



Linear Regression with Biological Data (or the Realities of Working with Real-Life Data)



Data: The following data shows the relationship between chirps per second of a ground cricket and the corresponding ground temperature.

In 1949, G. W. Pierce measured the number of chirps per second made by a ground cricket, for different ground temperatures. Since crickets are cold-blooded, the rate of their physical processes are influenced by temperature. Pierce thought that temperature might influence the chirp frequency.	Chirps/Second	Temperature (° F)
	20.0	88.6
	16.0	71.6
	19.8	93.3
	18.4	84.3
	17.1	80.6
	15.5	75.2
	14.7	69.7
	17.1	82.0
	15.4	69.4
	16.2	83.3
	15.0	78.6
	17.2	82.6
	16.0	80.6
	17.0	83.5
14.1	76.3	

What You Are To Do

- Turn on the calculator. Press [Clear] a few times to clear the home screen.
- Enter the Chirps/Sec data into list L1.
Hint: Press [Stat] [Edit] ... to start.
Hint: delete the existing data first.
- Enter the Temperature data into list L2.
Hint: delete the existing data first.
- Press [Y=] and Clear all existing functions.
- Press [Window].
Set Xmin to a number smaller than the smallest number of chirps per second.
Set Xmax to a number larger than the largest number of chirps per second.
Set Xscl to 1.
Set Ymin to a number smaller than the smallest temperature.
Set Ymax to a number larger than the largest temperature.
Set Yscl to 5.
- Press [2nd] [Y =] to choose StatPlot.
Choose Plot1 by pressing [Enter].
Select these settings: [On], [Scatterplot – the 1st choice], [L1], [L2], [+].
Press [Graph] to draw the scatterplot.
Note: the data are roughly linear. This amount of variation is typical of biological data.
- Find the line of best fit as follows:
Press [Stat]. Select [Calc] and then [4: LinReg (ax + b)]. Press [Enter].
LinReg (ax + b) will appear on the home screen. Add 3 parameters, as follows:
Type: [2nd] [1] [,] [2nd] [2] [,] [Vars] [Y-Vars] [Function] [Y1] [Enter].
You should see: LinReg (ax + b) L1, L2, Y1
If not, press [Clear] and try again. If it looks OK, press [Enter].
The equation of the line of best fit appears on the screen.
Press [Graph] to see the graph of the line of best fit.
- To see the coordinates of the points on the graph, press [Trace], then [down-arrow].
Press [→] and [←]. The coordinates are at the bottom of the screen.

TO DO: Answer the questions on the board or on the overhead.

Linear Regression with Biological Data

1. Use the line of best fit to predict the ground temperature if there are 18 chirps per second.
2. Use the line of best fit to predict the ground temperature if there are 19.2 chirps per second.
3. The temperature is 82° F. Predict the number of chirps per second.
4. **Copy** and **complete** this sentence: As the ground temperature increases, the number of chirps per second _____.

Explain your answer, using **full sentences**.

5. The number of chirps per second has increased to 23.0.

Predict the ground temperature.

Hint: You might wish to change the Window values.

Explain how you arrived at your answer. Use **full sentences**.

6. What do you think happens if the temperature drops to 20° F?