Appendix B: Assessing Normality Worksheet

Which Gum Lasts Longer?

Problem:

We want to determine if there is a significant difference in the typical flavor duration, in minutes, for two different brands of chewing gum.

Instructions:

The Data Sheet contains the gum data that was collected in class (the length of time, in minutes, that the flavor lasted for Brand 1 and Brand 2 gums).

1. Explain why our two samples (the number of minutes that the flavor lasted for chewing gum Brand 1 and chewing gum Brand 2) are **not** independent.

2. Calculate the differences in the number of minutes the flavor lasted for the two gums (Brand 1 minus Brand 2). Enter the differences into the appropriate column on the Data Sheet.

3. Calculate the following quantities for the differences:

min = _____ quartile 1 = _____ median = _____ quartile 3 = _____ max = _____

mean = _____

4. Now, determine if it is safe to assume that the distribution of the differences is a normal distribution.

(a) Construct a stem-and-leaf plot of the differences and check for non-normal features such as gaps, outliers, or pronounced skewness. Do you detect any non-normal features?

(b) Compare the mean difference to the median difference. Recall that, in a normal distribution, the mean and the median will be roughly the same. Are the mean and the median roughly the same? If not, what do the values indicate about the shape of the distribution of the differences?

(c) Compare the distance from the difference quartiles to the median difference. Recall that, in a normal distribution, the first quartile and the third quartile will be approximately the same distance from the median. Are the quartiles approximately the same distance from the median? If not, what do the distances indicate about the shape of the distribution of the differences?

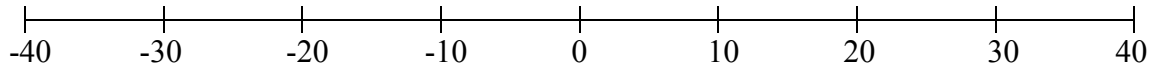
(d) Use a statistical software package to construct a Q-Q plot of the differences. Does the Q-Q plot indicate that the differences do not have a normal distribution? Explain your answer.

5. In your opinion, is it safe to assume that the distribution of the differences is a normal distribution? Write a summary paragraph to explain your answer.

6. Construct a boxplot of the differences.

min = _____ quartile 1 = _____ median = _____ quartile 3 = _____ max = _____

Boxplot:



Based on the box plot, would you conclude that there is a difference in the number of minutes that flavor is retained for Brand 1 and Brand 2 gums? Explain.

7. Conduct an appropriate statistical hypothesis test to determine if the typical flavor duration differs for chewing gum Brands 1 and 2. The test procedure that you use will depend on your answer to Question 5.

(1) H_0 :

H_A :

(2) formula for test statistic =

calculated value of test statistic =

(3) *P*-value =

(4) conclusion =

8. Give a practical interpretation of the *P*-value that you calculated in Question 7.