MAT121 Statistics I

Midterm Exam 3

Problem 1

Suppose you wish to test the claim that μd, the mean value of the differences d for a population of paired data, is greater than 0. Given a sample of n = 15, a significance level of α = 0.01, and differences are normally distributed, what criterion would be used for rejecting the null hypothesis?

Answers *

- [ ] Reject null hypothesis if test statistic > 2.602.
- [ ] Reject null hypothesis if test statistic > 2.977 or < - 2.977.
- [x] Reject null hypothesis if test statistic > 2.624.
- [ ] Reject null hypothesis if test statistic < 2.624.

Problem 2

The average growth of a certain variety of pine trees is 10.1 inches in three years. A biologist claims that a new variety will have greater three-year growth. A random sample of 25 of the new variety has an average three-year growth of 10.8 inches and a standard deviation of 2.1 inches. With the convention of the null hypothesis, the appropriate null and alternative hypotheses to test the biologist's claim are:

Answers *

- [ ] H_0: μ=10.8 against Ha: μ>10.8
- [ ] H_0: μ=10.8 against Ha: μ≠10.8
- [x] H_0: μ=10.1 against Ha: μ>10.1
- [ ] H_0: μ=10.1 against Ha: μ<10.1
- [ ] H_0: μ=10.1 against Ha: μ≠10.1

Problem 3.

The following are percentages of fat found in 5 samples of each of two brands of baby food:
I: 5.7, 4.5, 6.2, 6.3, 7.3
II: 6.3, 5.7, 5.9, 6.4, 5.1
Which of the following procedures is appropriate to test the hypothesis of equal average fat content in the two types of ice cream?

Answers *

- [ ] Paired t-test with 5 d.f
- [x] Two samples t-test with 8 d.f
- [ ] Paired t-test with 4 d.f
- [ ] Two samples t-test with 9 d.f

Problem 4

Suppose we wish to test $H_0: \mu \geq 21$ vs $H_a: \mu < 21$. Which of the following possible sample results gives the most evidence to support H_a (i.e., reject H_0)? [Hint: Compute TS]

Answers *

- [ ] $\bar{x} = 23,\ s = 3,\ n = 36$
- [ ] $\bar{x} = 20,\ s = 6,\ n = 36$
- [ ] $\bar{x} = 19,\ \ s = 7,\ n = 36$
- [x] $\bar{x} = 18,\ \ s = 8,\ n = 36$

Problem 5

A bottling company needs to produce bottles that will hold 12 ounces of liquid. Periodically, the company gets complaints that their bottles are not holding enough liquid. To test this claim, the bottling company randomly samples 36 bottles. Suppose the p-value of this test turned out to be 0.0455. State the proper conclusion.

Answers *

- [ ] At $\alpha = 0.085$, fail to reject the null hypothesis.
- [ ] At $\alpha = 0.035$, accept the null hypothesis.
- [x] At $\alpha = 0.05$, reject the null hypothesis.
- [ ] At $\alpha = 0.025$, reject the null hypothesis.

Problem 6

The area to the left of the test statistic is 0.375. What is P- value if this is a right tail test?

Answers *

- [x] 0.625
- [ ] 0.1885
- [ ] 0.750
- [ ] 0.375

Problem 7

Test Statistic: t = 2.374, Critical Values: t = +/- 2.011. There is _____ evidence to _____ the claim that the before and after results are the same (i.e., difference of before and after means are equal!).

Answers *

- [ ] not enough / reject
- [ ] enough / support
- [x] enough / reject
- [ ] not enough / support

Problem8

When the necessary conditions are met, a two-tail test is conducted to test the difference between two population means. The statistical software in use only provides one tail p-values as part of its output. Given a one-tail p-value of 0.036, what would a two-tail p-value for the same test be?

Answers *

- [ ] 0.018
- [ ] 0.009
- [x] 0.072
- [ ] 0.964
- [ ] 0.360

Problem 9

The owner of Bun & Run Hamburgers wishes to compare the sales per day at two different locations. The mean number of hamburgers sold for 10 randomly selected days at Northside was 83.55 with a population standard deviation of 10.50. For a randomly selected 12 days at Southside, the mean number of hamburgers sold was 69.54 with a population standard deviation of 14.25. We wish to test whether there is a difference in the mean number of hamburgers sold at the two locations using a 5% significance level. Assume that distributions of the sales at two locations are normally distributed and with equal variances. What is the value of the test statistic in this case?

Answers *

- [ ] 1.84
- [ ] 0.24
- [x] 2.50
- [ ] 1.71
- [ ] 2.20

Problem 10

Two independent samples from populations that are normally distributed produced the following statistics: for sample 1 the sample size was 50, the sample mean was 34.2 and the sample standard deviation was 12.6. For sample 2, the sample size was 32, the sample mean was 49.1 and the sample standard deviation was 19.4. Given a significance level of 5%, Is there evidence to **reject** the null hypothesis that states that the means of the two populations are equal? [Hint: draw a density curve to help find the RR.]

Answers *

- [x] Yes, since TS = 3.86 is in the rejection region $RR = (-\infty, -1.96) \cup (1.96, \infty)$
- [ ] Yes, since TS = 1.96 is in the rejection region $RR = (-\infty, -1.645) \cup (1.645, \infty)$
- [ ] Yes, since TS = 3.86 is in the rejection region $RR = (-\infty, -1.645) \cup (1.645, \infty)$
- [ ] No, since TS = 1.645 is NOT in the rejection region $RR = (-\infty, -1.96) \cup (1.96, \infty)$

Problem 11

Joe Palermo interviewed 507 randomly chosen WCU students and found that 59%of the students in his sample like to play chess. Consider the research question of whether or not a majority of WCU students like to play chess. The test for this research question is a:

Answers *

- [ ] Neither a one-sided nor two-sided test.
- [x] One-sided test.
- [ ] Both a one-sided and two-sided test.
- [ ] Two-sided test.

Problem 12

In a survey, 1,865 out of 2,246 randomly selected adults in the United States said that texting while driving should be illegal. Using these results, conduct a hypothesis test at the 5% significance level to test the claim that more than 80% of adults believe that texting while driving should be illegal. What is the P-value?

Answers *

- [ ] <0.999
- [x] <0.001
- [ ] >3.55
- [ ] =1.96
- [ ] -3.55

Problem 13

The health of the bear population in Yellowstone National Park is monitored by periodic measurements taken from anesthetized bears. In a sample of 100 bears, the mean weight was found to be 185 lbs. Assume that σ (population standard deviation) is known to be 125 lbs., use a 0.03 significance level to test the claim that the population mean weight of bears is equal to 210 lbs. What is the value of the test statistic?

Answers *

- [ ] 2.00
- [ ] 0.0228
- [x] -2.00
- [ ] 0.0456
- [ ] 12.5

Problem 14

A recent study showed that 53% of college applications were submitted online. Assume that this result is based on a simple random sample of 1,000 college applications, with 530 submitted online. Use a 0.01 significance level to test the claim that among all college applications the percentage submitted online is equal to 50%.

Identify the null and alternative hypotheses:

Answers *

- [ ] Ho: $p \geq .50$ vs H1: $p < .50$
- [x] Ho: $p = .50$ vs H1: $p \neq .50$
- [ ] Ho: $p > .50$ vs H1: $p \leq .50$
- [ ] Ho: $p \leq .50$ vs H1: $p > .50$

Problem 15

Two types of flares are tested and their burning times (in minutes) are recorded. The summary statistics are given below.

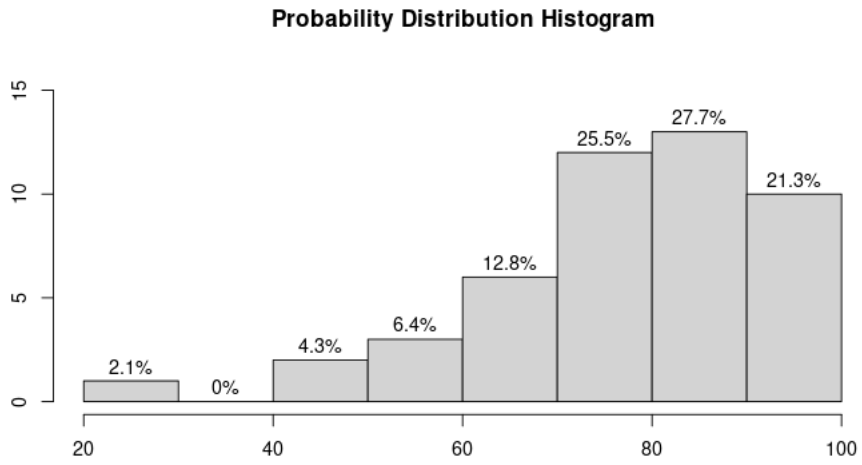
Brand X	Brand Y
$n_1 = 35$	$n_2 = 40$
$\bar{x}_1 = 19.4$	$\bar{x}_2 = 15.1$
$s = 1.4$	$s = 0.8$

Use a 0.05 significance level to test the claim that the two samples are from populations with the **same** mean. State your conclusion along with the test statistic.

Answers *

- Fail to reject the null hypothesis; t = -16.025
- ✓ Reject the null hypothesis; t = 16.025
- Reject the null hypothesis; t = -16.025
- Fail to reject the null hypothesis; t = 16.025

Summary of Midterm Exam #3



1. Five Number Summary :

The five-number summary is use used to describe the shape of the distribution of a given numerical data. It consists of five numbers: minimum data value, first quartile, median, the third quartile, and the maximum data value.

The five-number summary of this given data set is:

stats	value
Min.	25.00
1st Qu.	72.50
Median	80.00
3rd Qu.	90.00
Max.	100.00

2. Boxplot :

The boxplot is a geometric representation of the five-number summary. The boxplot of the given data set is given below.