Review for the Final Exam STA 3123

1) Three types of oil absorbing materials are compared. The amount of oil absorbed by a square meter of the material is weighed. Use the ANOVA table below to test the claim at the 1% significance level that the three different materials absorb the same amount of oil on average.

ANOVA

Weight

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.595	2	7.898	6.06	.07
Within Groups	23.143	18	1.286		
Total	38.738	20			

a. What do you conclude?

b. If this test rejects the null, can this test tell us which means differ significantly?

A) a. The three methods don't all absorb the same amount of oil. b. No, it can't.
B) a. The three methods all absorb the same amount of oil. b. Yes, it can.
C) a. The three methods all absorb the same amount of oil. b. No, it can't.
D) a. The three methods don't all absorb the same amount of oil. b. Yes, it can.

2) We are interested in comparing the average supermarket prices of two leading colas. Our sample was taken by randomly selecting eight supermarkets and recording the price of a six–pack of each brand of cola at each supermarket. What procedure you will use?

A) ANOVA CRD
B) Matched Pair t–test
C) One Sample t–test
D) The t–test for independent samples

Solve the problem.

3) We have created a 95% confidence interval for μ with the result (8, 13). What conclusion will we make if we test H_0: $\mu = 12$ vs. H_a: $\mu \neq 12$ at $\alpha = .05$?

A) Accept H_0 rather than H_a.
B) Fail to reject H_0.
C) Reject H_0 in favor of H_a.
D) We cannot tell what our decision will be with the information given.

4) A 99% confidence interval for the average salary of all CEOs in the electronics industry was constructed using the results of a random survey of 45 CEOs. The interval was ($130,592, $142,389). To make more useful inferences from the data, it is desired to reduce the width of the confidence interval. Which of the following will result in a reduced interval width?

A) Decrease the sample size and increase the confidence level.
B) Increase the sample size and increase the confidence level.
C) Increase the sample size and decrease the confidence level.
D) Decrease the sample size and decrease the confidence level.

5) A random sample of 4000 U.S. citizens yielded 2250 who are in favor of gun control legislation. A 90% confidence interval was constructed for the true proportion of people who are in favor of gun control. The resulting interval was as follows: [0.543, 0.583]. If the NRA claims that 55% of the public supports gun control legislation, does this interval contradict their claim?

A) Yes, because 67% is outside the interval.
B) No, because 56.3% is the sample proportion.
C) No, because 55% is inside the interval
D) Yes, because 33% is outside the interval.

Solve the problem.

6) The results of a Bonferroni analysis are summarized below.

Supermarket	C	B	A
Mean Price	1.665	1.919	1.925

Interpret the Bonferroni analysis results.

A) C has a significantly larger mean price than either of the other two supermarkets.
B) C has a significantly smaller mean price than either of the other two supermarkets.
C) B and A have significantly different mean prices.
D) A has a significantly larger mean price than either of the other two supermarkets.

7) Which procedure gives the best results for pairwise comparisons when the sample sizes of the treatments are not equal?

A) Bonferroni
B) Tukey
C) ANOVA
D) Scheffé

8) What is the connection between the following inference methods: Kruskall–Wallis H–test, ANOVA for CRD, and Independent samples t–test ?

A) They all use blocking to isolate the variation due to treatments from the variation due to a sources we are not primarily concerned with.
B) All of them have the assumption of normality underlying the statistical test.
C) All of them are used for two or more independent samples.
D) They all use a test statistic that has an f–distribution.

9) For a right-tailed test of hypothesis about the mean at the 5% significance level, what can be said about the probability of committing the type one error?

A) exactly 0.05 B) at least 0.05 C) at most 0.05 D) exactly 0.95

10) If a researcher decides to use a 8% significance level for a hypothesis test instead of a 5% level and he/she keeps everything else the same, what effect will this have on the hypothesis test?

A) The type I error will increase, but the type II error will decrease.
B) The type I error will decrease, but the type II error will increase.
C) Both the type I and II error rates will decrease.
D) Both the type I and II error rates will increase.

11) There exists the one proportion Z–test which is used to test claims like the percentage of Americans who have a college degree is greater than 34%. What procedure exists to test claims such as: the proportion of African Americans with a college degree is equal to the proportion of Latin Americans with a degree, which is equal to the proportion of Asian Americans with a college degree?

A) The Wilcoxon Rank Sign test
B) The t–test for independent samples
C) The Anova CRD procedure
D) The Kruskal–Wallis H test
E) The Chi–Squared Test for a one–way table.

12) ANOVA CRD is to the Friedman Fr test as the:

A) Independent t–test is to the Wilcoxon Sign Ranktest (for dependent samples)
B) Anova RBD is to the Friedman Fr test
C) One sample Z–test is to the One sample t–test
D) Independent t–test is to the Chi–Squared test for independence using a two way table.

13) What procedure could you use to test the claim that the mean time to finish a Bachelor's degree at FIU is less than in FAU?

A) ANOVA CRD B) Two sample t–test
C) The Friedman Fr test D) The Chi–Squared Goodness of Fit test

14) How can you reduce the probability of both a type one error and a type two error simultaneously?

A) Reduce the significance level and reduce the variance.
B) Increase the sample size, n, while lowering the significance level.
C) Decrese the sample size and raise the significance level.
D) Increase the significance level and increase the sample size, n.

15) If I tested the effectiveness of four kinds of headache medication and a placebo using a CRD and I was able to reject the null hypothesis, What does this say about the headache meds?

A) At least one of the headache meds or the placebo reduces pain in patients suffering from a headache.
B) All of the headache meds reduce pain in patients suffering from a headache.
C) There is not enough information to answer this question.
D) The medications are not effective.

16) If the significance level for a hypothesis test is 0.01 and the p-value for the test ends up being 0.034, after forming the appropriate conclusion based on the p-value, which possible error could have be committed, type I or type II.

A) Since we rejected the null, we might have committed a type two error.
B) Since we did not reject the null, we might have committed a type one error.
C) Since we rejected the null, we might have committed a type one error.
D) Since we did not reject the null, we might have committed a type two error.

17) A company needs to estimate the average total compensation of CEOs in the service industry. Data were randomly collected from 35 CEOs and the 95% CI was calculated to be ($2,256,000, $5,580,000). What assumptions are necessary for this CI to be valid?

A) The sample is randomly selected from a population of total compensations that is a t distribution.
B) The total compensation of CEOs in the service industry is approximately normally distributed.
C) None. The Central Limit Theorem applies.
D) The distribution of the means is approximately normal.

18) The following equation uses the waist measurement of a woman (x) and her body fat percentage (y): $y = 1.86 + 0.5x$. The correlation coefficient is $r = 0.966$, and the average body fat percentage was 15%. What body fat percentage would you expect women to have on average when their waist size was 30 inches?

A) 13.28% B) 1.86% C) 16.28% D) 16.86% E) 15.17%

19) Which arrangment below correctly orders the procedures from **most** powerful to **least**?

A) Two Sample Z–test, Two Sample t–test, The Wilcoxon Sum Rank Test
B) Wilcoxon Sign Rank test, Chi–Squared test for independence, One Proportion Z–test
C) Kruskal–Wallis, Friedman Fr–test, ANOVA CRD
D) Wilcoxon Rank Sum, Wilcoxon Sign Rank test, Independent t–test

20) The Wilcoxon Rank Sign test is to the Wilcoxon Rank Sum test as

A) The one sample z–test is to the Wilcoxon Sign Rank Test
B) the Kruskal–Wallis H test is to the ANOVA RBD
C) Independent t–test is to the Chi–Squared test for independence using a two way table.
D) The Match Pair t–test is to the Independent Sample t–test

21) A marketing research company is estimating the average total compensation of CEOs in the service industry. Data were randomly collected from 18 CEOs and the 99% confidence interval for the mean was calculated to be ($2,181,260, $5,836,180). Explain what the phrase "99% confident" means.

A) 99% of the population values will fall within the interval.
B) 99% of the similarly constructed intervals would contain the value of the sample mean.
C) In repeated sampling, 99% of the intervals constructed would contain μ.
D) 99% of the sample means from similar samples fall within the interval.

22) The least squares regression line for two variables x and y is given here: y = 4.23 +1.76 x. If the coefficient of determination is $r^2 = 0.914$, find the correlation coefficient r.

A) 0.956 B) –1.76 C) 2.62 D) –0.956 E) 2.55

23) Which test does not assume normality for the populations involved?

A) Friedman Fr – test B) One sample t– test C) ANOVA CRD D) One Sample Z–test

24) For balanced design CRD ANOVA experiment involving 5 means, the p –value is 0.0001. What would be the best multiple comparison procedure to use to make pairwise comparisons? What is the total number of comparisons that can be made?

A) Scheffe; 12 comparisons B) Tukey; 10 comparisons C) Scheffe; 10 comparisons
D) Bonferroni; 28 comparisons E) Bonferroni; 10 comparisons F) None of these

Solve the problem.

25) Four brands of baseball bats were tested to determine which bat allowed hitters to hit a baseball farthest. Eight different batters were thrown 25 pitches while hitting with each of the four bats (assigned in random order). The average distance of the five longest hits using each bat is shown in the table below. The goal is to determine if the average hit distance differs for the four brands of baseball bats.

Batter	Brand 1	Brand 2	Brand 3	Brand 4
1	307	315	300	275
2	310	317	305	285
3	335	335	330	302
4	325	328	320	300
5	300	305	295	270
6	345	350	340	310
7	312	315	308	300
8	298	302	295	288

How should the data be analyzed?
A) Randomized block design with eight treatments and four blocks
B) Randomized block design with four treatments and eight blocks
C) 4 × 8 factorial design
D) Completely randomized design with four treatments

26) Is there a relationship between the raises administrators at State University receive and their performance on the job? A faculty group wants to determine whether job rating (x) is a useful linear predictor of raise (y).

The faculty group obtained the following prediction equation: $\hat{y} = 14{,}000 - 2{,}000x$

Interpret the estimated slope of the line.

A) For a $1 increase in an administrator's raise, we estimate the administrator's rating to decrease 2,000 points.
B) For a 1–point increase in an administrator's rating, we estimate the administrator's raise to increase $2,000.
C) For an administrator with a rating of 1.0, we estimate his/her raise to be $2,000.
D) For a 1–point increase in an administrator's rating, we estimate the administrator's raise to decrease $2,000.

27) What is the relationship between diamond price and carat size? 307 diamonds were sampled and a straight–line relationship was hypothesized between y = diamond price (in dollars) and x = size of the diamond (in carats).

R–Squared = 0.8925. Interpret the coefficient of determination for the regression model.

A) There is sufficient evidence to indicate that the size of the diamond is a useful predictor of the price of a diamond when testing at alpha = 0.05.
B) We can explain 89.25% of the variation in the sampled diamond prices around their mean using the size of the diamond in a linear model.
C) For every 1–carat increase in the size of a diamond, we estimate that the price of the diamond will increase by $1117.56.
D) We expect most of the sampled diamond prices to fall within $2235.12 of their least squares predicted values.

28) A multiple–comparison procedure for comparing four treatment means produced the confidence intervals shown below. Rank the means from smallest to largest. Use solid lines to connect those means which are not significantly different.

$(\mu_A - \mu_B)$: (20, 32)
$(\mu_A - \mu_C)$: (6, 24)
$(\mu_A - \mu_D)$: (3, 21)
$(\mu_B - \mu_C)$: (–17, –5)
$(\mu_B - \mu_D)$: (–22, –6)
$(\mu_C - \mu_D)$: (–13, 1)

A) B $\overline{\text{C D}}$ A B) B C D A C) $\overline{\text{C D}}$ B A D) B C $\overline{\text{A D}}$

29) A county real estate appraiser wants to develop a statistical model to predict the appraised value of houses in An important predictor of appraised value is the number of rooms in the house. Consequently, the appraiser decided to fit the simple linear regression model: $E(y) = \beta_0 + \beta_1 x$, where y = appraised value of the house (in thousands of dollars) and x = number of rooms. Using data collected for a sample of $n = 80$ houses, the following results were obtained:

$\hat{y} = 80.80 + 19.72x$

What are the properties of the least squares line, $\hat{y} = 80.80 + 19.72x$?

A) It will always be a statistically useful predictor of y.
B) All 80 of the sample y–values fall on the line.
C) Average error of prediction is 0, and SSE is minimum.
D) It is normal, mean 0, constant variance, and independent.

30) A marketing study was conducted to compare the mean age of male and female purchasers of a certain product. Random and independent samples were selected for both male and female purchasers of the product. What type of analysis should be used to compare the mean age of male and female purchasers?
A) An independent samples comparison of population proportions.
B) An independent samples comparison of population means.
C) A test of a single population mean.
D) A paired difference comparison of population means.

31) What is the proper interpretation of $\hat{\sigma}_{\bar{x}}$ the standard error of X–bar ?

A) It indicates the location of the average sample mean on the number line.
B) It indicates the likelihood that your p–value causes us to commit the type I error.
C) It indicates the size of the sample mean.
D) It indicates how the sample mean varies from sample to sample.

32) Suppose that a manufacturer is testing one of its machines to make sure that the machine is producing more than 97% good parts (H_0: $p = 0.97$ and H_A: $p > 0.97$). The test results in a P–value of 0.002. Unknown to the manufacturer, the machine is actually producing 95% good parts. What probably happens as a result of the testing?

A) They fail to reject H_0, making a Type I error.
B) They fail to reject H_0, making a Type II error.
C) They reject H_0, making a Type I error.
D) They correctly reject H_0.

Solve the problem.

33) A certain HMO is attempting to show the benefits of managed care to an insurance company. The HMO believes that certain types of doctors are more cost–effective than others. One theory is that certification level is an important factor in measuring the cost–effectiveness of physicians. To investigate this, the HMO obtained independent random samples of 21 physicians from each of the three certification levels—Board certified (C); Uncertified, board eligible (E); and Uncertified, board ineligible (I)— and recorded the total per member per month charges for each (a total of 63 physicians). How many factors are present in this study?

A) 1
B) 63
C) 21
D) 3

Answer Key
Testname: REVIEW FINAL_3123_

1) C
2) B
3) B
4) C
5) C
6) B
7) A
8) C
9) C
10) A
11) E
12) A
13) B
14) B
15) A
16) D
17) C
18) D
19) A
20) D
21) C
22) A
23) A
24) B
25) B
26) D
27) B
28) A
29) C
30) B
31) D
32) C
33) A