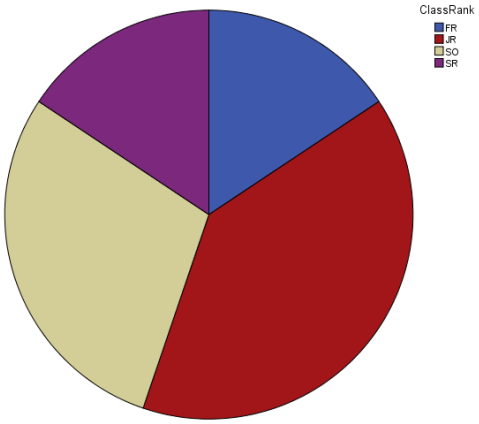
L16: Homework Answer Key

Instructions: You are encouraged to collaborate with other students on the homework, but it is important that you do your own work. Before working with someone else on the assignment, you should attempt each problem on your own.

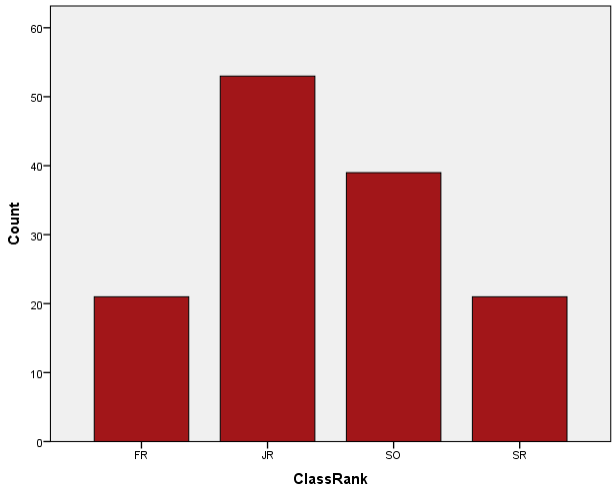
1. In your own words, explain the difference between a pie chart and a histogram.
   A pie chart is used for categorical data. Each slice represents a part of a whole. A histogram, on the other hand, is used for quantitative data. It is a visual representation of the spread of a set of data.

Demographic data of Brother Johnson's statistics students were collected at the beginning of one semester. Open the data file Survey Data. Use this information to answer questions 2 through 4.

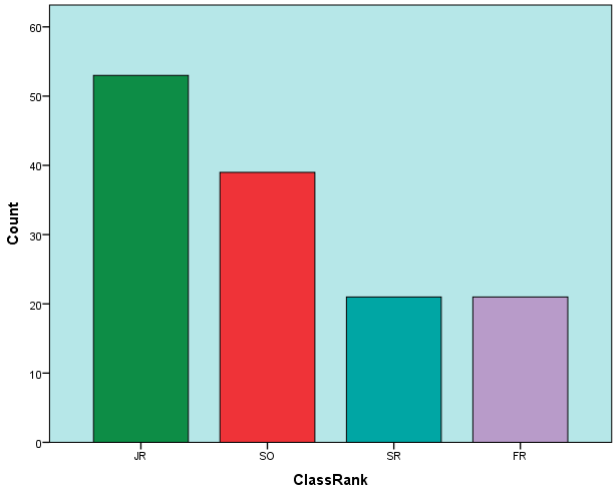
2. Make and attach a pie chart showing the class rank of all Brother Johnson's students. **You can either sketch the pie chart and scan in your document or use the snipping tool to paste a picture of the pie chart here. Click here for instructions on how to use the snipping tool.**



3. Make and attach a bar chart of the class rank of all students in Brother Johnson's Class.



4. Make and attach a Pareto chart of the class rank of all students in Brother Johnson's Class.



5. Under what conditions will the sample proportion $\hat{\boldsymbol{p}}$ be approximately normal?
   The sample proportion $\hat{\boldsymbol{p}}$ will be approximately normal when $\boldsymbol{n}$ is large. How do we know if n is large? We will conclude that $\boldsymbol{n}$ is large when $\boldsymbol{np \geq 10}$ and $\boldsymbol{n(1-p) \geq 10}$.

6. If $\boldsymbol{p} = \frac{1}{10}$, what is the smallest value of $\boldsymbol{n}$ that satisfies the requirements?
   $\boldsymbol{n}$ = 100

Political candidates frequently conduct polls to assess what proportion of likely voters support them. Of course, until the ballots are counted, no one knows what the true proportion of voters who will support a given candidate is. Suppose you are campaigning for a particular candidate for the Senate. Campaign headquarters decided to conduct a poll of 1000 likely voters a few days before the election. At that time, it is unknown to you, but your candidate will win with $\boldsymbol{p}$ = 52.8% of the vote. This is the true value that will not be known until Election Day. Use this information to answer questions 7 through 10.

7. Verify that $\hat{\boldsymbol{p}}$ will be approximately normally distributed.
   The sample proportion $\hat{\boldsymbol{p}}$ will be approximately normal when:
   $\boldsymbol{np \geq 10}$ and $\boldsymbol{n(1-p) \geq 10}$
   $\boldsymbol{1000(0.528) = 528 \geq 10}$ and $\boldsymbol{1000(1-0.528) = 472 \geq 10}$
   Since both conditions are true, we conclude that $\boldsymbol{n}$ is sufficiently large so that $\hat{\boldsymbol{p}}$ will be approximately distributed.

8. Describe the sampling distribution of the sample proportion, $\hat{\boldsymbol{p}}$ which will be observed in the poll. Be sure to state the distribution, the mean, and the standard deviation.
   The sampling distribution of $\hat{\boldsymbol{p}}$ is approximately normal with mean $\boldsymbol{p}$ = 0.528 and standard deviation of 0.016.

9. You want to know the probability that the poll results will show that your candidate will get less than 50% of the vote. What z-score will be used?
   z = -1.774

10. What is the probability that the poll results will show that your candidate will get less than 50% of the vote?
   $P(Z<-1.774) = 0.038$

A coin that was assumed fair was tossed 4,040 times and observed heads on 2,048 tosses. Use this information to answer questions 11 through 13.

11. Verify that $\hat{p}$ will be approximately normally distributed.
   The sample proportion $\hat{p}$ will be approximately normal when:
   $np \geq 10$ and $n(1-p) \geq 10$
   $4040(0.5) = 2020 \geq 10$ and $4040(1-0.5) = 2020 \geq 10$
   Since both conditions are true, we conclude that n is sufficiently large so that $\hat{p}$ will be approximately distributed.

12. Describe the sampling distribution of the sample proportion $\hat{p}$. Be sure to state the distribution, the mean, and the standard deviation.
   The sampling distribution of $\hat{p}$ is approximately normal with mean p = 0.5 and standard deviation of 0.008.

13. Assuming the coin is fair, what is the probability that $\hat{p}$ will be less than 0.493 or greater than 0.507? (Note that $\hat{p}$ = 2048/4040 = 0.507 and 1 - $\hat{p}$ = 0.493.)
   $P(Z<-0.890 \text{ or } Z>0.890) = 0.374$