

**ECO 230: Business Communication and Research**

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**Name (5 points):** \_\_\_\_\_

**Practice Exam 2**

**Multiple Choice:** Select the best-fitting response for each question or statement. (1 point each)

1. If a p-value for a test is 0.068 and the significance level used in the hypothesis test is 10%, what is your conclusion?
  - (a) Fail to reject the null hypothesis.
  - (b) Reject the null hypothesis.
  - (c) Fail to reject the alternative hypothesis.
  - (d) Reject the alternative hypothesis.
  
2. Which of the following tests involve computing the mean?
  - (a) Mann-Whitney U-test.
  - (b) Pearson correlation.
  - (c) Paired-samples T-test.
  - (d) All of the above.
  
3. Under which condition would you want to choose use the Mann Whitney U-test rather than an independent-samples t-test?
  - (a) Comparing variables related to income, whose distributions are skewed to the right.
  - (b) When data is measured on a nominal scale.
  - (c) You are interested in computing correlations.
  - (d) All of the above.
  
4. Which of the following statements is TRUE regarding Pearson and Spearman correlations?
  - (a) The Pearson correlation can be estimated using ordinal, interval, or ratio data.
  - (b) The Pearson correlation can only be estimated using nominal data.
  - (c) The Pearson correlation is a difference in means test.
  - (d) The Spearman correlation involves finding the correlation between the ranks of variables, instead of the actual values the variables take.
  
5. Suppose you collected data on employment status (two categories: unemployed and employed), and how many hours people watch TV. What statistical test would you use to determine if there was a relationship between employment status and how much people watch TV?
  - (a) Independent samples T-test.
  - (b) Chi-squared test of independence.
  - (c) Paired samples T-test.
  - (d) One-sample T-test.

6. Which of the following is NOT a necessary step for conducting a hypothesis test?
- (a) Stating the null and alternative hypotheses.
  - (b) Explaining in plain-English the value of the t-statistic.
  - (c) Using the p-value to determine whether to reject or fail to reject the null hypothesis.
  - (d) All the above are necessary steps of a hypothesis test.
7. If a researcher asked the question: "Is there a difference between men and women on the average amount of money they carry with them?" the appropriate statistical test would be:
- (a) independent samples t-test.
  - (b) paired samples t-test.
  - (c) Chi-Squared test of independence.
  - (d) one-sample t-test.
8. Which of the following test is appropriate for ordinal data?
- (a) Spearman correlation
  - (b) Mann Whitney U-Test
  - (c) Wilcoxon Signed Rank Test
  - (d) All of the above.
9. Under which of the following situations should you use the paired-samples t-test?
- (a) You collect data on academic performance for 87 individuals before and after taking a course on study skills, and you are interested in determining whether academic performance changed after taking the course.
  - (b) You collect data for 54 individuals on the number of hours students study and the number of hours students watch TV, and you are interested in whether students spend more time watching TV or studying.
  - (c) You collect data for 109 BUS 230 students for how many days they dedicated for studying for exam 1 and how many days they dedicated for studying for exam 2. You are interested in determining whether students spend different amount of days studying for each exam.
  - (d) All the above are situations appropriate for a paired-samples t-test.
10. A survey among Democrats, Republicans, and Independent voters asked, "How often do you contribute to candidates of an opposition party?" The possible answers were "always", "sometimes", and "never". Without altering the format of the data, the appropriate statistical test of differences is:
- (a) Independent samples T-test
  - (b) Paired samples T-test
  - (c) Chi-Squared test of independence
  - (d) Mann Whitney U-test
11. Under which conditions will the sampling distribution for the sample mean be normally distributed?
- (a) When the population is normally distributed.
  - (b) When the sample size is small.
  - (c) When the standard deviation of the population is small.
  - (d) The Central Limit Theorem assures the sampling distribution will always be normally distributed.

12. Which of the following research projects would a Pearson correlation test be appropriate?
- (a) A researcher tests whether college-educated 25-29 year old people have more credit card debt (measured in dollars) than non-college-educated people of the same age range.
  - (b) A researcher tests whether the ratio of credit card debt to income (a single, ratio variable) for Wisconsin residents is higher than the national average of 5%.
  - (c) A researcher computes descriptive statistics on credit card debt and income.
  - (d) A researcher tests whether there is a relationship between credit card debt (measured in dollars) and income (measured in dollars).
13. Which of the following could be considered a null hypothesis for a statistical test?
- (a) The population mean for marathon running time is equal to 4.5 hours.
  - (b) The population mean for marathon running time is less than 4.5 hours.
  - (c) The sample mean for marathon running time is equal to 4.5 hours.
  - (d) The sample mean for marathon running time is different than 4.5 hours.
14. Under which scenario do you find statistical evidence to prove the null hypothesis?
- (a) When the p-value is less than the significance level.
  - (b) When the p-value is greater than the significance level.
  - (c) When the t-statistic implies you should reject the alternative hypothesis.
  - (d) None of the above.
15. If the number of number of babies born is used to predict the sales of baby carriages, the number of babies born is the \_\_\_\_\_ variable and the unit sales of baby carriages is the \_\_\_\_\_ variable.
- (a) explanatory; outcome
  - (b) outcome; explanatory
  - (c) expected; observed
  - (d) interval/ratio; categorical
16. A Pearson correlation coefficient of zero would indicate that:
- (a) a math error has occurred.
  - (b) there is a perfect positive linear relationship between variables.
  - (c) the variables do not have a linear relationship.
  - (d) another sample should be drawn.
17. Which of the following is a valid description of a sampling distribution?
- (a) The sampling distribution is the distribution of sample data.
  - (b) The sampling distribution is only normally distributed when the population is large.
  - (c) The sampling distribution is the probability distribution of a statistic.
  - (d) The sampling distribution is the probability distribution of the population.

18. An alternative hypothesis for the Pearson Correlation test could be,
- There is no relationship between the row variable and the column variable.
  - There is a negative linear correlation between two variables.
  - There is no difference between the mean of the first variable and the mean of the second variable.
  - None of the above.
19. Which of the is NOT a valid consideration when choosing a statistical test?
- What is the research question?
  - How many variables are there?
  - How large is the population?
  - What is the scale of measurement for the variables?
20. Suppose the null and alternative hypothesis for test is given by,
- Null: The median income for people with 4-year college degrees is equal to the median income for people without a 4-year college degree.
  - Alternative: The median income for people with 4-year college degrees is greater than the median income for people without a 4-year college degree.
- Suppose the p-value of the test is 0.031 and the significance level you use is 5%. Which of the following is the correct conclusion of the test?
- We found sufficient statistical evidence* that the median income for people with a 4-year college degree *is equal to* the median income for people without a 4-year college degree.
  - We failed to find sufficient statistical evidence* that the median income for people with a 4-year college degree *is equal to* the median income for people without a 4-year college degree.
  - We found sufficient statistical evidence* that the median income for people with a 4-year college degree *is greater than* to the median income for people without a 4-year college degree.
  - We failed to find sufficient statistical evidence* that the median income for people with a 4-year college degree *is greater than* to the median income for people without a 4-year college degree.
21. Suppose you measure the productivity of workers by the number of units of output they produce per hour. You want to test if a financial incentive increases productivity, so you compare the productivity of the same workers after the incentive is offered to their productivity before the incentive was offered. Which statistical test would you use?
- Paired-sample t test.
  - Independent samples t test
  - Chi-Squared test of independence
  - One sample t test
22. Which of the following is correct statement about nominal data?
- With nominal data, the mean can be computed, but not the median.
  - With nominal data, the median can be computed, but not the mean.
  - Nominal data is data organized into categories that *cannot* be ordered in a meaningful way.
  - None of the above.

23. Suppose a human resources department surveys a sample of its employees to determine the level of satisfaction that employees have with their health insurance policy. The survey asks about level of satisfaction on the following four-point scale: Very satisfied, satisfied, unsatisfied, very unsatisfied. Suppose the researcher wants to test whether the median response of employees is above unsatisfied. What statistical test should be used?
- (a) Single-Sample Wilcoxon Signed Rank test.
  - (b) Independent samples t-test.
  - (c) Pearson correlation coefficient.
  - (d) Any of the above tests could be used.
24. Which of the following is a possible alternative hypothesis for a Paired-Samples t-test?
- (a) The two groups are positively linearly correlated.
  - (b) There is zero linear correlation between the two groups.
  - (c) The mean for the each of the two groups are different from each other.
  - (d) None of the above.
25. Which of the following tests involve comparing the mean between two groups?
- (a) Chi-squared test of independence.
  - (b) Spearman correlation.
  - (c) One-sample t-test.
  - (d) Independent samples t-test.

**Directions:** Write your answers in the space provided. Please include the following in every answer:

- Write down the one line of code that produced the output needed to answer the question.
- Report what statistical test or procedure you are using to answer the question. For every hypothesis test, be sure to include every step of hypothesis testing.

The dataset `jobsat.RData` includes the following variables related to job satisfaction for Jewish public workers:

- **Satisfaction:** ratio scale, measure of overall job satisfaction
- **Supervision:** ratio scale, a measure of how satisfied an employee is with their supervisor
- **Promotion:** ratio scale, a measure of how satisfied an employee is with their opportunities for promotion
- **Married:** Binary variable equal to 1 if person is married, 0 otherwise.

28. Answer the following questions regarding **overall job satisfaction** and **marital status**.

(a) (5 points) Report and interpret a 95% confidence interval for the mean level of satisfaction.

(b) (5 points) Is there evidence that the median level of job satisfaction is different for married employees versus employees that are not married?

- (c) (5 points) Report the mean level of job satisfaction for married employees and unmarried employees. Report and interpret a 95% confidence interval for the difference between job satisfaction between married and unmarried employees.
- (d) (5 points) Is there evidence that the mean level of job satisfaction for married employees is greater than 64?
- (e) (5 points) Report and interpret a 95% confidence interval for the mean level of job satisfaction for married employees.
- (f) (5 points) Report and interpret a 95% confidence interval for the interpolated median level of job satisfaction for all employees.

29. Answer the following questions regarding **promotion satisfaction** and **supervision satisfaction**

(a) (5 points) Is there evidence that the median level of promotion satisfaction is different than supervision satisfaction?

(b) (5 points) Report the mean levels of promotion satisfaction and supervisor satisfaction. Which of these two dimensions of workplace satisfaction is higher?

(c) (5 points) Report and interpret the 95% confidence interval for the mean level of supervision satisfaction.

(d) (5 points) Report and interpret the 95% confidence interval for the difference between the mean promotion satisfaction and supervision satisfaction.



(e) (5 points) Is there evidence that satisfaction regarding promotion and supervision are positively correlated?

30. (5 points) Describe when it is appropriate to compute the median, but not the mean.

31. (5 points) Describe the difference of the influence that extremely large values have on the mean versus the median.

32. (5 points) Describe the definition and purpose of the interpolated median.