

King Fahd University of Petroleum and Minerals
Department of Mathematics
Stat 212
Major Exam I
221
October 04, 2022
Net Time Allowed: 120 Minutes

MASTER VERSION

1. If a test of hypotheses has a Type I error probability (α) of 0.01, it means that:
 - (a) If the null hypothesis is true, you reject it 1% of the time _____(correct)
 - (b) If the null hypothesis is true, you don't reject it 1% of the time
 - (c) If the null hypothesis is false, you don't reject it 1% of the time
 - (d) If the null hypothesis is false, you reject it 1% of the time
 - (e) If the null hypothesis is true, you accept it 1% of the time

2. You have created a 95% confidence interval for μ with the result $49 \leq \mu \leq 60$. What decision will you make if you test $H_0 : \mu = 61$ versus $H_1 : \mu \neq 61$ at $\alpha = 0.1$?
 - (a) Reject H_0 in favor of H_1 _____(correct)
 - (b) Do not reject H_0 in favor of H_1
 - (c) Fail to reject H_0 in favor of H_1
 - (d) Reject H_1 in favor of H_0
 - (e) We cannot tell what our decision will be

3. **(Use Data 1)** AT & T wanted to test if there is evidence that the new repair service process has reduced the mean waiting time for repairs. At 0.01 level of significance, what is the conclusion of the test?
- (a) There is no evidence that the mean time for repairs is less than 24.3 hours
(correct)
 - (b) There is evidence that the mean time for repairs is less than 24.3 hours
 - (c) There is evidence that the mean time for repairs is not different from 24.3 hours
 - (d) There is no evidence that the mean time for repairs is more than 24.3 hours
 - (e) There is no evidence that the mean time for repairs is not different from 24.3 hours
4. **(Use Data 1)** AT & T wanted to test if there is evidence that the new repair service process has reduced the mean waiting time for repairs. At 0.01 level of significance, what is **approximate p -value**?
- (a) 0.1 _____(correct)
 - (b) 0.05
 - (c) $0.005 < p - \text{value} < 0.01$
 - (d) $0.025 < p - \text{value} < 0.05$
 - (e) 0.025

5. (Use Data 1) AT & T wanted to test if there is evidence that the new repair service process has reduced the mean waiting time for repairs. At 0.05 level of significance, what is the **critical value** and **decision of the test**?

- (a) $t_{stat} = -1.662$, and decision: Not to reject H_0 _____(correct)
- (b) $t_{stat} = 1.662$, and decision: Reject H_0
- (c) $t_{stat} = -1.2911$, and decision: Reject H_0
- (d) $t_{stat} = 1.2911$, and decision: Not to Reject H_0
- (e) $t_{stat} = -1.2911$, and decision: Not to Reject H_0

6. (Use Data 2) The telephone company wanted to test that the percentage of customers, that would consider purchasing an additional telephone line if it were made available at a substantially reduced installation cost, is more than 20%. What is the null and alternative hypotheses?

- (a) $H_0 : \pi \leq 0.2$ vs. $H_1 : \pi > 0.2$ _____(correct)
- (b) $H_0 : \pi \geq 0.2$ vs. $H_1 : \pi < 0.2$
- (c) $H_0 : \pi = 0.2$ vs. $H_1 : \pi \neq 0.2$
- (d) $H_0 : \pi = 0.19$ vs. $H_1 : \pi \neq 0.19$
- (e) $H_0 : \pi \leq 0.19$ vs. $H_1 : \pi > 0.19$

7. **(Use Data 2)** The telephone company wanted to test that the percentage of customers, that would consider purchasing an additional telephone line if it were made available at a substantially reduced installation cost, is more than 20%. At 0.02 level of significance, what is the **critical value**?

- (a) 2.05 _____(correct)
- (b) -2.05
- (c) 0.97982
- (d) -0.97982
- (e) -0.4767

8. **(Use Data 2)** The telephone company wanted to test that the percentage of customers, that would consider purchasing an additional telephone line if it were made available at a substantially reduced installation cost, is more than 20%. At 0.02 level of significance, what is the **decision of the test**?

- (a) There is no evidence that the population proportion is above 0.2 _____(correct)
- (b) There is evidence that the population standard deviation is above 0.2
- (c) There is evidence that the population standard deviation is 0.2
- (d) There is no evidence that the population standard deviation is below 0.2
- (e) There is no evidence that the population proportion is below 0.2

9. If an economist wishes to determine whether there is evidence that mean family income in a community exceeds \$50,000, what test should be used?

- (a) An upper-tail test should be utilized _____(correct)
- (b) A lower-tail test should be utilized
- (c) A two-tail test should be utilized
- (d) Either a one-tail or a two-tail test could be used with equivalent results
- (e) A lower-tail Z -test should be utilized

10. (Use Data 3) If an analyst wanted to determine whether the mean amount spent by men is more than the mean amount spent by women, then the **alternative hypothesis** would be?

- (a) $H_1 : \mu_{men} > \mu_{women}$ _____(correct)
- (b) $H_1 : \mu_{men} \geq \mu_{women}$
- (c) $H_1 : \mu_{men} \leq \mu_{women}$
- (d) $H_1 : \mu_{men} < \mu_{women}$
- (e) $H_1 : \mu_{men} \neq \mu_{women}$

11. **(Use Data 3)** If an analyst wanted to determine whether the mean amount spent by men is **not different** from the mean amount spent by women. At 0.1 level of significance, what is the **test statistic**?

(a) 0.1311 _____(correct)

(b) 0.0386

(c) 0.3133

(d) 0.3806

(e) 0.2365

12. **(Use Data 3)** If an analyst wanted to determine whether the mean amount spent by men is **not different** from the mean amount spent by women. At 0.1 level of significance what is the appropriate confidence interval?

(a) $-92.3818 \leq \mu_1 - \mu_2 \leq 108.3818$ _____(correct)

(b) $-70.2307 \leq \mu_1 - \mu_2 \leq 86.2307$

(c) $-111.6038 \leq \mu_1 - \mu_2 \leq 127.6038$

(d) $-133.9380 \leq \mu_1 - \mu_2 \leq 149.9389$

(e) $-107.2795 \leq \mu_1 - \mu_2 \leq 114.7205$

13. **(Use Data 3)** If an analyst wanted to determine whether the mean amount spent by men is not different from the mean amount spent by women. At 0.1 level of significance what is the **decision of the test**?
- (a) There is no evidence that the mean amount spent by men is different from the mean amount spent by women _____(correct)
 - (b) There is evidence that the mean amount spent by men is different from the mean amount spent by women
 - (c) There is evidence that the mean amount spent by women is higher than mean amount spent by men
 - (d) There is evidence that the mean amount spent by men is higher than mean amount spent by women
 - (e) There is no evidence that the mean amount spent by men is equal to the mean amount spent by women
14. **(Use Data 4)** The students wanted to test whether the mean delivery time for the local pizza restaurant is less than the mean delivery time for the national pizza chain. At 0.025 level of significance what is the null and alternative hypotheses?
- (a) $H_0 : \mu_D \geq 0$ vs. $H_1 : \mu_D < 0$ _____(correct)
 - (b) $H_0 : \mu_D = 0$ vs. $H_1 : \mu_D \neq 0$
 - (c) $H_0 : \mu_1 - \mu_2 \leq 0$ vs. $H_1 : \mu_1 - \mu_2 > 0$
 - (d) $H_0 : \mu_1 \leq \mu_2$ vs. $H_1 : \mu_1 > \mu_2$
 - (e) $H_0 : \mu_D < 0$ vs. $H_1 : \mu_D > 0$

15. **(Use Data 4)** The students wanted to test whether the mean delivery time for the local pizza restaurant is less than the mean delivery time for the national pizza chain. At 0.025 level of significance what is the **decision of the test**?
- (a) There is evidence that the mean delivery time is lower for the local pizza restaurant than for the national chain _____(correct)
 - (b) There is evidence that the mean delivery time is higher for the local pizza restaurant than for the national chain
 - (c) There is no evidence that the mean delivery time is lower for the local pizza restaurant than for the national chain
 - (d) There is no evidence that the mean delivery time of the local pizza restaurant is different from the mean delivery time of national chain
 - (e) There is evidence that the mean delivery time of the local pizza restaurant is different from the mean delivery time of national chain
16. A survey of 500 shoppers was taken in a large metropolitan area to determine various information about consumer behaviour. Among the questions asked was, “Do you enjoy shopping for clothing?” Of 240 males, 136 answered yes. Of 260 females, 224 answered yes. If an analyst wanted to test whether there is significant difference between males and females in the proportion who enjoy shopping for clothing at 0.01 level of significance. What is the **test statistic and critical value(s)**?
- (a) -7.3366 & ± 2.58 _____(correct)
 - (b) -4.5752 & ± 2.58
 - (c) -4.5752 & ± 2.33
 - (d) -7.3366 & ± 2.33
 - (e) -4.5752 & ± 2.00

17. **(Use Data 5)** If the professor wanted to test whether there is evidence that variability is higher in the final exam scores of non accounting students than accounting students. At 0.05 level of significance, what are the **degrees of freedom**?

- (a) 20 & 15 _____(correct)
- (b) 15 & 20
- (c) 21 & 16
- (d) 20 & 16
- (e) 16 & 21

18. **(Use Data 5)** If the professor wanted to test whether there is evidence that the variability is higher in the final exam scores of non-accounting students than accounting students. At 0.05 level of significance, the **test statistic** is?

- (a) 2 _____(correct)
- (b) 1.414
- (c) 0.5
- (d) 0.707
- (e) 4

19. **(Use Data 6)** The manufacturer wanted to test if that the population standard deviation has increased above $1.2^\circ F$. What is the null and alternative hypotheses?

- (a) $H_0 : \sigma^2 \leq 1.44$ vs. $H_1 : \sigma^2 > 1.44$ _____(correct)
- (b) $H_0 : \sigma^2 \leq 4.10$ vs. $H_1 : \sigma^2 > 4.10$
- (c) $H_0 : \sigma^2 \geq 1.44$ vs. $H_1 : \sigma^2 < 1.44$
- (d) $H_0 : \sigma^2 = 1.44$ vs. $H_1 : \sigma^2 \neq 1.44$
- (e) $H_0 : \sigma^2 \geq 4.10$ vs. $H_1 : \sigma^2 < 4.10$

20. **(Use Data 6)** The manufacturer wanted to test if that the population standard deviation has increased above $1.2^\circ F$. At 0.05 level of significance what is the **test statistic**?

- (a) 88.8125 _____(correct)
- (b) 9.4694
- (c) 50.75
- (d) 16.5714
- (e) 91.875

Data 1

In a recent year, the Federal Communications Commission reported that the mean wait for repairs for AT&T customers was 24.3 hours. In an effort to improve this service, suppose that a new repair service process was developed. This new process, used for a sample of 90 repairs, resulted in a sample mean of 23.7 hours and a sample standard deviation of 4.4086 hours.

Data 2

A telephone company wants to investigate the desirability of beginning a marketing campaign that would offer customers the right to purchase an additional telephone line at a substantially reduced installation cost. The campaign will be initiated if there is evidence that more than 20% of the customers would consider purchasing an additional telephone line if it were made available at a substantially reduced installation cost. A random sample of 440 households is selected. The results indicate that 84 of the households would purchase the additional telephone line at a reduced installation cost.

Data 3

According to a recent study, when shopping online for luxury goods, men spend a mean of \$2,401, whereas women spend a mean of \$2,393. Suppose that the study was based on a sample of 600 men and 700 women, and the standard deviation of the amount spent was \$1,200 for men and \$1,000 for women. **Assume equal population variances.**

Data 4

Some college students have decided to test the validity of an advertisement by a local pizza restaurant, which says it delivers to the dormitories faster than a local branch of a national chain. The students collect the data by ordering 10 pizzas from the local pizza restaurant and 10 pizzas from the national chain at different times. They organize and store the data in the following table that shows the delivery times (in minutes):

Time	1	2	3	4	5	6	7	8	9	10	St. Dev
Local	15.4	16.3	14.6	11.4	13.7	17.6	12.9	12.3	13.3	14.3	1.8790
Chain	20.3	15.3	15.3	18.7	16.7	18.6	17.5	13.4	17.4	22.4	2.6163
difference	-4.9	1	-0.7	-7.3	-3	-1	-4.6	-1.1	-4.1	-8.1	2.9690

Data 5

A professor in the accounting department of a business school would like to determine whether there is more variability in the final exam scores of students taking the introductory accounting course who are not majoring in accounting than for students taking the course who are majoring in accounting. Random samples of 21 non-accounting majors and 16 accounting majors are selected from the professor's class roster in his large lecture, and the following results are computed based on the final exam scores: Non-accounting: $S_1^2 = 84.4$, Accounting: $S_2^2 = 42.2$.

Data 6

A manufacturer of candy must monitor the temperature at which the candies are baked. Too much variation will cause inconsistency in the taste of the candy. Past records show that the standard deviation of the temperature has been $1.2^\circ F$. A random sample of 30 batches of candy is selected, and the sample standard deviation of the temperature is $2.1^\circ F$.