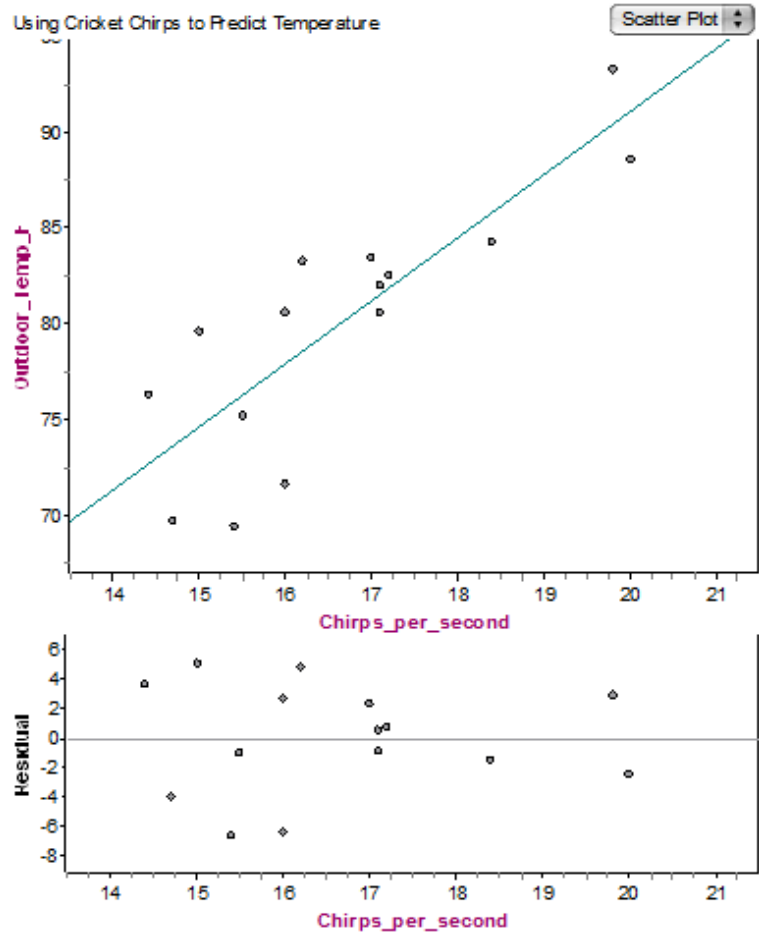Problem #1

Can the frequency of cricket chirps be used to predict the outdoor temperature? According to one of the founding fathers of communications engineering, George Washington Pierce, the answers is yes. During his career, Pierce invented several pieces of technology that earned him patents and a lot of money from companies like RCA and AT&T. When he retired, Pierce built a device that allowed him to record the sounds made by various insects near his New Hampshire home. In 1948, he published his research findings in a book titled *The Songs of Insects*. You will examine the data that Pierce collected on the number of chirps per second of the striped ground cricket and the outdoor temperatures in degrees Fahrenheit.

Chirps	20.0	16.0	19.8	18.4	17.1	15.5	14.7	17.1	15.4	16.2	15.0	17.2	16.0	17.0	14.4
Temp	88.6	71.6	93.3	84.3	80.6	75.2	69.7	82.0	69.4	83.3	79.6	82.6	80.6	83.5	76.3

1. Which variable is the explanatory? Response? How do you know?

2. Use your calculator to find the equation of the least-squares regression line. Define the variables.

3. What is the y-intercept? Describe its meaning in context of the problem.

4. What is the slope? Describe its meaning in context of the problem.

5. Find the correlation, and describe its meaning?

6. Find $\bar{x}$, $\bar{y}$, s_x, s_y, and use this info to find the equation of the regression line. Show your work. (Hint: The equation should match your answer from #2).

7. What does the model predict for the temperature when there are 15 chirps per second?

8. Does the residual plot indicate that a linear model is appropriate? Explain.

9. If a new point, (20, 75), was added to the scatterplot, would the correlation increase or decrease? Explain.

10. If a new point, (20, 75), was added to the scatterplot, would the slope increase or decrease? Explain.

11. What percent of the variation in outdoor temperature is explained by the regression model with chirps per second?

12. Would it be reasonable to use the model to predict the outdoor temperature if there were 30 chirps per minute? Explain.

13. Does it seem plausible that due to the positive association, the number of chirps per second causes the outdoor temperature to increase? Explain.

Problem #2

Baseball players have been signing even larger contracts. The highest salaries (in millions of dollars per season) for some notable players are given in the table below.

Player	Year	Salary
Nolan Ryan	1980	1
George Foster	1982	2.04
Kirby Puckett	1990	3
Jose Canseco	1990	4.7
Roger Clemens	1991	5.3
Ken Griffey, Jr.	1996	8.5
Albert Belle	1997	11
Pedro Martinez	1998	12.5
Mike Piazza	1999	12.5
Mo Vaughn	1999	13.3
Kevin Brown	1999	15
Carlos Delgado	2001	17
Alex Rodriguez	2001	25.2

1. In looking at the scatterplot and residual plot, explain why a linear model may not be the best for this data.

2. To create a new model, take the logarithm of the y-values. Look at the new scatterplot and residual plot below and explain how this new model appears to be better. (When typing the data, make sure that your x-values match the scale 1980 = 80, 1990 = 90, etc.)

3. Find the new regression equation using the transformed data. Do all work in your calculator, but you can compare your answer with the equation at the bottom right of this page.

4. Find the new r and r^2 values, and explain why they are better than the previous model.

5. Use this new model to predict what a player might make in 2009. Show your work.

Collection 1 — Scatter Plot

salary_millions = 0.865year - 71.3; r^2 = 0.76

Collection 1 — Scatter Plot

log_salary = 0.0573year - 4.53; r^2 = 0.96