Student Task

THERMOMETER CRICKETS PERFORMANCE TASK

In this task, you will organize and analyze data to model the relationship between temperature and the chirping rates of snowy tree crickets. You will develop an equation to describe the relationship, and you will compare your mathematical model to another formula.

Data Set

This table shows data about snowy tree crickets. Each data point in the table represents the average number of chirps per minute at a specific temperature.

Average Number of Chirps (per min)	Temperature (°F)
45	40°
60	47°
75	50°
80	45°
95	55°
110	50°
125	60°
140	55°
140	80°
150	65°
165	70°
180	65°
185	75°

Developing and Analyzing a Model

1. A. Using the data table, create a scatter plot of the temperature and number of chirps per minute for snowy tree crickets. [Note: The online delivery and response format for these types of questions is still being evaluated.]
   B. Explain the patterns you observe on the graph.

2. A. Estimate the line of best fit for the data points on the graph, and graph this line.
   B. Write an equation to represent the line.
   C. Write an interpretation of the slope of your equation (mathematical model) in terms of the context of chirping rates and temperature.

3. Describe how well your mathematical model fits the given observation data on cricket chirps and temperature, using correlation coefficient, R^2, and/or plots of residuals.

Comparing a Model

Amos Dolbear developed an equation in 1897 called Dolbear's law. He arrived at the relationship between number of chirps per minute of a snowy tree cricket and temperature. You can use this law to approximate the temperature, in degrees Fahrenheit, based on the number of chirps heard in one minute.

$$\text{Dolbear's law:} \qquad T = 50 + \frac{N - 40}{4}$$

where T = temperature (°Fahrenheit)

N = number of chirps per minute

4. A. Plot the line that represents Dolbear's Law on the same graph as your line of best fit.
   B. What are the differences between this model and the one you developed earlier? (Include a discussion of their slopes and *y*-intercepts in your answer.) Interpret what these differences mean in the context of chirping rates and temperature.

5. Explain the differences between the results of Dolbear's formula and what you see in the observation data for determining the temperature depending on the number of times a cricket chirps. Support your conclusion using four data points. Why do you think these differences could occur?