60080079 Introduction to Statistical Methods
Semester 2 2023-2024
Homework Assignment 6

21 CST H3Art

In this homework assignment, if two distinct populations are to be compared, assume the variances to be equal.

1 You want to rent an unfurnished one-bedroom apartment for next semester. You take a random sample of 10 apartments advertised in the local newspaper and record the rental rates. Here are the rents (in dollars per month):

500, 650, 600, 505, 450, 550, 515, 495, 650, 395

Find a 95% confidence interval for the mean monthly rent for unfurnished one-bedroom apartments available for rent in this community.

1.1 The sample mean is 531 and standard deviation 8_.792; the *df* is ___ and the critical *t* is _.262.
1) 2
2) 4
3) 5
4) 7
5) 9

Part I: Write your answer as a three-digit number.

Answer: 151

1.2 The margin of error is 5_.222; and the 95% CI is (471.78, 59_.22). [Recall that the margin of error is the critical value multiplied by the standard error.]
1) 0
2) 3
3) 6
4) 9

Part II: Write your answer as a two-digit number.

Answer: 41

2 Use the same data as Problem 1. Do these data give good reason to believe that the mean rent of all advertised apartments is greater than $500 per month? State hypotheses, find the *t* statistic and its p-value, and state your conclusion.

2.1 The correct alternative is ___.
1) $\mu \neq 500$

2) $\mu > 500$
3) $\mu \neq 531$
4) $\mu > 531$

2.2 The computed *t* statistic is 1._84 with 9 degrees of freedom.
1) 1
2) 2
3) 3
4) 4

Part I: Write your answer as a two-digit number.

Answer: 21

2.3 The p-value is between 0.10 and 0._5.
1) 0
2) 1
3) 2
4) 3

2.4 Therefore, we ___ the null hypothesis and conclude that the current population mean is ___ the hypothesized value.
1) retain
2) reject
3) equal to
4) greater than

Part II: Write your answer as a three-digit number.

Answer: 213

3 A sample of $n = 15$ is used to perform a significance test for H_0: $m = 0$ versus H_A: $m > 0$. The test statistic is $t = 2.15$.

3.1 The degrees of freedom are 1_ and the computed *t* is between the tabulated values 2.145 and 2.6_4.
1) 1
2) 2
3) 3
4) 4

Part I: Write your answer as a two-digit number.

Answer: 42

3.2 The area to the right is between .0_ and .025. This is a ___ test so the p-value must be ___ the area to the right.

1) 1
2) 2
3) 3
4) one-sided
5) two-sided
6) equal to
7) twice

3.3 At what significance level do we reject the null? Choose one from the options below.

1) 0.01 but not 0.05
2) 0.05 but not 0.01
3) Both 0.01 and 0.05
4) Neither 0.01 nor 0.05

Part II: Write your answer as a four-digit number.

Answer: 2462

4 The following situations all require inference about a mean or means. Identify each as:

1) a single sample
2) matched pairs (or two dependent samples)
3) two independent samples.

4.1 An education researcher wants to learn whether inserting questions before or after introducing a new concept in elementary school mathematics text is more effective. He prepared two text segments that teach the concept, one with motivating questions before and the other with review questions after. Each text segment is used to teach a different group of children, and their scores on a test over the material are compared.

4.2 Another researcher approaches the same problem differently. She prepares text segment on two unrelated topics. Each segment comes in two versions, one with question before and the other with questions after. Each of a group of children is taught both topics, one topic (chosen at random) with questions before and the other with questions after. Each child's test scores on the two topics are compared to see which topic he or she learned better.

4.3 To evaluate whether a new intervention procedure is more effective than the traditional procedure with a known success rate, a researcher obtains a random sample of 20 individuals. The success rate for the new procedure was documented and compared to the success rate of the traditional procedure.

4.4 A different researcher is evaluating the same intervention procedures. She randomly assigned 20 individuals to the traditional procedure and another 20 individuals to the new intervention procedure. The success rates of the two procedures were compared.

Write your answer as a four-digit number.

Answer: 3213

5 Redo Problems 1 and 2 using SPSS. Give the exact p-value and/or confidence limits.

5.1 The 95% CI for Problem 1 has a lower limit of 47_.7745 and an upper limit of 59_.2255.

1) 0
2) 1
3) 2
4) 3

Part I: Write your answer as a two-digit number.

Answer: 21

5.2 The SPSS reported output for Problem 2 shows a "p-value" of 0._67.

1) 1
2) 2
3) 3
4) 4

5.3 Considering the alternative hypothesis, the correct p-value is ___ this value.

1) equal to
2) half of
3) twice

Part II: Write your answer as a two-digit number.

Answer: 22

6 The table below gives the pretest and posttest score on the LMA listening test in Spanish for 20 high school Spanish teachers who attended an intensive summer course in Spanish. You are interested whether the intensive course has a positive impact of the teachers' listening ability.

Teacher	Pretest	Posttest	Teacher	Pretest	Posttest
1	30	29	11	30	32
2	28	30	12	29	28
3	31	32	13	31	34
4	26	30	14	29	32

5	20	16	15	34	32
6	30	25	16	20	27
7	34	31	17	26	28
8	15	18	18	25	29
9	28	33	19	31	32
10	20	25	20	29	32

6.1 Suppose you are interested in determining whether the intensive course has a positive impact of the teachers' listening ability, and you defined the difference *D* as Posttest minus Pretest, the alternative hypothesis is ___.

1) $m_D \neq 0$
2) $m_D < 0$
3) $m_D > 0$

6.2 The differences have a mean of 1._50, standard deviation of 3.203. Given that the sample size is 20, the standard error must be 0._16, and the computed statistic is 2._25.

1) 0
2) 4
3) 5
4) 7
5) 8

Part I: Write your answer as a four-digit number.

Answer: 3241

6.3 The *df* is 1_ and the p-value is between .0_5 and .05. The test is significant at ___.

1) 2
2) 6
3) 9
4) 1% only
5) 5% only
6) both 1% and 5%

Part II: Write your answer as a three-digit number.

Answer: 315

6.4 If we are interested in a 90% CI for $\mu_{\text{posttest}} - \mu_{\text{pretest}}$, the critical *t* is 1.72_, and the interval estimate is (0.212, 2._88).

1) 0
2) 3
3) 6
4) 9

Part III: Write your answer as a two-digit number.

Answer: 43

7 Pat wants to compare the cost of one- and two-bedroom apartments in the area of your campus. She collects data for a random sample of 10 advertisements of each type. Here are the rent for the two-bedroom apartments (in dollars per month):

595, 500, 580, 650, 675, 675, 750, 500, 495, 670

Here are the rents for the one-bedroom apartments:

500, 650, 600, 505, 450, 550, 515, 495, 650, 395

7.1 This is a two-independent-sample problem. Two assumptions of this method are ___.

1) $\mu_1 = \mu_2$ and $\sigma_1 = \sigma_2$.
2) $\sigma_1 = \sigma_2$ and normal population distributions.
3) $\mu_1 = \mu_2$ and normal population distributions.

7.2 The sample mean and variance for the one-bedroom apartments is 53_ and 6854.44; for the two-bedroom apartments, these statistics are 609 and 7976.67. The pooled estimate of the standard deviation equals to 8_.1136.

1) 1
2) 3
3) 6
4) 9

Part I: Write your answer as a three-digit number.

Answer: 213

7.3 The exact *df* is 1_ and the critical *t* is 2._01.

1) 0
2) 1
3) 2
4) 7
5) 8

Part II: Write your answer as a two-digit number.

Answer: 52

7.4 We are interested in a 95% confidence interval for $\mu_2 - \mu_1$. The mean difference is _8, and margin of error is 8_.9120. The confidence limits are -2.91 and 15_.91.

1) 0
2) 1
3) 2

4) 7
5) 8

Part III: Write your answer as a three-digit number.

Answer: 415

8 You use statistical software to perform a significance test of the null hypothesis that two means are equal. The software reports p-values for the two-sided alternative. You alternative is that first mean is greater than the second mean. If the software reports a test statistics of $t = 1.81$ with a p-value of 0.07. Would you reject H_0 with $\alpha = .05$?

8.1 The alternative is ___, so the p-value is ___.
1) one-tailed
2) two-tailed
3) 0.035
4) 0.070

8.2 If the alternative is H_a: $\mu_1 > \mu_2$, and the difference is positive (i.e., it is computed as the first mean minus the second mean) then the p-value should result in ___ of the null hypothesis.
1) retention
2) rejection

Write your answer as a three-digit number.

Answer: 132

9 A study of iron deficiency among infants compared sample of infants following different feeding regimens. One group contained breast-fed infants, while the children in another group were fed a standard baby formula without any iron supplements. Here are summary results on blood hemoglobin levels at 12 months of age:

Group	n	$\bar{x}$	s
Breast-fed	23	13.3	1.7
Formula	19	12.4	1.8

9.1 Is there a significant evidence that the mean hemoglobin level is higher among breast-fed babies?

Let 1 = breast-fed and 2 = formula. The correct alternative is ___.

1) $\mu_1 \neq \mu_2$
2) $\mu_1 > \mu_2$
3) $\mu_1 < \mu_2$

9.2 The pooled estimate of the population standard deviation is 1._457, and the computed *t* is 1._6.

1) 5
2) 6
3) 7
4) 8

Part I: Write your answer as a three-digit number.

Answer: 232

9.3 The computed *t* is between the tabulated *t* values of 1._03 and 1.684, which correspond to a p-value between .0_ and .10. Hence, we ___ the null hypothesis.

1) 1
2) 3
3) 5
4) 7
5) retain
6) reject

Part II: Write your answer as a three-digit number.

Answer: 235

9.4 Give a 95% confidence interval for the mean difference in hemoglobin level between the two population means.

The critical *t* is _.021, and the lower and upper limits of the CI are -0.19 and 1._9.

1) 2
2) 6
3) 8
4) 9

9.5 For the methods to be valid, we need to assume ___ and ___.

1) Population distributions are normal.
2) Population means are equal.
3) Population standard deviations are equal.

Part III: Write your answer as a four-digit number.

Answer: 1413

10 Redo Problem 6 using SPSS. The 90% CI for this problem has an upper limit of 2._885. The SPSS output shows an uncorrected p-value of 0.0_7. The correct p-value should be 0.0_85.

Write your answer as a three-digit number.

Answer: 652

11 Redo Problem 7 is SPSS. The standard error of the difference is 38.511_82 and exact p-value is 0.05_917.

Write your answer as a two-digit number.

Answer: 17