

MTH 324, Exam #2, Fall 2023 Name _____

Instructions: Answer each question thoroughly. For questions in Part 1, use the work you did at home to answer the questions. Be sure to answer each part of each question. In Part 2, report exact answers unless directed to round.

Part I:

1. A sample of 81 students is selected and it is determined that their mean math ACT score is 24.2. If the true mean math score is actually 21.6 (with a standard deviation of 5.2), what is the power of the one-sample test to detect this 3-point difference?

Use the work you did at home to answer these questions about sales and the card type in our dataset.

2. State your null and alternative hypotheses for the card type question.
3. What kind of test did you conduct? What is the P-value for your tests?
4. What do you conclude from your test? State your conclusion in plain language in context.
5. What is the null and alternative hypotheses for your two-way ANOVA?
6. What were the results of your test? Using Tukey's method and a box plot, which factors or combination of factors produced the most sales. Explain your reasoning.

10. Describe the normality of the data? Is it normal? Are there significant deviations from normal?

11. Describe the Tukey intervals for the three main effects. (Explain what each one means.)

12. State the null and alternative hypotheses for your one-sample test of credit card debt levels.
What is your P-value? What did you conclude?

13. For your sampling distribution, describe the shape of the distribution.

14. What is the mean of your means? What is the mean of the data? Are they similar?

15. What is the standard deviation of your means? What is the standard deviation of the data? Given that you took samples of size 50, what is the predicted standard error from the central limit theorem? Is it similar to what you simulated?

Part II:

16. Describe the main results of the Central Limit Theorem.

17. A sample of the weights of seven feral cats is collected and the data is found to be $\{7.8, 9.1, 6.4, 5.8, 7.3, 7.7, 8.2\}$ pounds each. Assuming the data follows a normal distribution, use the method of moments to find estimates for the mean and variance.

18. At the beginning of the semester a representative sample of 342 students were surveyed and asked if they owned a dog. The sample proportion was 0.31. Use this information to construct a 95% confidence interval for the proportion of all college students who own a dog.

19. If you want to determine the appropriate sample size needed to conduct a poll with just at 2.5% margin of error for a proportion, with a 95% level of confidence, use the formula $n = p(1 - p) \left(\frac{z^*}{E}\right)^2$. Use this formula with $p = 0.5$ to estimate the sample size needed.

20. Describe what a Latin Square design is. Give an example of a Latin Square design for three levels of data, each with 4 levels each.