MATH 3307

Homework 11 (Lessons 31 - 32)

Instructions: Answer all questions through the EMCF tab of casa under the assignment named "Homework 11" before the deadline.

There is no "Submit" button. Your answers will be automatically submitted once the deadline arrives.

Assignments will be graded out of 20 points.

For Questions 1 - 4, determine Choice A: True, or Choice B: False.

1. A statement contradicting the claim in the null hypothesis is classified as the alternate hypothesis.

2. If we want to claim that a population parameter is different from a specified value, we would perform a one-tailed test.

3. In the p-value approach to hypothesis testing, if p-value < 0.001, there is overwhelming evidence to reject the null hypothesis.

4. If the null hypothesis is rejected, this means that the null hypothesis is not true.

For Questions 5 - 7, refer to: A company claims that the mean weight per apple they ship is 120 grams with a standard deviation of 12 grams. Data generated from a sample of 49 apples randomly selected from a shipment indicated a mean weight of 122.5 grams per apple. Is there sufficient evidence to reject the company's claim, at a significance level of 5%?

5.   Determine the Null and Alternate Hypothesis and the Rejection Region:

   A. Ho: $\mu = 120$; Ha: $\mu < 120$; Rejection Region: $z < -1.64$

   B. Ho: $\mu = 120$; Ha: $\mu < 120$; Rejection Region: $t < -1.80$

   C. Ho: $\mu = 120$; Ha: $\mu > 120$; Rejection Region: $z > 1.64$

   D. Ho: $\mu = 120$; Ha: $\mu \neq 120$; Rejection Region: $z < -1.96$ or $z > 1.96$

   E. Ho: $\mu = 120$; Ha: $\mu \neq 120$; Rejection Region: $t < -2.20$ or $t > 2.20$

6. Calculate the test statistic.

    A. t = 0.03

    B. z = 1.46

    C. z = 0.03

    D. z = 0.55

    E. t = 1.46

7. Determine the p-value and draw the conclusion.

    A. p = 1.856; FRH_o (No sufficient evidence to reject the claim)

    B. p = 0.144; RH_o (Sufficient evidence exists to reject the claim)

    C. p = 0.928; FRH_o (No sufficient evidence to reject the claim)

    D. p = 1.856; RH_o (Sufficient evidence exists to reject the claim)

    E. p = 0.144; FRH_o (No sufficient evidence to reject the claim)

For Questions 8 - 9, refer to the following: Bottles of a particular brand soft drink are supposed to contain 300 ml of soda. There is some variation from bottle to bottle because the filling machine is not perfectly precise. The distribution of the contents is normal with a standard deviation of 3 ml. A student who suspects that the bottler is under-filling measures the contents of six bottles as indicated here: | 299.4 | 297.7 | 301.0 | 298.9 | 300.2 | 297.0 |

Is this convincing evidence that the mean contents of soda bottles is less than the advertised 300 ml. Test at the 5% significance level.

8. Determine the Null and Alternate Hypothesis and the Rejection Region:

    A. H_o: μ = 300; H_a: μ < 300; Rejection Region: z < -1.64

    B. H_o: μ = 300; H_a: μ < 300; Rejection Region: t < -2.02

    C. H_o: μ = 300; H_a: μ > 300; Rejection Region: z > 1.64

    D. H_o: μ = 300; H_a: $\mu \neq$ 300; Rejection Region: z < -1.96 or z > 1.96

    E. H_o: μ = 300; H_a: $\mu \neq$ 300; Rejection Region: t < -2.57 or t > 2.57

9. Determine the Test Statistic and Conclusion:

A. -0.789; FRHo (No sufficient evidence to reject the claim)

B. -1.576; RHo (Sufficient evidence exists to reject the claim)

C. -1.576; FRHo (No sufficient evidence to reject the claim)

D. -0.789; RHo (Sufficient evidence exists to reject the claim)

E. -0.132; FRHo (No sufficient evidence to reject the claim)

For Questions 10 - 12, refer to the following: You would like to know how effective a diet program is at helping people lose weight. A sample of 18 overweight people are randomly selected to participate in the program. They are weighed before and after the program and the results are listed below. Do these results give evidence that the diet program is effective at the 1% significance level?

Participant	1	2	3	4	5	6
Before	185	220	190	158	227	211
After	175	215	195	155	230	207

Participant	7	8	9	10	11	12
Before	260	156	201	300	180	270
After	258	159	201	290	172	272

Participant	13	14	15	16	17	18
Before	293	183	205	151	291	166
After	290	185	200	146	287	166

10. Determine the Null and Alternate Hypothesis and the Rejection Region:
A. Ho: $\mu = 0$; Ha: $\mu < 0$; Rejection Region: $z < -2.34$
B. Ho: $\mu_D = 0$; Ha: $\mu_D < 0$; Rejection Region: $t < -2.57$
C. Ho: $\mu = 0$; Ha: $\mu > 0$; Rejection Region: $z > 2.34$
D. Ho: $\mu_D = 0$; Ha: $\mu_D \neq 0$; Rejection Region: $z < -2.58$ or $z > 2.58$
E. Ho: $\mu_D = 0$; Ha: $\mu_D \neq 0$; Rejection Region: $t < -2.90$ or $t > 2.90$

11. Determine the Mean Difference and Test Statistic

      A. μ_D = -1.889; t = -2.331   B. μ_D = -2.444; t = -9.891

      C. μ_D = -1.889; z = -2.331   D. μ_D = -2.444; t = -2.331

               E. μ_D = -211.278; z = 18.333

12. Determine the p-value and the conclusion:

  A. p = 0.026; FRHo (No sufficient evidence to reject the claim)

  B. p = 0.038; RHo (Sufficient evidence exists to reject the claim)

  C. p = 0.038; FRHo (No sufficient evidence to reject the claim)

  D. p = 0.016; RHo (Sufficient evidence exists to reject the claim)

  E. p = 0.016; FRHo (No sufficient evidence to reject the claim)

For Questions 13 - 14, refer to the following: A researcher claims that 90% of people trust DNA testing. In a survey of 100 people, 91 of them said they trusted DNA testing. Is the actual proportion of people who trust DNA testing larger than 90%. Test the researcher's claim at the 1% level of significance.

13.   Determine the Null and Alternate Hypothesis and the Rejection Region:

  A. Ho: p = 0.90; Ha: p < 0.90; Rejection Region: z < -2.576

  B. Ho: p = 0.90; Ha: p < 0.90; Rejection Region: z < -2.326

  C. Ho: p = 0.90; Ha: p > 0.90; Rejection Region: z > 2.326

  D. Ho: p = 0.90; Ha: p > 0.90; Rejection Region: z > 1.960

  E. Ho: p = 0.90; Ha: p ≠ 0.90; Rejection Region: z < -2.576 or z > 2.576

14. Determine the Test Statistic and the Conclusion:

    A. z = 0.333; FRH$_o$ (No sufficient evidence to reject the claim)

    B. z = 0.351; RH$_o$ (Sufficient evidence exists to reject the claim)

    C. z = 0.333; RH$_o$ (Sufficient evidence exists to reject the claim)

    D. z = 0.351; FRH$_o$ (No sufficient evidence to reject the claim)

    E. z = 0.00033; RH$_o$ (Sufficient evidence exists to reject the claim)

For Questions 15 - 16, refer to the following: An experimenter flips a coin 100 times and gets 54 heads. Test the claim that the coin is fair against the two-sided alternative.

15. Determine the Null and Alternate Hypothesis, and the Test Statistic:

A. Ho: p = 0.50; Ha: p < 0.50; z = 0.800
B. Ho: p = 0.50; Ha: p > 0.50; z = 0.800
C. Ho: p = 0.50; Ha: p > 0.50; z = 0.081
D. Ho: p = 0.50; Ha: p ≠ 0.50; z = 0.800
E. Ho: p = 0.50; Ha: p ≠ 0.50; z = 0.081

16.   Determine the p-value and conclusion:

A. p = 0.540; FRHo (No sufficient evidence to reject the claim)
B. p = 0.424; RHo (Sufficient evidence exists to reject the claim)
C. p = 1.576; FRHo (No sufficient evidence to reject the claim)
D. p = 0.424; FRHo (No sufficient evidence to reject the claim)
E. p = 1.576; RHo (No sufficient evidence to reject the claim)

17.   It is fourth down and a yard to go for a first down in an important football game. The football coach must decide whether to got the for the first down or punt the ball. The null hypothesis is that the team will not get the first down if they go for it. The coach will make a Type I Error by doing what?
A.   Getting the first down
B.   Going for the first down and not getting it
C.   Not going for the first down that could have been made

18. You wish to determine the effectiveness of taking Omega-3 tablets to lower a person's cholesterol. To determine this, you collect data on the cholesterol level of 50 individuals before and after a 6-week course of Omega-3 tablets. Which test would determine if this treatment was effective?

A. Two-Sample t-test for means

B. Two-Sample z-test for means

C. Matched-Pairs t-test

D. Two-Sample z-test for proportions

19. The choice between a z-test and a t-test for a population mean depends primarily on:

A. the sample size.

B. the level of significance.

C. whether a one- or two-tailed test is indicated.

D. whether the given standard deviation is from the population or the sample.

E. a z-test should never be used.

20. A company claims that it has a mean customer service score of 78 (out of 100). You examine 150 customer reviews and find that the mean score of those reviews is 73 with a standard deviation of 2. Test the accuracy of the company's claim at the 2% significance level.

Proposed Solution:

H_o: μ = 78

H_a: μ < 78 (since $\overline{}$ is less than 78)

Rejection Region: qt(0.02,149); t < -2.07

Test Statistic: t = (73-78)/(2/sqrt(150)) = -30.61

In rejection region: (RHo)
P-Value Test: pt(-30.61,149) = 0%

p < α (RHo)

The customer value score is lower than the claimed 78.

What is wrong with the proposed solution?

A. A z-test should have been used instead of t-test.

B. $\hat{p}$ should be calculated as 78/100 = 0.78 and a proportion test used.

C. The alternate hypothesis is not supported by the question.

D. For p < α, the wrong conclusion was drawn.

E. There is nothing wrong with the proposed solution.