**In-Class Activity**

The accompanying table shows the winning running time in minutes for women in the Boston Marathon.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | 1972 | 1974 | 1975 | 1978 | 1980 | 1981 | 1984 | 1987 | 1990 | 1992 | 1996 | 1998 | 1999 |
| Time (min) | 190 | 167 | 162 | 165 | 154 | 147 | 149 | 145 | 145 | 145 | 145 | 143 | 143 |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |

a. Define the variables.

b. Make a scatterplot. Label your axes.



c. Find the linear regression function for the data. Round to 3 decimals.

d. If the marathon times continued to change at the rate of your linear model, predict the winning running time for the women’s marathon in 2015.

e. Does it appear that a linear function is a good model for this data? Explain.

f. Find the exponential regression function for the data. Round to 3 decimals.

g. If the marathon times continued to change at the rate of your exponential model, predict the winning running time for the women’s marathon in 2015.

h. Does it appear that this exponential function is a good model for this data? Explain.

i. What is the horizontal asymptote of your equation from **part f**? What does it represent in the context of the problem?

Comparison:

Do either one of these models make sense to use for 2015? Explain your answer.

The Transformation:

j. What value does it appear the winning running time is approaching (the horizontal asymptote)?

k. Subtract running time in **part j** from the actual winning running time in each year getting a new time value. So in 1972, the new time would be 190 – **part j**. Write these new times in the given space in the table.

1. Make a scatterplot with the new table on your calculator.

m. Find the linear regression function for the new data. Round to 3 decimals.

n. Find the exponential regression function for the new data. Round to 3 decimals.

o. Compare both of these regression models to the original models. What do you notice about the slopes? Decay Factors?

p. Which regression model makes more sense in the context of the problem?

q. Using the information from **part j** and **part p**, construct a new and better model for the original data.

**Mr. Potato Head Investigation**

Using the data collected in class on November 22 (and the Boston Marathon problem), create a function that best models the decrease in potato temperature over time. Explain the steps you took to create this model, identify your variables and show all relevant mathematical work. Round to 3 decimals.

Now that you have a working model, you will be using it to determine the time of death for another potato. See your instructor for your dead potato’s information. Show your work!

Dead Potato Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_