NAME:

OBJECTIVES: The purpose of this activity is to introduce the statistical software JMP. Upon successful completion of this activity, you will be able to…

- Describe a distribution of values
- Find and interpret a given percentile
- Calculate a z-score
- Find the 5-number summary of a data set and draw a box plot by hand
- Use JMP to draw multiple box plots on the same axis
- Compare two distributions

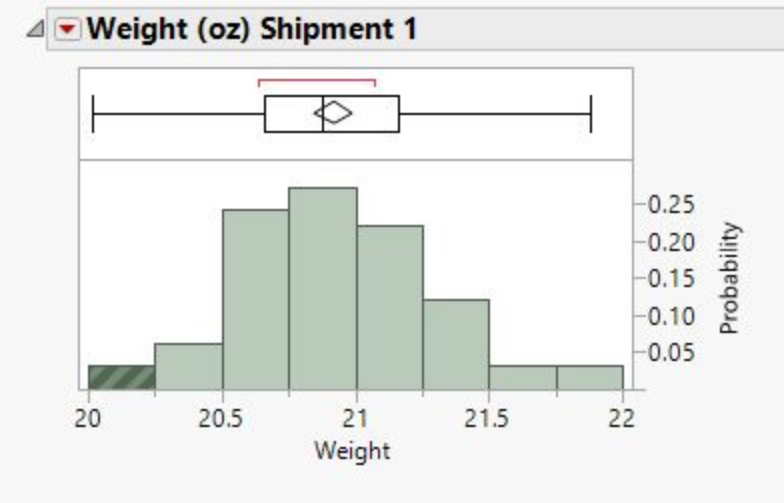
Delectable Delights is a large consumer food manufacturer selling its products in retail stores nationwide. You have landed your first job after graduation from Clemson in their advertising division. Since you took statistics as a part of your coursework, you are often called upon to perform data analysis for the advertising division, as well as other divisions of the company.

DIRECTIONS: Answer the following questions using complete sentences as though you were presenting your analysis to the employees of Delectable Delights. Please provide any appropriate output and/or screenshots from JMP. Instructions for creating several types of graphs or tables and statistics can be found on Canvas in the file **JMP Instructions.docx**. Paste your answers and any output into this document.

Cheerio's

Many manufacturing processes produce data that is approximately normally distributed (mound or bell shaped, symmetric and unimodal). The machine that fills the Cheerios boxes is set to have a mean box weight of 21 oz and a standard deviation of 0.4oz. The JMP file **Cheerio Box Weights** contains the weights of 100 randomly selected boxes each of cereal that Delectable Delights prepared for 2 shipments.

1) Use JMP to draw a histogram and provide basic summary statistics for the sample from shipment 1 (**use Analyze>>Distribution**). Change the orientation of the output to horizontal by selecting the red triangle next to the word **Distributions** and choose **Stack**. **Add** the relative frequency (prob) axis to the histogram. **Paste** the histogram, the quantiles table and the summary statistics table below. You do not need to adjust any of the default settings, simply copy and paste the output.



2) Do you believe that the machine that filled the boxes in this sample from shipment 1 was working correctly? **Why?**

   - I would say the machine was working because the mean of this graph is very close to 21 which is what the mean weight should be

3) The weights for shipment 1 have been sorted smallest to largest for your convenience. What is the weight of the box at the **16th percentile**? Use the method on page 52 of the lecture guide to find the value.

   - 20.56

4) What does it mean to be at the 16th percentile?

   - That means the box weight is higher than 16% of the other boxes. But 84% also weigh more than the box

5) What is the **z-score** of the weight that you found in question 4. Recall that the machine that fills the Cheerios boxes is set to have a mean box weight of 21 oz and a standard deviation of 0.4oz. Use these values of the mean and standard deviation to calculate the z-score.

   - (20.56-21)/.4 = -1.1

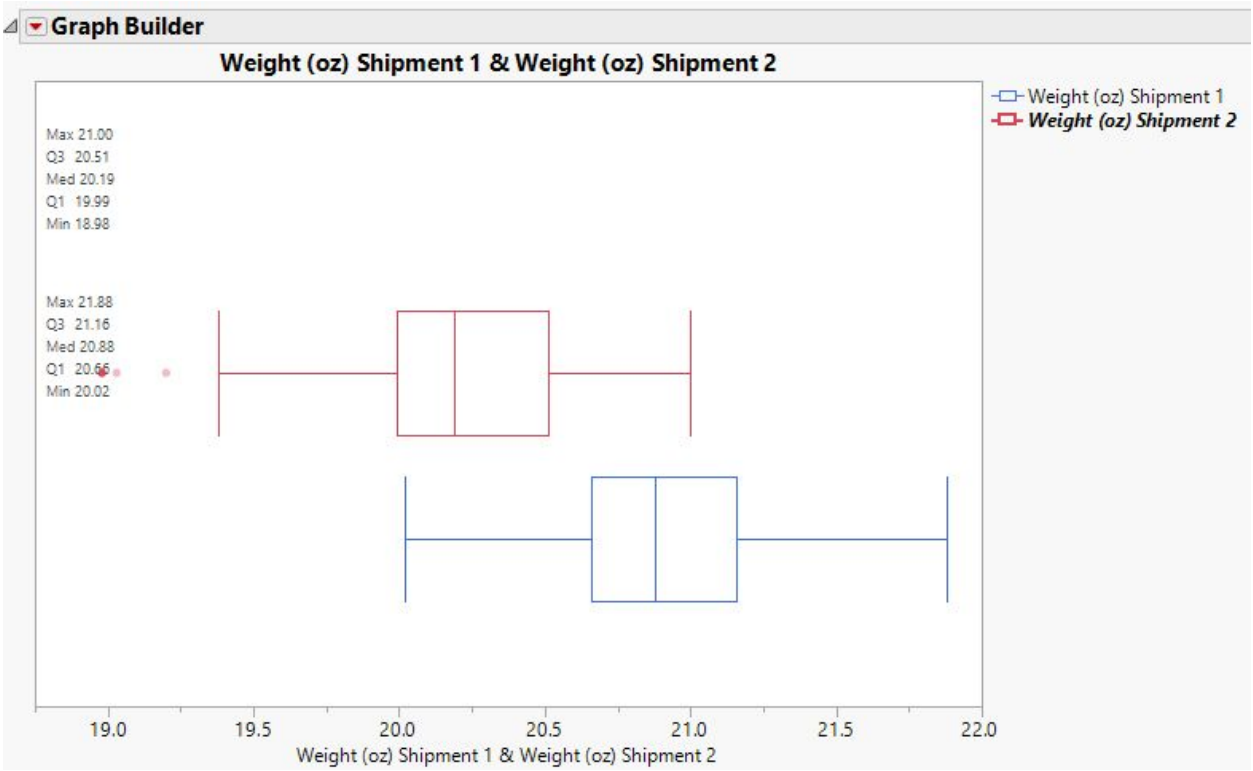
6) Find the **5-number summary** of this data set by hand and include all decimal places in your answer.

   min: 20.02
   median: 20.88
   max: 21.88
   1st quartile: 20.6298
   3 quartile: 21.2066

   What value does JMP give for Q3?
   - 21.1575

   You will notice that JMP uses a slightly different method for calculating quantiles. You may also have learned a different method for calculating Q1 and Q3 in another statistics class. In other words, there is more than one way to calculate the quantiles or percentiles. In this course please use the method taught in chapter 4 or the JMP output depending on how a question is asked.

7) Harold is an employee who works in the shipping department. As he was preparing shipment 2, he felt that the boxes of cereal seemed lighter than usual. You are asked to **compare** a random sample of 100 boxes of cereal from shipment 2 to the sample from shipment 1. Using the **graph builder** function in JMP draw two box plots on the same scale for shipment 1 and 2. Open graph builder and select both samples (select 1 sample, then hold down the shift key to select the second). Drag both samples to the x-axis. Choose the picture at the top of the graph that looks like 3 box plots. On the left select the check box for the 5-number summary. Paste the resulting box plots below.



8) Write a few sentences to compare the shape, centers and spread for the two box plots using the output provided by JMP. Do you think that the machine that filled the boxes for the second shipment may be malfunctioning?

- The min for shipment two is an ounce lighter as well as the max is almost an ounce lighter. It also contains outliers. And the Med. is almost an ounce lighter from where it is supposed to be which is 21. The shape is almost the same except the overall distribution is about exactly one ounce less than where it should be.

- Shipment two is almost one ounce lighter all around so it's possible that machine two is malfunctioning by not outputting enough cheerios into the box. The outliers also make it safe to conclude the machine is malfunctioning