STAT 145 Math Crash SOLUTIONS

STAT 145

1. C
2. B
3. E
4. A
5. B
6. D
7. C
8. D
9. A
10. B
11. C
12. A
13. D
14. B
15. A
16. A

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. ← TRUE
   B) An approximate formula for a 95% confidence interval is ***sample estimate ± margin of error.*** ← TRUE
   C) A confidence interval between 20% and 40% means that the population proportion definitely lies between 20% and 40%. — NO, not definitely!!
   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. yes! TRUE
   E) Confidence intervals are (by definition) statistical inference procedures. yes! TRUE

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

NO, its the probability of getting sample data like you did ...or more extreme... assuming the null is true.

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

Parameter (describes population)
μ or P

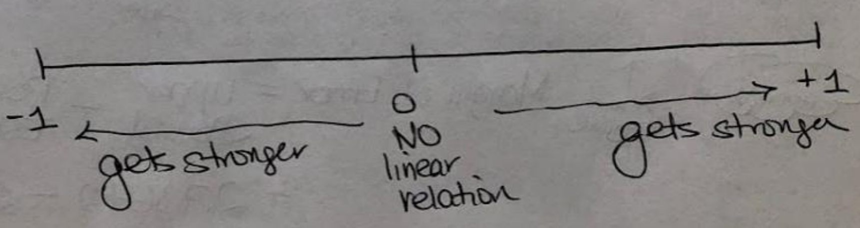
Statistic (describes a sample)
$\bar{x}$ or $\hat{p}$

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

The higher the "r" value, — closer to +1 or closer to −1 — the stronger the linear relation.

A r=−.65



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

Sample p ($\hat{p}$) is the middle of CI

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?

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

90% is a smaller Interval

It's more narrow

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

$\bar{x} \pm (t) \frac{s}{\sqrt{n}}$

a. Sample size does not affect the width of a confidence interval.
7. 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.

If n increases, SE decreases, and ME decreases.

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

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

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)

upper

↑ Point Estimate

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

Margin of Error = Upper Bound − Point Estimate

= 2.73672 − 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: $\mu < 1200$ or H_0: $\mu = 1200$ and 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 $> \alpha$.
- b. We CANNOT Reject H_0 when when p-value $< \beta$.
- c. We CANNOT Reject H_0 when when p-value $= \alpha$.
- d. We CANNOT Reject H_0 when when p-value $< \alpha$.

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 $\alpha = 0.05$? P-value $\leq .05(\alpha)$ ∴ WE CAN REJECT H_0

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. REJECT H_0
- 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. 1.8 standard errors less, in fact.

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.

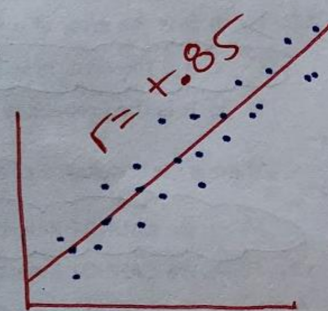
16. A correlation of r=0.85 indicates that the graph of the data would show

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

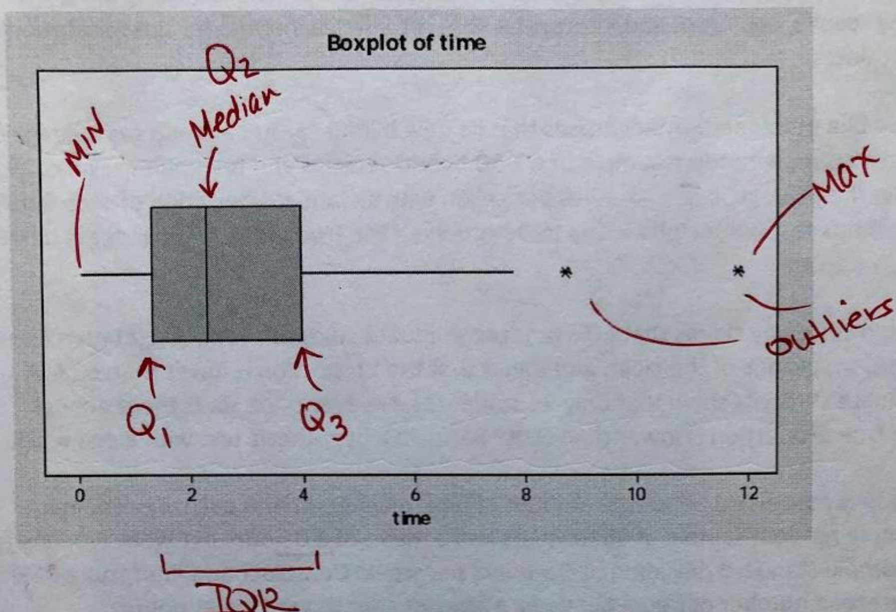
b. Points tightly packed around a line that slopes down to the right.

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 PROPORTION

Estimate p w/ 95% conf.

$$\hat{p} \pm (z)\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$\hat{p} = \frac{53}{173} = .3064$$

Stat → Tests → A: 1 prop Z INT

$$\hat{p} \pm (z)\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.3064 \pm (1.96)(.035)$$

$$.3064 \pm .0687$$

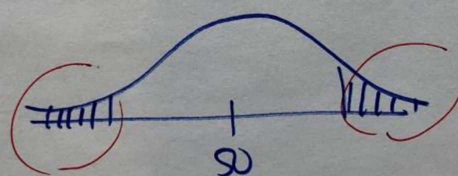
$$(.238 \; , \; .375)$$

#21 Numerical data
Miles per gallon
μ = the true mean mpg for hybrid
Goal: Show that $\mu \neq 50$ mpg.

$H_0: \mu = 50$
$H_a: \mu \neq 50$

$t = \frac{47-50}{5.5/\sqrt{30}} = -2.99$, df = 29

P-value
.0057



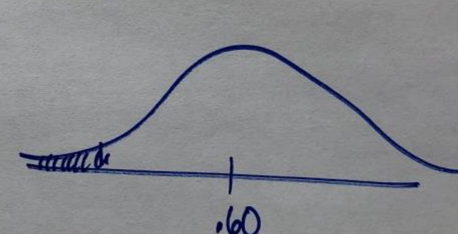
We CAN reject Ho
At the 5% level of significance, the sample data does provide sufficient evidence to say that the true mean mpg. for hybrids is different than 50 mpg.

#22 Purchased online ? Y/N
Categorical
p = the true proportion that purchase online

Goal $p < .60$

$H_0: p = .60$ or $p \geq .60$
$H_a: p < .60$
Z = ______

S: 1 prop Z test



The P-value is less than alpha and we can reject Ho. There is sufficient evidence to say that the true proportion is less than .60

#23

Hours per week of working at home

Numerical

μ = the true mean hours per week

Estimate μ with 95% conf.

$n = 56$
$df = 55$

$$\bar{x} \pm (t)\, s/\sqrt{n}$$

$$8 \pm (2.004)\, 1.5/\sqrt{56}$$

$$8 \pm .40169$$

Stat → Tests → 8: T-interval

$$(7.598, 8.402)$$

#24

$$\text{City} = 33.4 - .0624(\text{displacement})$$

$$y = 33.4 - .0624(x)$$

a) $y = 33.4 - .0624(150)$

$y = 24.04$

City MPG for 150 in^3 is $\underline{\underline{24.04}}$

b) CORRELATION will be $\underline{\underline{\text{NEGATIVE}}}$ SINCE SLOPE is N

c) If $R^2 = 66\%$

$r = \sqrt{.66} = \underline{\underline{-.81}}$ ← correlation

d) 66% of the spread in City gas mileage is being explained by the line.