Name_____

STATS EXAM 3
Fall 2017
Form A

Show as much work as possible for partial credit!

Please round your answers to four digits after the decimal when possible. Make sure to put your final answers neatly within the answer boxes (when provided).

All questions are worth 4 points unless noted otherwise.

A

A

1. (15 points) Dirt bikes are simpler and lighter motorcycles that are designed for off-road events. Specifications for dirt bikes can be found through Motorcycle USA. A random sample of 30 dirt bikes has a mean fuel capacity of 1.91 gallons with a standard deviation of 0.74 gallons. At the 10% significance level, is there sufficient evidence to conclude that the mean fuel tank capacity of all dirt bikes is less than 2 gallons?
    a. State the appropriate null and alternative hypothesis.

    b. Calculate the test statistic.

    c. Calculate the corresponding p-value.

    d. Make and justify a statistical decision using a significance level of 5%.

    e. Interpret your decision in the context of the problem.

Use the following information to answer the next two questions

Suppose it is known that 63% of American adults have an organ donor card. A random sample of 240 American adults is selected.

2. Fill in the blanks to describe the distribution of the **proportion** of adults in the sample of 240 Americans who have an organ donor card

    _____~_____(_____, _____)

3. Find the probability that between 60% and 70% of the sample of 240 Americans will have an organ donor card.

A

Use the following information to answer the next three questions

The manager of a local fast food restaurant is concerned about customers who ask for a water cup when placing an order but fill the cup with a soft drive from the beverage fountain instead of filling the cup with water. The manager selected a random sample of 80 customers who asked for a water cup when placing an order and found that 23 of those customers filled the cup with a soft drink from the beverage fountain.

4. Construct a 95% confidence interval for the proportion of all customers who, having asked for a water cup when placing an order, will fill the cup with a soft drink from the beverage fountain.

5. Interpret the interval you found above.

6. The manager estimates that each customer who asks for a water cup but fils it with a soft drink costs the restaurant $0.25. Suppose that in the month of June, 3000 customers ask for a water cup when placing an order. Use the confidence interval in part (a) to given an interval estimate for the cost to the restaurant for the month of June from customers who ask for a water cup but fill the cup with a soft drink.

7. Toilets with an automatic sensor flushing system use motion as their evidence. Considering a null hypothesis that you are not done pooping, which of the following would correctly describe a Type II error in this situation?
    A. The toilet doesn't flush when you are done pooping.
    B. The toilet doesn't flush when you are not done pooping.
    C. The toilet flushes when you are done pooping.
    D. The toilet flushes when you are not done pooping.

A

8. Over the past several years 58% of adults believed that global warming was real. A 2012 Gallup Poll of 1014 adults found that 52% of the sample believed that global warming was real. Is there enough evidence to show the proportion who believes in global warming has changed?
   Identify the appropriate null and alternative hypotheses.
   A. $H_0 : p = 0.52 \quad H_a : p \neq 0.52$
   B. $H_0 : p = 0.58 \quad H_a : p < 0.58$
   C. $H_0 : p = 0.58 \quad H_a : p \neq 0.58$
   D. $H_0 : p = 0.52 \quad H_a : p > 0.52$

9. Which of the following will result in a narrower confidence interval for a mean? Circle the correct answers:

   Increasing / Decreasing the sample size.

   Increasing / Decreasing the confidence level.

10. In performing a two-sided hypothesis test, you calculated that the test statistic z = 2.10. What is the appropriate p-value?
    A. 0.0179 B. 0.5 C. 0.9821 D. 0.0358 E. 1.9642

11. (5 points) A researcher wishes to estimate the population proportion of U.S. adults who are overweight. They wish to estimate the proportion to within 4.5% with 95% confidence. How many individuals should be included in the sample?

12. In a random sample of 14 iPads, the sample mean battery life was calculated to be 10.2 hours with a standard deviation of 2.5 hours. Which of the following is a 95% confidence interval for the population mean battery life of an iPad?
    A. (8.8904, 11.5096)
    B. (8.7668, 11.6332)
    C. (8.7568, 11.6432)
    D. (8.9912, 11.4088)
    E. None of the above

13. A survey was conducted to estimate the proportion of adults who say it is acceptable to check personal e-mail while at work. A 95% confidence interval was calculated to be (0.633, 0.691) Identify the margin of error.

    A. 0.029 B. 0.058 C. 0.662 D. 1.96

A

14. A 95% confidence interval is computed to estimate the mean household income for a city. Which of the following values will definitely be within the limits of this confidence interval?
    A. The population mean
    B. The sample mean
    C. The standard deviation of the sample mean
    D. None of the above

15. Suppose two researchers want to estimate the proportion of American college students who favor abolishing the penny. They both want to have about the same margin of error to estimate this proportion. However, Researcher 1 wants to estimate with 99% confidence and Researcher 2 wants to estimate with 95% confidence. Which researcher would **need more students** for her study in order to obtain the desired margin of error?
    A. Researcher 1.
    B. Researcher 2.
    C. Both researchers would need the same number of subjects.
    D. It is impossible to obtain the same margin of error with the two different confidence levels.

16. A researcher conducts an experiment on human memory and recruits 15 people to participate in her study. She performs the experiment and analyzes the results. She obtains a p-value of 0.17. Which of the following is a reasonable interpretation of her results?
    A. This proves that her experimental treatment has no effect on memory.
    B. There could be a treatment effect, but the sample size was too small to detect it.
    C. She should reject the null hypothesis.
    D. There is evidence of a small effect on memory by her experimental treatment.

17. Which of the following is a **true** statement regarding the comparison of t-distributions to the standard normal distribution?
    A. The normal distribution is symmetrical whereas the t- distributions are slightly skewed.
    B. As the degrees of freedom increases, the t-distribution approaches the standard normal curve.
    C. The shape of the standard normal distribution changes as the sample size increases, but the shape of the t-distribution does not change.
    D. The total area under the t-distribution is larger than the total area under the standard normal distribution

18. Explain why Z test and Z intervals are unrealistic to actually do outside of an introductory statistics class.

A

Use the following information to answer the following two questions
Do people lie about voting? A survey was conducted to determine the proportion of eligible voters who **said** that they voted in the recent presidential election. Based on the response of 1002 randomly selected adults a 96% confidence interval was calculated to be (0.671, 0.728).

19. Voting records show that 68% of eligible voters actually did vote. Use the above confidence interval to test the null hypothesis that people do not lie about voting (so the proportion who say they vote is the same as the proportion who actually vote)
    A. There is enough evidence to conclude that the people do not lie about voting.
    B. There is not enough evidence to conclude that the people do not lie about voting.
    C. There is enough evidence to conclude that the people lie about voting.
    D. There is not enough evidence to conclude that the people lie about voting.

20. (2 points) What is the level of significance of the above hypothesis test?

A. 0.02 B. 0.04 C. 0.05 D. 0.06 E. Not enough information.

21. Which situation best describes when to declare results statistically significant?
    A. The p-value is less than the significance level and we fail to reject the null hypothesis.
    B. The p-value is less than the significance level and we reject the null hypothesis.
    C. The p-value is greater than the significance level and we reject the null hypothesis.
    D. The p-value is greater than the significance level and we fail to reject the alternative hypothesis.

22. (2 points) What critical value (table value) would you use to create a confidence interval for the true average weight of a watermelon if you used a sample of size 20?

True / False, each worth 3 points.

23. The null hypothesis should be what you are trying to prove.
    TRUE / FALSE

24. If we increase the Type I error in our hypothesis test, we will also increase the power.
    TRUE / FALSE

25. If we increase the sample size, the sampling distribution of the sample mean will be less spread out.
    TRUE / FALSE

Goldilocks Survey

Difficulty: I felt that this exam was…. too easy / just right / too hard.

Length: I felt that this exam was…. too short / just right / too long.