



ICE - Periodic Functions

Where is the coldest place in earth? On July 21, 1983, a temperature of -89.2°C (-128.6°F) was recorded at Vostock Base on the Antarctic continent (see Figures 1¹ and 2²). This is the lowest temperature ever recorded³.



Figure 1: Map of the Antarctic continent showing the location of Vostock base.

Figure 2: Part of the complex of research facilities located at Vostock base.

Some data on the climate of the area around Vostock Base is given in Table 1 below (the numbers are the average temperatures in $^{\circ}\text{F}$).

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
-25.7	-47.6	-72.1	-84.4	-86.0	-85.3	-88.3	-89.6	-86.7	-70.7	-45.8	-25.7

Table 1: Average monthly temperatures in Vostock, Antarctica⁴.

In this ICE, your job is to use this data to create an equation for a function that can be used to estimate the temperature in Vostock on any given day.

- Enter the data from Table 1 into your calculator and plot a graph that shows temperature versus time.**
- What patterns do you see in this graph? Would you expect these patterns to be repeated?**

¹ Image source: National Geographic Society.

² Image is a portion of a photograph made by Richard Brown, University of Minnesota.

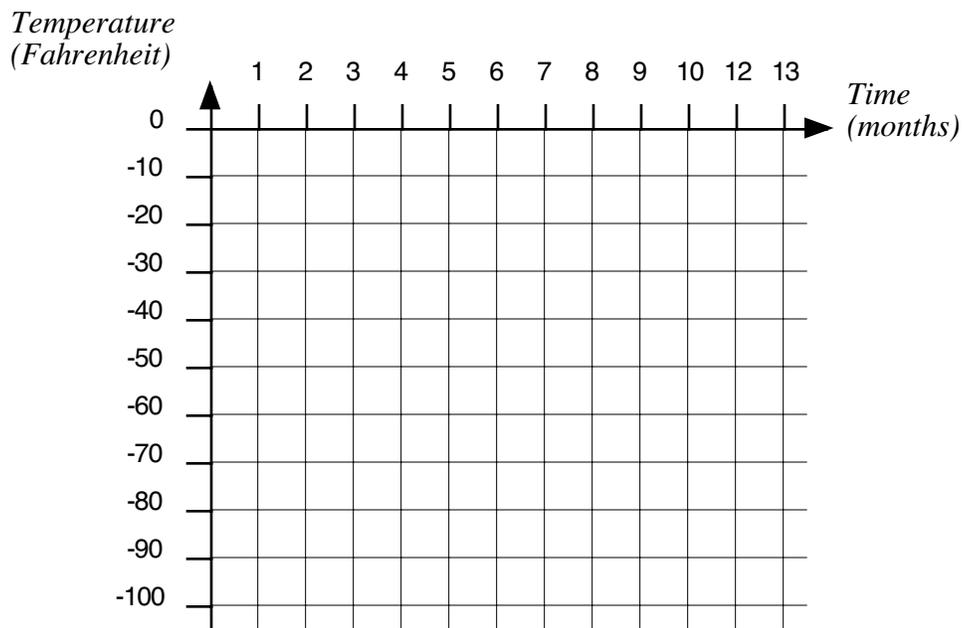
³ Source: World Book Encyclopedia, 2001 Edition.

⁴ Source: www.worldclimate.com

- Decide what quantities you would have to specify in order to describe these patterns with numbers, and then use your graph to find these numbers.

- Use these numerical quantities to create an equation that could be used to predict the temperature at Vostock base.

- Using the axes provided below, plot the points from Table 1, and sketch the graph of the equation that you found above.



- Figures 3 and 4 (below) show where to find the “sine regression” procedure on a TI-83. Enter the data from Table 1 into the “L1” and “L2” lists of your calculator (see Figure 3) below, and then run the SinReg routine on your calculator (see Figure 4). What do the outputs of this routine mean, and how are they related to the graph you have drawn?

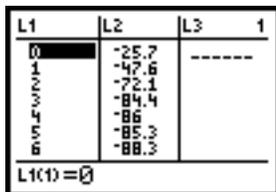


Figure 3: Enter data from Table 1 into calculator.



Figure 4: To locate the “Sine Regression” feature, press [STAT]. Select the “CALC” menu. The “Sine Regression” is Feature “C.”