Calc ok
notes ok
tables ok

B

Illowsky – Chapt. 9 & 10
Larson – Chapt. 7 & 8

100

Math 123 Exam 3   SHOW ALL WORK   Name

M. [illegible]

All hypothesis tests MUST include: 1. Clear statement of hypotheses 2. Clear statement of critical value 3. Clear statement of formula used to calculate the standardized test statistic 4. Clear conclusion: reject or do not reject Ho and *answer the question*.

P_1 = AHC
P_2 = Cuesta

1. A recent survey showed that of 145 AHC students, 25 planned to transfer to UCSB while for 130 students from Cuesta the number who planned to transfer to UCSB was 18. Test the claim that the population proportion of AHC students who plan to transfer to ~~Cal Poly~~ UCSB exceeds that of Cuesta students. Use alpha = 5%.

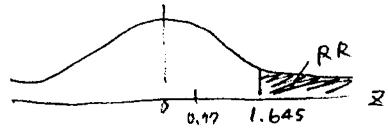
= more than
$P_1 > P_2$

$n_1 = 145$ AHC
$x_1 = 25$ UCSB
$n_2 = 130$ Cuesta
$x_2 = 18$

$\alpha = 0.05$

① Ho: $P_1 \le P_2$
Ha: $P_1 > P_2$ (claim)

② $\alpha = 0.05$, $n = \infty$, right (+)
$z_0 = 1.645$



$\hat{p}_1 = \frac{x_1}{n_1} = \frac{25}{145} = 0.1724$

$\hat{p}_2 = \frac{x_2}{n_2} = \frac{18}{130} = 0.1384$

$\bar{q} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{25+18}{145+130} = \frac{43}{275} = 0.1563$

$= 0.8436$

③ $z = \frac{\hat{p}_1 - \hat{p}_2 - (0)}{\sqrt{\bar{p} \cdot \bar{q} \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{0.1724 - 0.1384}{\sqrt{(0.1563)(0.8436)\left(\frac{1}{145} + \frac{1}{130}\right)}} = 0.7739$

④ Do not reject Ho
Do not support the claim

2. The listing prices from a random sample of six homes in Santa Maria are given below. At alpha = 5%, test the claim that the population mean listing price of a home in Santa Maria is no more than \$340,000. You may assume that listing prices are normally distributed. $\mu \le 340{,}000$ claim

$\bar{x} = 332{,}166$
$s = 58{,}427.44$

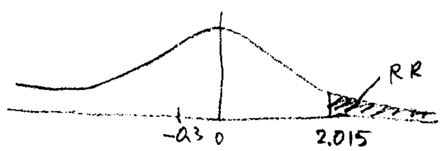
$n = 6$
$\alpha = 0.05$

\$255,000	\$415,000	\$339,000	\$380,000	\$295,000	\$309,000

1,963,000 ÷ 6 =

① Ho: $\mu \le$ \$340,000 (claim)
Ha: $\mu >$ \$340,000

② $\alpha = 0.05$, $n = 6 \rightarrow d.f = n - 1 = 6 - 1 = 5$, right (+)
$t_0 = 2.015$



③ $z = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}} = \frac{332{,}166 - 340{,}000}{\frac{58{,}427.447}{\sqrt{6}}} = -0.3284$

④ Do not reject Ho
Do not reject the claim.

3. Give the name of the hypothesis test you would use to compare the population ~~mean~~ GPA of students at AHC, Cuesta College and SBCC. K=3 (AHC, Cuesta, SBCC)

ANOVA

(one-way analysis of variance)

4. Suppose the P-value of a hypothesis test is P = 0.0765. Do you reject Ho at alpha = 5%? Explain.

$$\underset{P}{0.0765} > \underset{\alpha}{0.05}$$

Do not reject Ho.

5. Use the following sample data to test the claim that political affiliation and salary for residents of a town are independent. Use alpha = 1%.

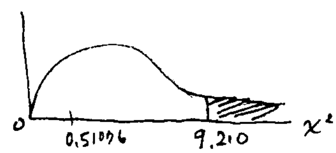
Salary

political affiliation	<$25,000	$25,000-$50,000	>$50,000	Total
Liberal	45	87	37	169
Conservative	27	42	20	89
Total	72	129	57	258

① Ho: Salarys are independent of Political affiliation (claim)
Ha: Salarys are dependent of Political affiliation

② $\alpha = 0.01$, $d.f = (2-1)(3-1) = 1(2) = 2$

$\chi_0^2 = 9.210$



③ $\chi^2 = \frac{(O-E)^2}{E} = 0.51076$

O	E
45	47.1627
87	84.5
37	37.3
27	24.8372
42	44.5
20	19.6627

④ Do not reject Ho.
Do not reject the claim.

$<\$3500$

6. A CEO claims that the population variance of salaries at her company is less than \$3500. A random sample of 22 employees yielded $s^2 = \$3019$. Test the CEO's claim at a 1% level of significance.

$\sigma^2 = \$3500$

$n = 22$

$s^2 = \$3019$

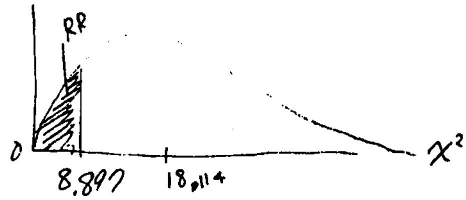
$\alpha = 0.01$

① $H_0: \sigma^2 \geq \$3500$

$H_a: \sigma^2 < \$3500$ (claim)

② $\alpha = 0.01 \rightarrow \alpha = 0.99$, d.f. = 21, left

$\chi_0^2 = 8.897$



③ $\chi^2 = \dfrac{(n-1)s^2}{\sigma_0^2} = \dfrac{(22-1)\,3019}{3500} = 18.114$

④ Do not reject Ho

Do not support the claim.

7. A researcher claims that on average a person's left foot length will exceed that of their right foot. She randomly selects five individuals and records their left and right foot lengths in cm. Using the data below, at alpha = 10%, test the researcher's claim. You may assume that foot lengths are normally distributed.

more than

$\mu_d > 0$ claim

$n = 5$

$\alpha = 0.10$

Subject	1	2	3	4	5
Left	26.3	18.3	21.8	29.2	24.3
Right	26.3	18.4	21.7	29.1	24.2
	0	-0.1	+0.1	+0.1	+0.1

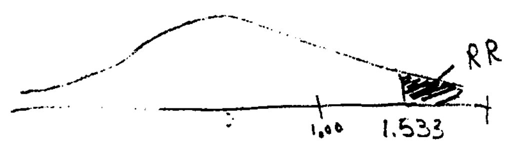
$\bar{x} = 0.04$

$s_x = 0.08944$

①

$H_0: \mu_d \leq 0$

$H_a: \mu_d > 0$ (claim)



② $\alpha = 0.10$, d.f. = 4, right (+)

$t_0 = 1.533$

③ $t = \dfrac{\bar{d} - 0}{\frac{s_d}{\sqrt{n}}} = \dfrac{0.04}{\frac{0.08944}{\sqrt{5}}} = 1.000$

④ Do not reject Ho

Do not support the claim.

8. To test the claim that the population proportion of AHC students who work full time is less than 14%, you survey 210 AHC students and find 22 that work full time. At alpha = 10%, what do you conclude?

p $p < 0.14$

$p_0 = 0.14$

$n = 210$

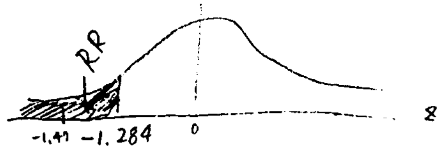
$x = 22$

$\hat{p} = \frac{x}{n} = \frac{22}{210} = 0.1047$

$q_0 = 0.86$

① $H_0: p \geq 0.14$

$H_a: p < 0.14$ (claim)



② $n = 210 \to \infty$, $\alpha = 0.10$, left (−)

$z_0 = -1.284$

③ $z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{(p_0)(q_0)}{n}}} = \dfrac{0.1024 - 0.14}{\sqrt{\dfrac{(0.14)(0.86)}{210}}} = -1.47166$

$\boxed{\text{calc}}$ gave me this number

~~-1.3614~~

④ Reject Ho.

Support the claim.

9. A random sample of 38 workers in Bigtown yielded a sample mean salary of $60,213 with a standard deviation of $7234. For a random sample of 41 workers in Littletown the mean salary was $61,234 with standard deviation $7675. Test the claim that the population mean salaries are the same for the two towns. Use a 1% level of significance.

① $H_0: \mu_1 = \mu_2$ (claim)

$H_a: \mu_1 \neq \mu_2$

$n_1 = 38$

$\bar{x}_1 = \$60,213$

$S_1 = \$7234$

* Assume population variances not equal *

② $\alpha = 0.01$, two tailed

$t_0 = -2.715, 2.715$

$n_2 = 41$

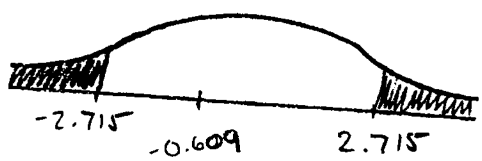
$\bar{x}_2 = \$61,234$

$S_2 = \$7675$

③ $t = \dfrac{(\bar{x}_1 - \bar{x}_2) - (0)}{\sqrt{\dfrac{S_1^2}{n_1} + \dfrac{S_2^2}{n_2}}}$

$\alpha = 0.01$

$d.f = 38 - 1 = 37$



$= \dfrac{60,213 - 61234}{\sqrt{\dfrac{7234^2}{38} + \dfrac{7675^2}{41}}}$

$= -0.609$

④ Do not reject Ho

Do not reject claim.