

King Fahd University of Petroleum and Minerals
Department of Mathematics

CODE00

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STAT 211
Final Exam
Term 212
18-May-2022

Name: _____

ID: _____ Sec: _____

Check that this exam has 30 questions.

Important Instructions:

1. All types of calculators may be used, provided that they cannot store text.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1 The Internal Revenue Service (IRS) is interested in estimating the mean amount of money spent on outside tax service by income tax filers filing as single on their individual form. To do this, they have selected a random sample of $n = 16$ people from this population and surveyed them to determine the sample mean and sample standard deviation. The following information was observed: Sample mean = \$88.60, Sample S.D. = \$30.79. What is the 95 percent confidence interval for the mean dollars spent on outside tax assistance by taxpayers who file as single?

- (a) **Approximately \$72.19 - \$105.01**
- (b) About \$22.97 - \$154.23
- (c) Approximately \$80.90 - \$96.30
- (d) About \$28.25 - \$148.95
- (e) Approximately \$45.36 - \$89.39

2 A traffic engineer plans to estimate the average number of cars that pass through an intersection each day. Based on previous studies the standard deviation is believed to be 52 cars. She wants to estimate the mean to within ± 10 cars with 90 percent confidence. The needed sample size for n is:

- (a) **$n = 74$ days**
- (b) $n = 104$ days
- (c) $n = 10$ days
- (d) $n = 9$ days
- (e) $n = 50$ days.

3 The produce manager for a large retail food chain is interested in estimating the percentage of potatoes that arrive on a shipment with bruises. A random sample of 150 potatoes showed 14 with bruises. Based on this information, what is the margin of error for a 95 percent confidence interval estimate?

- (a) 0.0466
- (b) 0.0933
- (c) 0.0006
- (d) 0.1995
- (e) 0.8212

4 If we are estimating the C.I. for the difference between the means of 2 independent populations presuming equal variances with samples of $n_1 = 20$ and $n_2 = 20$, the number of degrees of freedom is equal to

- (a) 38
- (b) 39
- (c) 19
- (d) 18
- (e) 40

5 Given the following information: $S_1 = 4$, $S_2 = 6$, $n_1 = 16$, $n_2 = 25$, calculate S_p^2 (the pooled sample variance) that should be used in the pooled-variance t-interval.

- (a) $S_p^2 = 5.32$
- (b) $S_p^2 = 6.00$
- (c) $S_p^2 = 5.00$
- (d) $S_p^2 = 4.00$
- (e) $S_p^2 = 8.00$

6 A 99% confidence interval estimate can be interpreted to mean that

- (a) if all possible samples of size n are taken and confidence interval estimates are developed, 99% of them would include the true population mean somewhere within their interval.
- (b) we have 99% confidence that we have selected a sample whose interval does include the population mean.
- (c) both (a) and (b).
- (d) the population mean is approximately 99%
- (e) the population mean is less than 99%

7 An economist is interested in studying the incomes of consumers in a particular country. The population standard deviation is known to be \$1,000. A random sample of 50 individuals resulted in a mean income of \$15,000. What is the width of the 90% confidence interval?

- (a) \$465.28
- (b) \$232.60
- (c) \$364.30
- (d) \$728.60
- (e) \$1000

8 Private colleges and universities rely on money contributed by individuals and corporations for their operating expenses. Much of this money is put into a fund called an endowment, and the college spends only the interest earned by the fund. A recent survey of 8 private colleges in the United States revealed the following endowments (in millions of dollars): 60.2, 47.0, 235.1, 490.0, 122.6, 177.5, 95.4, and 220.0. Summary statistics yield $\bar{X} = 180.975$ and $S = 143.042$. To calculate a 95% confidence interval for the mean endowment of all the private colleges in the United States, what is the critical value for the rejection region

- (a) 2.365
- (b) 4.632
- (c) 1.325
- (d) 2.765
- (e) 5.365

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- (a) $\$180.975 \pm \119.586
- (b) $\$180.975 \pm \94.066
- (c) $\$180.975 \pm \99.123
- (d) $\$180.975 \pm \116.621
- (e) $\$180.975 \pm \111.621

10 In testing for differences between the means of two independent populations, the null hypothesis is

- (a) $H_0 : \mu_1 - \mu_2 = 0$
- (b) $H_0 : \mu_1 - \mu_2 = 2$
- (c) $H_0 : \mu_1 - \mu_2 > 0$
- (d) $H_0 : \mu_1 - \mu_2 < 2$
- (e) $H_0 : \mu_1 - \mu_2 = 1$

11 Are Japanese managers more motivated than American managers? A randomly selected group of each were administered the Sarnoff Survey of Attitudes Toward Life (SSATL), which measures motivation for upward mobility. The SSATL scores are summarized below.

American: Sample Size = 21, Sample Mean SSATL Score = 65.75, Sample Std. Dev. = 11.07.

Japanese: Sample Size = 10, Sample Mean SSATL Score = 79.83, Sample Std. Dev. = 6.41.

Judging from the way the data were collected, which test would likely be most appropriate to employ?

- (a) Pooled-variance t test for the difference between two means
- (b) Paired t test
- (c) F -test for the ratio of two variances
- (d) Z -test for the difference between two proportions
- (e) χ^2 for the ratio of two variances

12 In a random sample, 36 of 72 men and 35 of 50 women indicated they would vote Yes on Proposition A. To determine if there is a significant difference between the proportion of men and the proportion of women who will vote yes on proposition A. What is the confidence interval for $\pi_1 - \pi_2$ at the 0.05 level of significance?

- (a) $(-0.37, -0.03)$
- (b) $(-0.27, -0.02)$
- (c) $(-0.67, -0.06)$
- (d) $(-0.77, -0.07)$
- (e) $(-0.87, -0.08)$

13 Are Japanese managers more motivated than American managers? A randomly selected group of each were administered the Sarnoff Survey of Attitudes Toward Life (SSATL), which measures motivation for upward mobility. The SSATL scores are summarized below.

American: Sample Size = 21, Sample Mean SSATL Score = 65.75, Sample Std. Dev. = 11.07.

Japanese: Sample Size = 10, Sample Mean SSATL Score = 79.83, Sample Std. Dev. = 6.41.

Given the above information, state the null and alternative hypotheses to determine if the mean SSATL score of Japanese managers differs from the mean SSATL score of American managers.

- (a) $H_0 : \mu_A - \mu_J = 0$ versus $H_1 : \mu_A - \mu_J \neq 0$
- (b) $H_0 : \mu_A - \mu_J \geq 0$ versus $H_1 : \mu_A - \mu_J < 0$
- (c) $H_0 : \mu_A - \mu_J \leq 0$ versus $H_1 : \mu_A - \mu_J > 0$
- (d) $H_0 : \bar{X}_A - \bar{X}_J = 0$ versus $H_1 : \bar{X}_A - \bar{X}_J \neq 0$
- (e) $H_0 : \bar{X}_A - \bar{X}_J = 0$ versus $H_1 : \bar{X}_A - \bar{X}_J > 0$

14 In testing for the differences between the means of 2 independent populations where the variances in each population are unknown but assumed equal, the degrees of freedom are

- (a) $n_1 + n_2 - 2$
- (b) $n - 1$
- (c) $n_1 + n_2 - 1$
- (d) $n - 2$
- (e) $n_1 + n_2 + 1$

15 In the construction of confidence intervals, if all other quantities are unchanged, an increase in the sample size will lead to a interval.

- (a) narrower
- (b) wider
- (c) less significant
- (d) biased
- (e) more information is required

16 If you were constructing a 99% confidence interval of the population mean based on a sample of $n = 25$ where the standard deviation of the sample $S = 0.05$, the critical value of t will be

- (a) 2.7969
- (b) 2.7874
- (c) 2.4922
- (d) 2.4851
- (e) 2.8567

17 A university dean is interested in determining the proportion of students who receive some sort of financial aid. Rather than examine the records for all students, the dean randomly selects 200 students and finds that 118 of them are receiving financial aid. Use a 90% confidence interval to estimate the true proportion of students who receive financial.

- (a) $0.533 \leq \pi \leq 0.647$
- (b) $0.433 \leq \pi \leq 0.547$
- (c) $0.633 \leq \pi \leq 0.747$
- (d) $0.733 \leq \pi \leq 0.847$
- (e) $0.333 \leq \pi \leq 0.447$

18 The county clerk wants to estimate the proportion of voters who will need special election facilities. The clerk wants to construct a 95% confidence interval for the population proportion which extends at most 0.07 to either side of the sample proportion. How large a sample must be taken to assure these conditions are met? Assume $p = 0.5$

- (a) 196
- (b) 190
- (c) 205
- (d) 188
- (e) 199

19 The actual voltages of power packs labeled as 12 volts are as follows: 11.77, 11.90, 11.64, 11.84, 12.13, 11.99, and 11.77. A confidence interval for this sample would be based on the t distribution with degrees of freedom.

- (a) 6
- (b) 7
- (c) 5
- (d) 8
- (e) 2

20 To monitor campus security, the campus police office is taking a survey of the number of students in a parking lot each 30 minutes of a 24-hour period with the goal of determining when patrols of the lot would serve the most students. If X is the number of students in the lot each period of time, then X is an example of

- (a) a discrete variable.
- (b) a categorical variable.
- (c) a continuous variable.
- (d) a statistic.
- (e) a qualitative variable.

21 When extreme values are present in a set of data, which of the following descriptive summary measures are most appropriate:

- (a) interquartile range and median
- (b) CV and range.
- (c) arithmetic mean and standard deviation
- (d) variance and interquartile range
- (e) variance and standard deviation

22 The probability that a new advertising campaign will increase sales is assessed as being 0.80. The probability that the cost of developing the new ad campaign can be kept within the original budget allocation is 0.40. Assuming that the two events are independent, the probability that the cost is kept within budget or the campaign will increase sales is:

- (a) 0.88
- (b) 0.20
- (c) 0.32
- (d) 0.68
- (e) 0.40

23 The actual voltages of power packs labeled as 12 volts are as follows: 11.77, 11.90, 11.64, 11.84, 12.13, 11.99, and 11.77. The critical value for a 99% confidence interval for this sample is

- (a) 3.707
- (b) 3.499
- (c) 3.355
- (d) 4.032
- (e) 3.143

24 A food processor packages orange juice in small jars. The weights of the filled jars are approximately normally distributed with a mean of 10.5 ounces and a standard deviation of 0.3 ounce. Find the proportion of all jars packaged by this process that have weights that fall below 10.875 ounces.

- (a) 0.8944
- (b) 0.5474
- (c) 0.1056
- (d) 0.4526
- (e) 0.3194

25 Suppose a sample of $n = 50$ items is selected from a population of manufactured products and the weight, X , of each item is recorded. Prior experience has shown that the weight has a probability distribution with $\mu = 6$ ounces and $\sigma = 2.5$ ounces. Which of the following is true about the sampling distribution of the sample mean if a sample of size 15 is selected?

- (a) **The mean of the sampling distribution is 6 ounces**
- (b) The standard deviation of the sampling distribution is 2.5 ounces.
- (c) The shape of the sampling distribution is approximately normal.
- (d) The variance of the sampling distribution is 1.25
- (e) The mean of the sampling distribution is 4 ounces

26 What type of probability distribution will most likely be used to analyze the number of cars with defective radios in the following problem?

From an inventory of 48 new cars being shipped to local dealerships, corporate reports indicate that 12 have defective radios installed. The sales manager of one dealership wants to predict the probability out of the 8 new cars it just received that, when each is tested, no more than 2 of the cars have defective radios.

- (a) **Hypergeometric distribution**
- (b) Binomial distribution
- (c) Poisson distribution
- (d) Normal distribution
- (e) Exponential distribution

27 Let X represent the amount of time until the next student will arrive in the library parking lot at the university. If we know that the distribution of arrival time can be modeled using an exponential distribution with a mean of 4 minutes (i.e. the mean number of arrivals is $\frac{1}{4}$ per minute), find the probability that it will take more than 10 minutes for the next student to arrive at the library parking lot.

- (a) 0.082085
- (b) 0.917915
- (c) 0.670320
- (d) 0.329680
- (e) 0.229680

28 Which of the following statements about the sampling distribution of the sample mean is **incorrect**?

- (a) The standard deviation of the sampling distribution of the sample mean is equal to σ .
- (b) The sampling distribution of the sample mean is approximately normal whenever the sample size is sufficiently large ($n \geq 30$).
- (c) The sampling distribution of the sample mean is generated by repeatedly taking samples of size n and computing the sample means.
- (d) The mean of the sampling distribution of the sample mean is equal to μ .
- (e) More information is need

29 According to the empirical rule, if the data form a "bell-shaped" normal distribution, percent of the observations will be contained within 2 standard deviations around the arithmetic mean.

- (a) 95.44
- (b) 68.26
- (c) 88.89
- (d) 93.75
- (e) 75.00

30 The probability that house sales will increase in the next 6 months is estimated to be 0.25. The probability that the interest rates on housing loans will go up in the same period is estimated to be 0.74. The probability that house sales or interest rates will go up during the next 6 months is estimated to be 0.89. The probability that house sales will increase but interest rates will not during the next 6 months is

- (a) 0.15
- (b) 0.065
- (c) 0.51
- (d) 0.89
- (e) 0.1