KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS

STAT 212 BUSINESS STATISTICS II
Semester 222, Major Exam 1
Monday February 20, 2023

Time allowed 100 minutes.

Name: ______________________________________________ ID #: _________________________

Section #: _________________________________________ Serial #: _________________________

***Important Notes:***

- Formula sheet will be provided to you in exam. You are not allowed to bring, with you, formula sheet or any other printed/written paper.
- Make sure you have 11 pages of exam paper (including this title page) and 20 questions.
- Students are not allowed to enter the exam hall without either KFUPM ID or Saudi ID/ Iqama ID.
- Students must take the exam in the place assigned to them.
- Students are not allowed to carry mobiles, smart watches, or electronic devices to the exam halls/rooms.
- Violations of these rules will result in a penalty decided by the chairman of Math Department.

1. A Type I error is committed when:

   a. we reject a null hypothesis that is true.
   b. we don't reject a null hypothesis that is true.
   c. we don't reject a null hypothesis that is false.
   d. we reject a null hypothesis that is false.
   e. we accept an alternative hypothesis that is true.

2. A manager of the credit department for an oil company would like to determine whether the average monthly balance of credit card holders is equal to $75. An auditor selects a random sample of 100 accounts and finds that the average owed is $83.40 with a population standard deviation of $23.65. If you wanted to test whether the average balance is different from $75 and decided to reject the null hypothesis, what conclusion could you draw?

   a. There is evidence that the average balance is not $75.
   b. There is no evidence that the average balance is $75.
   c. There is evidence that the average balance is $75.
   d. There is no evidence that the average balance is greater than $75.
   e. There is evidence that the average balance is less than $75.

3. In an upper-tail test, what is the p-value if $t_{STAT} = +2.5$, with sample size of 11?

   a. $0.01 < p - value < 0.025$
   b. $0.005 < p - value < 0.01$
   c. $0.025 < p - value < 0.05$
   d. $0.1 < p - value < 0.25$
   e. Not enough information

4. The U.S. Department of Education reports that 46% of full-time college students are employed while attending college. (Data extracted from "The Condition of Education 2009," National Center for Education Statistics, nces.ed.gov.) A recent survey of 60 full-time students at Miami University found that 29 were employed. At 0.1 level of significance, if we want to test whether the proportion of full-time students at Miami University that are employed is different from the national norm of 0.46. Then, **the test statistic** is:

   a. 0.3626
   b. 0.8807
   c. 1.3441
   d. 2.30
   e. -0.04890

5. The U.S. Department of Education reports that 46% of full-time college students are employed while attending college. (Data extracted from "The Condition of Education 2009," National Center for Education Statistics, nces.ed.gov.) A recent survey of 60 full-time students at Miami University found that 29 were employed. At 0.1 level of significance, if we want to test whether the proportion of full-time students at Miami University that are employed is different from the national norm of 0.46. Then, **the conclusion for the test** is:

   a. Don't reject $H_o$: i.e. there is no sufficient evidence that the proportion of full-time students at Miami University that are employed is different from 0.46.
   b. Reject $H_o$: i.e. there is sufficient evidence that the proportion of full-time students at Miami University that are employed is different from 0.46.
   c. Don't reject $H_o$: i.e. there is sufficient evidence that the proportion of full-time students at Miami University that are employed is different from 0.46.
   d. Reject $H_o$: i.e. there is NO sufficient evidence that the proportion of full-time students at Miami University that are employed is different from 0.46.
   e. None of the above

6. The manager of a paint supply store wants to determine whether the mean amount of paint contained in 1-gallon cans purchased from a nationally known manufacturer is actually 1 gallon. You know from the manufacturer's specifications that the sample standard deviation of the amount of paint is 0.019 gallon. You select a random sample of 25 cans, and the mean amount of paint per 1-gallon can is 0.995 gallon. What are the appropriate null and alternative hypotheses?

   a. $H_0: \mu = 1$ Vs. $H_1: \mu \neq 1$
   b. $H_0: \mu \geq 1$ Vs. $H_1: \mu < 1$
   c. $H_0: \mu \leq 1$ Vs. $H_1: \mu > 1$
   d. $H_0: \mu \neq 1$ Vs. $H_1: \mu = 1$
   e. $H_0: \mu < 1$ Vs. $H_1: \mu \geq 1$

7. The manager of a paint supply store wants to determine whether the mean amount of paint contained in 1-gallon cans purchased from a nationally known manufacturer is actually 1 gallon. You know from the manufacturer's specifications that the sample standard deviation of the amount of paint is 0.019 gallon. You select a random sample of 25 cans, and the mean amount of paint per 1-gallon can is 0.995 gallon. Using the p-value, which of the following statements is most accurate?

   a. Unable to reject the null hypothesis at $\propto = 0.15$.
   b. Unable to reject the null hypothesis at $= 0.25$.
   c. Reject the null hypothesis at $\alpha = 0.025$, but not at $\alpha = 0.05$.
   d. Reject the null hypothesis at $\alpha = 0.05$, but not at $\alpha = 0.01$.
   e. Reject the null hypothesis at $\propto < 0.10$.

8. The owner of a gasoline station wants to study gasoline-purchasing habits of motorists at his station. He selects a random sample of 40 motorists during a certain week, with the following results:

   The amount purchased was $\bar{X} = 11.3$ gallons, $S = 3.1$ gallons.

   If we want to test that the population mean purchase was different from 10 gallons, then the **test statistic** is:

   a. 2.652
   b. -2.652
   c. 0.419
   d. -0.419
   e. 2.256

9. An auditor for a government agency is assigned the task of evaluating reimbursement for office visits to physicians paid by Medicare. The audit was conducted on a sample of 25 of the reimbursements, with the following results:
   • In 12 of the office visits, there was an incorrect amount of reimbursement.
   • The amount of reimbursement was $\bar{X} = \$93$ , $S = \$34.5$ and population is normally distributed.

   At the 0.05 level of significance, is there evidence that the proportion of incorrect reimbursements in the population was greater than 0.10? The p-value for this test equals to

   a. 0.0000
   b. 0.0836
   c. 0.9582
   d. 0.0209
   e. 0.0115

   This Q was cancelled and all students got full credit

10. Two professors wanted to study how students from their two universities compared in their capabilities of using Excel spreadsheets in undergraduate information systems courses. A comparison of the student demographics was also performed. One school is a state university in the western United States, and the other school is a state university in the eastern United States. **The following table contains information regarding the <u>ages</u> of the students:**

| School | n | Sample mean | s |
|---|---|---|---|
| Western | 41 | 23.28 | 6.29 |
| Eastern | 60 | 21.16 | 1.32 |

   Using a 0.01 level of significance, is there evidence of a difference in the variances of the age of students at the western school and at the eastern school?

   a. since the Test stat=22.7067 and the Critical value=2.08, we conclude there is sufficient evidence of a difference in the variances of the age of students at the western school and at the eastern school.
   b. since the Test stat=22.7067 and the Critical value =1.30, we conclude there is sufficient evidence of a difference in the variances of the age of students at the western school and at the eastern school.
   c. since the Test stat=22.7067 and the Critical value =1.87, we conclude there is not sufficient evidence of a difference in the variances of the age of students at the western school and at the eastern school.
   d. since the Test stat=22.7067 and the Critical value =2.18, we conclude there is not sufficient evidence of a difference in the variances of the age of students at the western school and at the eastern school.
   e. since the Test stat=22.7067 and the Critical value =1.96, we conclude there is sufficient evidence of a difference in the variances of the age of students at the western school and at the eastern school.

11. A survey was conducted of 665 consumer magazines on the practices of their websites. Of these, 273 magazines reported that online-only content is copy-edited as rigorously as print content; 379 reported that online-only content is fact-checked as rigorously as print content. Suppose that a sample of 500 newspapers revealed that 252 reported that online-only content is copy-edited as rigorously as print content and 296 reported that online-only content is fact-checked as rigorously as print content.

    At the 0.05 level of significance, we want to see if there is evidence of a difference between consumer magazines and newspapers in the proportion of online-only content that is <u>copy-edited</u> as rigorously as print content?

    The test statistic and the critical values for this test, respectively, are:

    a. -3.1747 and ±1.96
    b. -0.7563 and ±1.96
    c. -3.1747 and ±1.645
    d. -0.7563 and ±1.645
    e. ±1.96 and -3.1747

12. A survey was conducted of 665 consumer magazines on the practices of their websites. Of these, 273 magazines reported that online-only content is copy-edited as rigorously as print content; 379 reported that online-only content is fact-checked as rigorously as print content. Suppose that a sample of 500 newspapers revealed that 252 reported that online-only content is copy-edited as rigorously as print content and 296 reported that online-only content is fact-checked as rigorously as print content.

    At the 0.05 level of significance, we want to see if there is evidence of a difference between consumer magazines and newspapers in the proportion of online-only content that is <u>fact-checked</u> as rigorously as print content? Which of the following statements is true?

    a. We can reject the null hypothesis at any alpha greater than 0.4472.
    b. We cannot reject the null hypothesis at any alpha greater than 0.4472.
    c. We can reject the null hypothesis at any alpha greater than 0.2236.
    d. We cannot reject the null hypothesis at any alpha greater than 0.2236.
    e. We can reject the null hypothesis at alpha=0.05.

13. A problem with a telephone line that prevents a customer from receiving or making calls is upsetting to both the customer and the telephone company. The table below contains samples of 20 problems reported to two different offices of a telephone company and the time to clear these problems (in minutes) from the customers' lines:

| | **Sample Mean** | **Sample Variance** |
|---|---|---|
| Central Office I Time (min.) | 2.2140 | 2.9517 |
| Central Office II Time (min.) | 2.0115 | 3.5786 |

Use $\alpha$ = 0.05 and assume that the population variances from both offices are equal. If the company wants to test a difference in the **mean** waiting time between the two offices, then the ***p*-value** of the test is

a. 0.5 < *p*-value < 0.8
b. 0.25 < *p*-value < 0.4
c. 0.2 < *p*-value < 0.5
d. 0.1 < *p*-value < 0.25
e. 0.1 < *p*-value < 0.2

14. A problem with a telephone line that prevents a customer from receiving or making calls is upsetting to both the customer and the telephone company. The table below contains samples of 20 problems reported to two different offices of a telephone company and the time to clear these problems (in minutes) from the customers' lines:

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a. 38
b. 39
c. 40
d. 20
e. 19

15. A random sample of 180 men who took the driving test found that 103 passed. A similar sample of 225 women found that 105 passed. If you want test whether pass rates are the same for men and women, then the **pooled estimate** for the overall proportion equal to

    a. 0.5135
    b. 0.5194
    c. 0.4865
    d. 0.4806
    e. 0.5914

16. Shipments of meat, meat by-products, and other ingredients are mixed together in several filling lines at a pet food canning factory. Operations managers suspect that, although the mean amount filled per can of pet food is usually stable, the variability of the cans filled in line A is greater than that of line B. The following data from a sample of 8-ounce cans is as follows:

| | LINE A | LINE B |
|---|---|---|
| $\bar{X}$ | 8.005 | 7.997 |
| $S$ | 0.012 | 0.005 |
| $n$ | 11 | 16 |

At the 0.05 level of significance, we want to test whether there is evidence that the variance in line A is **greater** than the variance in line B. Then the **critical values** is/are:

a. 2.54
b. $\pm 2.54$
c. 2.85
d. $\pm$ 2.85
e. 2.42

17. A study was conducted on the use of cell phones for accessing news. The study reported that 47% of users under age 50 accessed news on their cell phones (population 1) and 15% of users age 50 and over accessed news on their cell phones (population 2). Suppose that the survey consisted of 1,000 users under age 50, of whom 470 accessed news on their cell phones, and 640 users age 50 and over, of whom 185 accessed news on their cell phones. At 0.05 level of significance, if we want to test whether the proportion of users under the age 50 who access news on their cell phones are **more** than the proportion of users age 50 and above who access news on their cell phones. Then, the **test statistic is**:

    a. 7.2964
    b. 0.3202
    c. -7.2964
    d. -0.3202
    e. 1.3110

18. The marketing manager of a branch office of a local telephone operating company wants to study characteristics of residential customers served by her office. In particular, she wants to estimate the mean monthly cost of calls within the local calling region. In order to determine the sample size necessary, she needs an estimate of the standard deviation. On the basis of her past experience and judgment, she estimates that the standard deviation is equal to $12. Suppose that a small-scale study of 15 residential customers indicates a sample standard deviation of $9.25. At 0.1 level of significance, the manager wants to test whether the standard deviation of the monthly cost of calls is **less** than $12. Then, the **test statistic** is:

    a. 8.3186
    b. 12.5334
    c. -8.3186
    d. 23.5617
    e. -23.5617

19. The marketing manager of a branch office of a local telephone operating company wants to study characteristics of residential customers served by her office. In particular, she wants to estimate the mean monthly cost of calls within the local calling region. In order to determine the sample size necessary, she needs an estimate of the standard deviation. On the basis of her past experience and judgment, she estimates that the standard deviation is equal to $12. Suppose that a small-scale study of 15 residential customers indicates a sample standard deviation of $9.25. At 0.1 level of significance, the manager wants to test whether the standard deviation of the monthly cost of calls is **less** than $12. Then, **the conclusion for the test** is:

    a. There is No sufficient evidence that the standard deviation of the monthly cost of calls is less than $12.
    b. There is sufficient evidence that the standard deviation of the monthly cost of calls is less than $12.
    c. There is sufficient evidence that the standard deviation of the monthly cost of calls is not different from $12.
    d. There is No sufficient evidence that the standard deviation of the monthly cost of calls is different from $12.
    e. None of the above

20. A manufacturer of doorknobs has a production process that is designed to provide a doorknob with a target diameter of 2.5 inches. In the past, the standard deviation of the diameter has been 0.035 inch. In an effort to reduce the variation in the process, various studies have resulted in a redesigned process. A sample of 25 doorknobs produced under the new process indicates a sample standard deviation of 0.025 inch.

    At the 0.05 level of significance, is there evidence that the population standard deviation is less than 0.035 inch in the new process? The critical value(s) for the test is (are):

    a. 13.8484
    b. 12.4012
    c. 36.415
    d. 39.3641
    e. 12.4012 and 39.3641