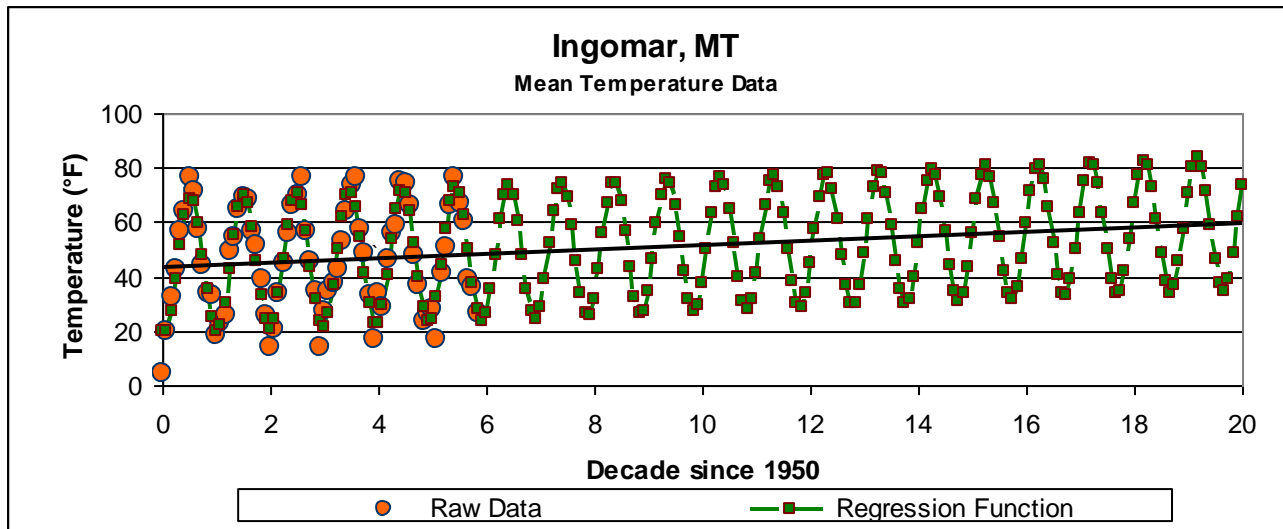
Here the linear function is in Y1, the sine function in Y2, and Y3=Y1+Y2

- Now type in your temperature data into L2. Following the directions from part 3 of deliverable #3, find the sinusoidal+linear function that models the temperature.
- Type in the function into Excel in column D (remember to reference column B for the x-values). Graph the raw data and the regression model. Customize, label, and scale the graph (as before).



### 3. Make predictions.

- The real power of a regression model comes in the ability to make predictions. That is why it was important to code the date values.
- To get started, let's find what the average temperature will be in July in the next decade (2010s) at your location. Thus you will want to find the value of your sinusoidal+linear regression function at the value of  $6+6/12$ , or 6.5. Calculate this value in Sheet2 of the same workbook as your graphs from above.
- Next, make a table of values for the predicted average temperature in each month of the 2020 decade. Put this in a separate worksheet in your file. Label everything appropriately.
- How long do you suppose it will take for the average temperature in July to be over 120°F? First, extend the x-axis of your plot up to  $x=20$  (decade 2150s). To do this, you will have to extend column A, B, and D (do not extend column C, Excel will try to do linear regression to extrapolate values and this would be incorrect). Then draw another graph with all of this new data like this (but longer, so you can see when it hits 120°):



- Keep extending the data (and the graph) until you first see a 120°F prediction. When did it occur? Translate the date code into a decade and month. Type your answer on a separate worksheet and label it appropriately so I see it.

### 4. Save and upload.

- Save the Excel worksheet as "Deliverable5" and upload your file to your ePortfolio. Type in a learning outcome reflection in the box provided. Note: remember to use <http://eportfolio.cascadia.edu/> for the website.