STA2023 Application 2: Sample Data and Inferential Statistics

The completed application should be submitted as a single document to the Assignments link in Falcon Online.

Purpose: The purpose of this assignment is to organize a random sample of data values and then create two different confidence interval estimates of the population mean. The information will then be analyzed in a written summary.

Part 1: Written Introduction

Write an introduction to this application. Discuss how sample data values can be used to estimate population values. Refer to the textbook or class notes to describe the basic components of the application and the statistical concepts that are applied. The introduction should be at least 50 words and be written with proper grammar and spelling.

Part 2: Collect and Organize Random Data Values and their Summary Statistics

Methods: Use Excel (or similar software) to create the tables. Then copy the items and paste them into a Word document. The tables should be formatted vertically, have borders, and be given the labels and titles stated in the assignment. The proper symbols should be used. Do not submit this assignment as an Excel file. The completed assignment should be a Word (or .pdf) document.

1. All relevant information is posted in the course website (Falcon Online). Your instructor will assign a data set to you in order to complete this application.

For the purpose of this application, treat the data set as if it represented the given random variable and was a valid random sample gathered by a researcher from a normally distributed population. The sample data was actually found with an online Gaussian random number generator that creates randomly distributed data values. The random number generator simulates the results of a researcher finding those values through observation or experimentation.

2. Use technology (Excel, graphing calculator, etc.) to sort the 25 sample data values from low to high. Use Excel or similar software to put the data into a table with 5 columns and 5 rows. Label this "Table 1: Sorted Set of Sample Data."

3. Use technology to find the mean, median, standard deviation, and variance of the sample data organized in Table 1 (from step 2 above). Put these values, plus the range and sample size, into a table with the proper symbol in the left column and the value of the statistic in the right column. The median and range do not generally have symbols so the terms "Median" and "Range" can be used in the left column. The statistics should be rounded properly (one more decimal place than the data). Label this "Table 2: Important Statistics."

3. Use the sample mean and standard deviation to find the minimum and maximum usual values. Put these values in a table with the proper symbol(s) in the left column and the values in the right column. Label this "Table 3: Minimum and Maximum Usual Values."

4. Choose a confidence level similar to one found in the homework (such as 90%, 95% or 99%; do not use the confidence level from the posted example). Based on the confidence level, find the critical value and calculate the margin of error. In a table, state the first confidence level, the point estimate, the critical value, margin of error, and confidence interval. Put the proper symbols in the left column and the value of the statistic or properly formatted confidence interval in the right column.   The statistics and confidence interval should be rounded properly. Label this "Table 4: Confidence Interval 1."

5. Choose **another** confidence level similar to one found in the homework (do not use the confidence level from the posted example). Based on the second confidence level, find the critical value and calculate the margin of error. In a table, state the second confidence level, the point estimate, the critical value, margin of error, and confidence interval. Put the proper symbols in the left column and the value of the statistic or properly formatted confidence interval in the right column.   The statistics and confidence interval should be rounded properly. Label this "Table 5: Confidence Interval 2."

Part 3:   Summary

Write a summary of the application, considering the following topics. The summary should be at least 150 words and be written with proper grammar and spelling. Refer to the tables (by label and number) throughout the summary. Use the proper statistical terms and symbols in the summary. Write about the concepts in the application rather than the steps followed.
- Discuss the data values, their distribution, and whether there are any unusual values.
- Discuss why the t-distribution is used and how the requirements for creating a confidence interval are met, including comments on sample size.
- Discuss the point estimate and how it is determined.
- Discuss the relationship between the confidence level and the critical value.
- Discuss the error and how the confidence interval is created. Do not describe the arithmetic steps.
- Interpret each confidence interval using the concepts presented in the textbook.
- Compare the 2 different confidence intervals, noting the differences in the critical values and errors.
- Does either one or both of the confidence intervals contain the mean that was used by the random number generator to create the sample data set?

Part 4: Format Requirements
- Include a title page with your name, STA2023 Application 2, the word count for the introduction, the word count for the summary, and which data set is used.
- The introduction and summary should be written in paragraphs that are typed and double-spaced, with 1-inch margins and a readable font type and font size. The preferred font size could be 12 Times New Roman.
- The introduction by itself should be at least 50 words.
- The summary should be at least 150 words.

- The introduction and summary should be college-level writing with proper grammar and spelling. With the exception of the interpretation of the confidence interval, do not use first or second person (I, you, etc.).
- Do not write about the parts of the assignment or the use of a calculator or excel to complete steps in the application. Write about the concepts used in the application.
- Throughout the introduction, tables, and summary, proper statistical symbols and terms should be used.
- The tables should be formatted vertically, have 2 columns, have borders, and be given the labels and titles stated in the assignment.
- The title page, introduction, tables, and summary should be a single document (.doc, .docx, or .pdf) which is submitted to the proper Assignments link in Falcon Online by the due date.
- Assemble the application (the Word document) in the following order.
    - Title page
    - Introduction
    - Tables
    - Summary

Part 5: Grading: Application 2 is worth up to 36 points, based on the following criteria.
- The **statistical content** (Part 2) is worth up to 12 points, based on completion of all the listed requirements.
- The **introduction and written summary** (Part 1 and 3) are worth up to 12 points, based on completion of all the listed requirements.
- The **format** (Part 4) of the complete document submitted to the Assignments link is worth up to 12 points, based on completion of all the listed requirements.

Rubric/allocation of 12 points:
- 0 points for completing none of the requirements
- 3 points for attempting the requirements
- 6 points for completing some of the requirements
- 9 points for completing most of the requirements
- 12 points for completing all of the requirements