Quantitative Fluency, Level B Summative Assessment: Outline & Rubric

Summative Assessment Outline

Quantitative Fluency, Level B

Competency Name: Quantitative Fluency, Level B
Competency Statement: Apply the concepts of statistical reasoning, data analysis, modeling, and interpretation.
Summative Assessment Submission Title: Case Study Analysis
Competency Objectives:

1. Analyze and interpret a statistical problem and determine the optimal solution.
2. Calculate and interpret descriptive and inferential statistical data.
3. Create and explain graphs and charts that contain statistical data.
4. Analyze and interpret real world problems using basic probability theory.
5. Explain hypothesis testing and its use in statistical analyses.
6. Analyze and interpret correlation and regression in a real world context.
7. Apply knowledge of statistics to a real-world project.

Program Learning Outcomes: N/A

Institutional Learning Outcomes: N/A

Purpose of This Assessment

The purpose of the final assessment for this competency is to demonstrate successful use of statistical tools within the context of a real-world situation.

Item Required for Submission

The item required for submission is a 12- to 15-page paper with the four distinct sections detailed below for a given case study from the perspective of a professional consultant.

Step ONE: Primary Data Analysis

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For the first section of your paper, follow the steps described below.

- Select a case study from the Appendix at the end of this document and identify the basic question you, as the researcher, want to address using this information.
- State the type of study (observational, correlational, experimental, etc.) and describe the sampling or experimental method used.
- Describe the sample and population of interest for this study.
- Identify the independent and dependent variable(s).
- Determine the level of measurement (nominal, ordinal, interval, or ratio) for all variables.
- Note confounding, lurking, or missing variables that have not been included in the case study.

Step TWO: Examination of Descriptive Statistics

The next step is to examine the data that are provided in the case study. For this section of your paper, you need to present the following information:

- Provide a discussion of summary statistics connected to the case study: mean, median, mode, standard deviation, variance, and range, referring the reader to the appendix for tables with this information.
- Describe the sample data are normally distributed, using an appropriate graphical display. Be sure to include why this verification is important.
- Identify outliers (present or not). If present, how will they affect your analysis?

Step THREE: Examination of Inferential Statistics

In the third section of your paper, conduct a hypothesis test or correlational study, describing your hypotheses, assumptions, and the tests used.

- State the null and alternative hypotheses.
- Select the significance level and determine if it is a one- or two-tailed test.
- Select your test statistic and use the traditional or p-value method to analyze the values you have obtained.
- Make a decision.

Step FOUR: Conclusions and Recommendations

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The fourth section of your paper will require you to use the results from your hypothesis test or correlational study to explain the meaning of the results within the case study's setting.

- Make an observation about your population of interest based on the results of your sample analyses
- Identify additional information that might lead you to a different conclusion.
- Note any variables that might be missing, and how they could influence your findings.
- Describe the qualitative or quantitative data that you would like to have in a subsequent analysis.
- Find at least two similar studies that include descriptive statistics and compare the findings from those studies with yours. Be sure to reference at least two scholarly sources and include them in your reference page.

Step FIVE: Complete Checklist for Submission

Before you submit, check to see if you believe you have met the criteria noted below.

Did you….

Criterion
Apply Appropriate Statistical Tools (Steps 2 and 3)
✓ Include complete and correctly calculated descriptive and inferential statistics that reflect the data provided?
✓ Adequately discuss measures of central tendency, position, dispersion, presence of outliers?
✓ Apply and present an appropriate procedure for a hypothesis test?
Present Graphical Displays of Data (Step 2)
✓ Include at least two appropriate graphical displays (distribution of raw data and distribution of data to consider normality) which are correctly labeled, scaled, and constructed?
✓ Provide a clear and appropriate explanation of the graphical displays and how they summarize the data provided?
Analyze and Discuss Your Data (Steps 1-4)
✓ Perform a thorough analysis of the purpose, sampling method, variables under consideration for the study, as well as of the descriptive and inferential statistics calculated and how the results apply to the question under study?
Present Findings in a Real World Context (Steps 1, 2, and 4)
✓ Provide strong contextual evidence, which is related to the analyses? ✓ Make recommendations and conclusions that are well supported by the data and situational factors? ✓ Provide a comparison to similar studies and thoroughly support your findings?
Writing Mechanics (Steps 1-4)

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- ✓ Demonstrate professional writing and a sophisticated presentation of all material, displaying clarity, conciseness, and correctness, by:
  - Proofreading your paper to ensure accurate spelling, grammar, and punctuation?
  - Meeting the requirements of length and formatting specifications? (Remember that the entire assignment is 12 to 15 pages in length (excluding title and reference pages). You may use any writing style for your paper, but the citations must be in APA format.
  - Including at least two scholarly sources listed correctly on the reference page?
  - Presenting raw data and summary statistics in an appendix at the end of your paper?

Step SIX: Submit Your Work

- Your completed final assessment documents should be submitted through the Final Assessment page of your competency.

- Please note, for files smaller than 10MB (i.e., most Word documents), use the corresponding "+UPLOAD STUDENT FILE" button to upload your final assessment assignments. For larger files of any type (i.e., voice-over PowerPoint files, videos, or image-heavy documents), please use the optional TEXT EDITOR to provide a URL where your grader can download your file.

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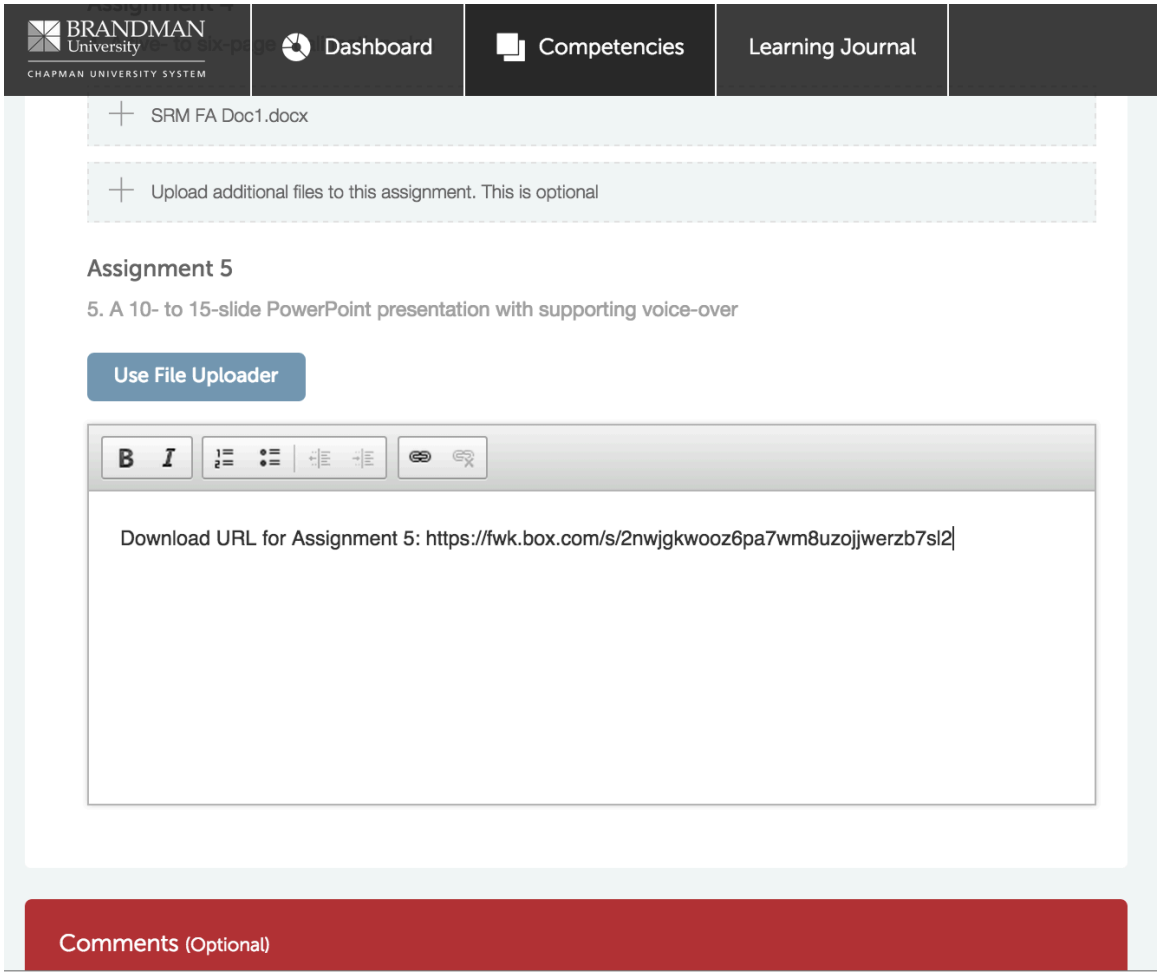

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Summative Assessment Rubric:

Quantitative Fluency, Level B

CRITERION	EMERGING (1)	DEVELOPING (2)	PROFICIENT (3)	EXEMPLARY (4)
Apply Appropriate Statistical Tools	Descriptive, summary, and inferential statistics are only partially or incompletely calculated and described. There is limited discussion of measures of central tendency, position, dispersion, and presence of outliers. An inappropriate procedure for a hypothesis test is conducted and presented. There are major errors in statistical applications.	Some descriptive, summary, and inferential statistics are complete and calculated to reflect the data provided. Some measures of central tendency, position, dispersion, and presence of outliers are adequately discussed. An appropriate procedure for a hypothesis test is conducted and presented. There may be some calculation errors or errors of interpretation.	Descriptive, summary, and inferential statistics are complete and calculated to reflect the data provided. Most measures of central tendency, position, dispersion, and presence of outliers are adequately noted and discussed. An appropriate procedure for a hypothesis test is correctly conducted and presented. There may be a few minor calculation errors in the statistics presented.	Descriptive, summary, and inferential statistics are complete and correctly calculated to reflect the data provided. Measures of central tendency, position, dispersion, presence of outliers are adequately and correctly discussed. An appropriate procedure for a hypothesis test is correctly conducted and presented.
Present Graphical Display of Data	A graphical display is not present or an inappropriate graphical display is constructed with major errors in labeling, scaling, and presentation. An explanation of the graphical display and how it summarizes the data is missing or incorrect.	An appropriate graphical display is labeled, scaled, and constructed. There may be errors in labeling and scaling. There is only a limited explanation of the graphical display and how it summarizes the data.	An appropriate graphical display is labeled, scaled, and constructed. There may be minor errors in labeling and/or scaling. An explanation of the graphical display and how it summarizes the data is mostly relevant and clear.	An appropriate graphical display is correctly labeled, scaled, and constructed. An explanation of the graphical display and how it summarizes the data is relevant and clear.
Analyze and Discuss Your Data	The student does not provide a complete analysis either of the purpose, sampling method, and variables under consideration for the study, or of the descriptive and	The student provides a partially complete analysis of the purpose, sampling method, variables under consideration for the study, as well as of the descriptive and inferential	The student provides a somewhat complete analysis of the purpose, sampling method, variables under consideration for the study, as well as of the	The student provides a thorough analysis of the purpose, sampling method, variables under consideration for the study, as well as of the descriptive and inferential

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	inferential statistics calculated and how the results apply to the question under study.	statistics calculated and how the results apply to the question under study.	descriptive and inferential statistics calculated and how the results apply to the question under study.	statistics calculated and how the results apply to the question under study.
Present Findings in a Real-World Context	Evidence provided does not relate to the analyses. Recommendations and conclusions are minimally supported by the data and situational factors. A comparison to a similar study is not present or is not adequately used to support the student's findings.	Partial contextual evidence is provided that is related to the analyses. Recommendations and conclusions are generally supported by the data and situational factors. A comparison to a similar study is present but partially used to support the student's findings.	Some contextual evidence is provided that is related to the analyses. Recommendations and conclusions are supported by the data and situational factors. A comparison to a similar study is present and is adequately used to support the student's findings.	Strong contextual evidence is provided that is related to the analyses. Recommendations and conclusions are well supported by the data and situational factors. A comparison to a similar study is present and thoroughly supports the student's findings.
Writing Mechanics	The paper lacks clarity and may be confusing; too long or short. Numerous errors in spelling, grammar and/or punctuation. Limited if any adherence to APA standards for the citations.	The paper is somewhat logical and well-written; too long or short. Errors in spelling, grammar and/or punctuation are present, affecting readability. APA standards for the citations are somewhat followed but with numerous errors.	The paper is logical, well-written, and the required length. Errors in spelling, grammar and/or punctuation are minimal and do not affect readability. APA formatting standards for the citations are mostly followed with minor errors.	The paper is logical, well-written, and the required length. Spelling, grammar and punctuation are accurate. APA formatting standards for the citations are followed; the citations and reference page is correct.

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Appendix: Case Studies for Summative Assessment

Case Study #1

Flight Delays

As an advisor to the small regional airport, you have been asked to look into the relationship between the delay times for flights and the length of the flight overall (measured in miles). The local division of the Federal Aviation Administration (FAA) has supplied you with a simple random sample of 20 recent flight delays for your analysis. The division would also like to know if the average flight delay times for this year are higher or lower than last year's average flight delay time of 42 minutes.

Length of flight (nearest 5 miles)	Flight Delay (in minutes)
720	5
1,090	16
400	3
920	11
800	6
900	6
1,400	23
1,150	12
190	1
240	2
950	8
850	10
960	11
320	2
290	3
820	7
555	7
1,005	9
950	9
540	4

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Case Study #2

Brand Name Change

A company has recently changed its brand name and would like to determine the effect (if any) on customers' perceived satisfaction with its products.
The company has provided you with a random sample of 20 products and their average customer satisfaction rating before and after the brand name change. Customer ratings range from 0 to 10 (10 representing the highest rating possible).

Determine whether there is a difference in customer satisfaction ratings before and after the brand name change.

Product	Customer Satisfaction Rating (before)	Customer Satisfaction Rating (after)
Headset A	2.4	2.7
Speakers	8.9	7.6
CD Player	5	6
DVD Player	7.2	7.1
Alarm Clock	9	8.4
Stereo	8.8	8.6
Shower Radio	7.7	7.7
Surround System	6.1	6.0
Satellite Radio	6.3	5.9
Microphone	4.3	8.2
Bluetooth Speakers	1.1	3.4
Karaoke System	2.6	3.5
Earbuds	7.2	7.5
Gaming Headset	8	8.9
Expanding Speaker	5.1	6.2
Portable Speaker	7.9	7.6
Multimedia Speaker	5.6	5.7
Phone Charger	5.2	5.3
Wireless headphones	6.4	7.8
Portable Keyboard	8.2	8.1

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Case Study #3
Insurance Claims

Veracity Insurance Company is analyzing its current policy rates. When the company first determined their rates, it was expecting an average claim amount of $1,500. After a few years, it has reason to believe that the true claim amount is higher than this figure and would like to determine a more profitable policy rate. Veracity selects 21 random claim amounts to analyze. Determine whether Veracity should change its current policy rates.

Claim Amounts	
Claimant ID	**Claim Amount**
JD43129	$820
SM55763	$999
EA12985	$1,010
RS28563	$2,078
QX55732	$3,900
YT65987	$3,045
YD23791	$1,800
PL34345	$1,950
HS21900	$1,962
LS88654	$900
OK45342	$560
DV77654	$432
LK67501	$4,010
RD54873	$5,060
PY98712	$105
LO90765	$6,010
AH76432	$1,822
HP90776	$1,756
EA76235	$2,300
JM66543	$2,001
HC89785	$2,180

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Case Study #4
Salaries (by gender)

It is claimed that women make 75 cents to every dollar a man makes when they work the same job. An organization decides to test this claim by collecting a random sample of reported salaries for 21 job titles.

Determine whether there is a significant difference in the average salaries for men and women for this particular organization.

Job Title	Salary (Male)	Salary (Female)
Accountant	$82,000	$79,000
Auditor	$76,000	$76,200
Budget Analyst	$92,000	$89,900
Business Operations Specialist	$65,000	$62,000
Claims Adjustor	$79,400	$71,500
Tax Preparer	$42,000	$35,000
Personal Financial Advisor	$110,000	$109,000
Human Resource Specialist	$56,000	$62,100
Investment Banker	$248,000	$252,000
Loan Counselor	$25,000	$27,000
Credit Analysts	$73,000	$76,500
Professional Development Officers	$79,900	$61,400
Insurance Appraisers	$52,700	$49,800
Management Analyst	$88,000	$89,000
Purchasing Agents	$56,000	$51,000
Cost Estimators	$52,450	$53,350
Training and Development Specialists	$49,870	$49,700
Insurance Underwriters	$92,000	$67,500
Emergency Management Specialists	$47,800	$49,200
Clerical Assistant	$27,100	$29,000
Customer Service Representative	$30,500	$28,300

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Case Study #5
Correlation

The managers of NorthSpire, a manufacturing company based in Washington, have asked your consulting firm to analyze whether worker productivity levels are affected by length of employment. They collect records, from a random sample of 20 employees, of the duration of each employee's tenure with NorthSpire and his/her associated productivity level.

Productivity level is measured by the percentage of target output (of manufactured units) met, recorded monthly and averaged over the entire year (e.g., a productivity level of 80% indicates that on average, the employee has met 80% of the monthly targets for that year).

Duration of Employment (years)	Annual Productivity Level (Percentage of target output per month)
5	115%
7	100%
2	98%
1	101%
12	105%
21	105%
2	95%
5	96%
6	92%
1	89%
11	82%
10	101%
7	98%
15	106%
4	99%
4	102%
9	110%
1	94%
2	105%
15	90%