STAT 145 Math Crash Review for Final

1. Which statement is *not* true about confidence intervals?
   A) A confidence interval is an interval of values computed from sample data that is likely to include the true population parameter value.
   B) An approximate formula for a 95% confidence interval is *sample estimate* ± *margin of error*.
   C) A confidence interval between 20% and 40% means that the population proportion definitely lies between 20% and 40%.
   D) A 99% confidence interval procedure has a higher probability of producing intervals that will include the population parameter than a 95% confidence interval procedure.
   E) Confidence intervals are (by definition) statistical inference procedures.

2. True or False: The p-value is the probability that the null hypothesis is true.
   A) True
   B) False

3. What statement is true about both $\hat{p}$ and μ?
   A) They are both parameters
   B) They are both statistics
   C) They are both symbols pertaining to means
   D) μ is a statistic and $\hat{p}$ is a parameter
   E) μ is a parameter and $\hat{p}$ is a statistic

4.

. Which of the following correlation values indicates the strongest linear relationship between two quantitative variables?
   A) r = –0.65
   B) r = –0.30
   C) r = 0.00
   D) r = 0.11
   E) r = 0.60

Consider the Minitab output given below. What is the value for the sample proportion ($\hat{p}$)?

Sample	X	N	Sample p	95% CI
1	38	70	???	(0.419421, 0.662552)

5.
- a. 0.4194
- b. 0.542857
- c. 0.6625
- d. 38

If (13.10, 13.73) is a 95% confidence interval for a population mean, which of the following would be a 90% confidence interval calculated from the same set of sample data?

6.
- a. (13.04, 13.79)
- b. (13.06, 13.77)
- c. (12.99, 13.84)
- d. (13.15, 13.68)

How does sample size affect the width of a confidence interval?

7.
- a. Sample size does not affect the width of a confidence interval.
- b. A larger sample will result in a wider confidence interval.
- c. A larger sample will result in a narrower confidence interval.
- d. A larger sample will result in a different confidence interval with the same width.

Which of the following does NOT apply to t critical values?

8.
- a. The t critical value depends on the degrees of freedom.
- b. The t critical value tells you how many standard deviations are needed to reach the desired confidence for numerical data.
- c. As the amount of confidence increases, the t critical value gets larger.
- d. A t critical value represents the center of the confidence interval.

Based on the Minitab output below for a random sample of GPA's, what is the margin of error for the estimate of mean GPA of the population?

One-Sample T: GPA

Variable	N	Mean	StDev	SE Mean	99% CI
GPA	200	2.63000	0.58033	0.04104	(2.52328, 2.73672)

9.
- a. 0.11
- b. 0.58
- c. 0.041
- d. 2.63

According to the Educational Testing Service (ETS), the average score on the SAT exam is 1200. A group of high school students would like to convince others that the average score is actually lower. What would be the null and alternative hypotheses?

10.

- a. H_0: $\mu = 1200$ versus H_a: $\mu \neq 1200$
- b. H_0: $\mu \geq 1200$ versus H_a: $\mu < 1200$
- c. H_0: $\mu \leq 1200$ versus H_a: $\mu > 1200$
- d. H_0: $\mu \neq 1200$ versus H_a: $\mu = 1200$

Which of the following is the definition of a Type II error for a statistical test?

11.

- a. It is denoted by α.
- b. It is the error of rejecting the null hypothesis when it is true.
- c. It is the error of NOT rejecting the null hypothesis when it is false.
- d. It is the probability of making a correct decision.

When is the conclusion of a test "CANNOT reject H_0"?

12.

- a. We CANNOT Reject H_0 when p-value > α.
- b. We CANNOT Reject H_0 when when p-value < β.
- c. We CANNOT Reject H_0 when when p-value = α.
- d. We CANNOT Reject H_0 when when p-value < α.

A researcher conducted a hypothesis test for the mean salary of recent graduates with H_0: $\mu \leq 40{,}000$ versus H_a: $\mu > 40{,}000$. His data had a p-value = 0.03. Which of the following statements is correct using a significance level of $\alpha = 0.05$?

13.

- a. The researcher failed in his attempt to reject the null hypothesis. He concluded that the mean salary of recent graduates is greater than $40,000.
- b. The researcher rejected the null hypothesis. He concluded that the mean salary of recent graduates is less than $40,000.
- c. The researcher failed in his attempt to reject the null hypothesis. He concluded there that the mean salary of recent graduates is less than $40,000.
- d. The researcher rejected the null hypothesis. He concluded that the mean salary of recent graduates is greater than $40,000.

Which of the following would represent a Type I error for H_0: $p \leq 0.35$ versus H_a: $p > 0.35$?

14.

- a. The population proportion is ≤ 0.35, and our sample does not have enough evidence to reject this, so we believe that ≤ 0.35 is true.
- b. The population proportion is ≤ 0.35, but our sample has enough evidence to reject this, so we believe that > 0.35 is true.
- c. The population proportion is > 0.35, and our sample has enough evidence to support this, so we believe that > 0.35 is true.
- d. The population proportion is > 0.35, but our sample does not have enough evidence to support this, so we believe that ≤ 0.35 is true.

15. A student takes a standardized exam. The grader reports the student's standardized score (z-score) as $z = -1.8$. This indicates:

a. The student scored lower than the average.

b. The student scored less than one standard deviation from the average.

c. A mistake has been made in calculating the score, since a standard score can never be negative.

d. Both a and b, but not c.

16. A correlation of $r=0.85$ indicates that the graph of the data would show

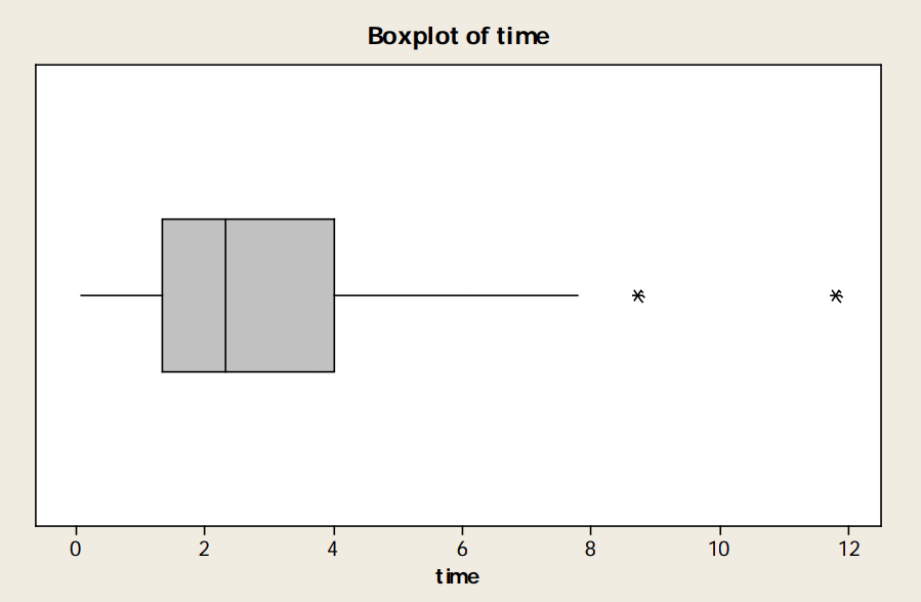
a. Points tightly packed around a line that slopes up to the right.

b. Points tightly packed around a line that slopes down to the right.

c. Points widely scattered around a line that slopes up to the right.

d. Points widely scattered around a line that slopes down to the left.

17. A study was conducted on the amount of time drivers wait for a stoplight to change at a particular intersection. The amount of time spent by 300 drivers was recorded and the resulting data were used to create this boxplot.



a. The median amount of time spent at this traffic light was

a. 1.0. b. 2.3. c. 4.0. d. It is impossible to tell without the standard deviation.

b. The top 25% of drivers waited over

a. 1.3. b. 2.3. c. 4.0. d. It is impossible to tell without the standard deviation.

19. The mean amount of time spent at this traffic light was

a. greater than the median.

b. less than the median.

c. about the same as the median.

d. It is impossible to tell without the standard deviation.

20. A college president would like to know more about students and has formed a committee to analyze a campus-wise online survey recently done. The sample consists of responses from n = 173 randomly selected students and is believed to be representative of the student body. They are particularly interested in the lives of athletes on campus. They notice that among 173 students in the survey, 53 participate in varsity sports. **Based on the survey results, construct and interpret a 95% confidence interval for the proportion of students who are varsity athletes.**

21. Suppose that an automobile manufacturer advertises that its new hybrid car has a mean gas mileage of 50 miles per gallon. You take a simple random sample of n = 30 hybrid vehicles and test their gas mileage. You find that in this sample, the average is $\bar{x}$ = 47 miles per gallon with a standard deviation of s = 5.5 miles per gallon. Perform a hypothesis test (with alpha = .05) to determine if the true mean gas mileage is different from 50 mpg.

22. An e-commerce research company claims that 60% or more graduate students have bought merchandise on-line. A consumer group is suspicious of the claim and thinks that the proportion is lower than 60%. A random sample of 80 graduate students show that only 22 students have ever done so. Is there enough evidence to show that the true proportion is lower than 60%? Perform a hypothesis test with alpha = .05.

23. A faculty advocacy group is concerned about the amount of time teachers spend each week doing schoolwork at home. A simple random sample of 56 teachers had a mean of 8.0 hours per week working at home after school and a sample standard deviation of 1.5 hours per week. **Construct and interpret a 95% confidence interval for the mean number of hours per week a teacher spends working at home.**

24. A consumer advocacy group recorded several variables on 140 models of cars. The resulting information was used to produce the following regression output that relates the city gas mileage (in mpg) and the engine displacement (in cubic inches).

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The regression equation is
mpg:city = 33.4 - 0.0624 displacement

R-Sq = 66.0%
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a. We have a car that has an engine with 150 cubic inches. Based on this output, what city gas mileage would you predict for this car?

b. Would the correlation value be positive or negative? How do you know?

c. Based on this output what is the correlation between city gas mileage and displacement?

d. What proportion of variability/spread in the city gas mileage is being explained by the regression line?