Math 227 **Test #4(chapter 8 & 9)** **Name** Danette Garcia

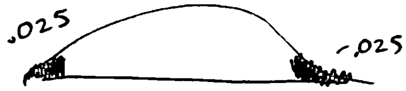
95

Show all steps for full credit. Total points: 100 (10 points each)

Find critical values.

1) a. Assume that normal distribution applies. Use $\alpha = 0.05$ for a two-tailed test. Find the creitical z value.

$\alpha = 0.05$



$\boxed{z = \pm 1.96}$ ✓

b. Assume that t-distribution applies. Use $\alpha = 0.01$ for a right-tailed test and n = 15. Find the creitical t value.

$n = 15$
$df = 14$

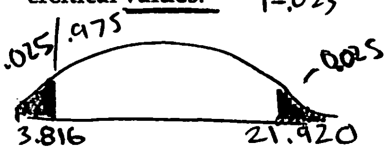
$\boxed{t = 2.624}$ ✓

c. Assume that normal distribution applies. Use $\alpha = 0.05$ for a left-tailed test. Find the creitical z value.

$\boxed{z = -1.645}$ ✓

d. Assume that chi-square distribution applies. Use $\alpha = 0.05$ and n = 12. It is a two-tailed test. Find the creitical values.

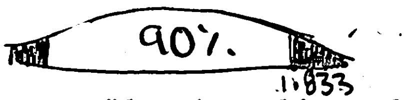
$1 - .025$



$n = 12$
$df = 11$
$\alpha = 0.05$

$\boxed{\chi^2_L = 3.816 \quad \chi^2_R = 21.920}$ ✓

e. Assume that t-distribution applies. Use $\alpha = 0.10$ and n = 10 for a two-tailed test. Find the creitical t values.



$n = 10$
$df = 9$

$\boxed{t = \pm 1.833}$ ✓

Construct a confidence interval for μ_d, the mean of the differences d for the population of paired data. Assume that the population of paired differences is normally distributed.

2) Ten different families are tested for the number of gallons of water a day they use before and after viewing a conservation video. Construct a 90% confidence interval for the mean of the differences.

Before	33	33	38	33	35	35	40	40	40	31
After	34	28	25	28	35	33	31	28	35	33

$n = 10$
$df = 9$
$C.L = 90\%$
$\alpha = 0.05$

$s_d = 5.245$
$\bar{d} = 4.8$

① $t_{\frac{\alpha}{2}} = \boxed{1.833}$

②

$$E = 1.833 \cdot \frac{5.245}{\sqrt{10}} = \boxed{3.04}$$

③ $\bar{d} - E < \mu_d < \bar{d} + E$

$4.8 - 3.04 < \mu_d < 4.8 + 3.04$

$\boxed{1.76 < \mu_d < 7.84}$

(+) (+)

④ Since the interval is positive, it is suggested that $p_1 > p_2$. $\mu_d > 0$

$\hat{p}$

3) An article in a journal reports that 34% of American fathers take ~~no~~ responsibility for child care. A researcher claims that the figure is higher for fathers in the town of Littleton. A random sample of 234 fathers from Littleton yielded 96 who did not help with child care. Test the researcher's claim at the 0.05 significance level.

$n = 234$

$x = 96$

$\hat{p} = .41$

$p = .34$

$q = .66$

① Claim

$p > .34$

$H_0: p = .34$

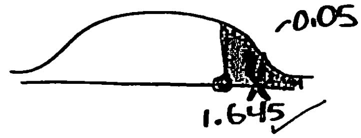
$H_1: p > .34$

② T.S

$$z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}} = \frac{.41 - .34}{\sqrt{\frac{(.34)(.66)}{234}}}$$

$= 2.26$

③ C.V $\alpha = 0.05$



Reject Ho.

④ There is sufficient evidence to support the claim that the figure is higher for fathers in the town of Littleton.

Assume that two dependent samples have been randomly selected from normally distributed populations.

4) A coach uses a new technique in training middle distance runners. The times for 8 different athletes to run 800 meters before and after this training are shown below.

Athlete	A	B	C	D	E	F	G	H
Time before training (seconds)	118.7	111.1	115.1	109.4	117.9	111.3	116.2	109
Time after training (seconds)	119.3	109.8	112.7	110.2	116.1	111.4	112.6	105.1

Using a 0.05 level of significance, test the claim that the training helps to improve the athletes' times for the 800 meters.

$n = 8$

$\bar{d} = 1.44$

$s_d = 1.83$

① Claim

$\mu_d > 0$

$H_0: \mu_d = 0$

$H_1: \mu_d > 0$

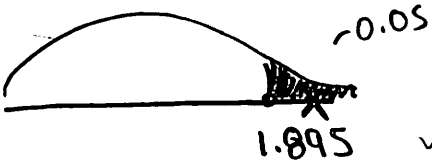
②

$$t = \frac{\bar{d}}{\frac{s_d}{\sqrt{n}}} = \frac{1.44}{\left(\frac{1.83}{\sqrt{8}}\right)} = 2.23$$

③ C.V

$\alpha = 0.05$

$df = 7$



Reject Ho.

④ There is sufficient evidence to support the claim that the training helps improve athlete's times for the 800 meters.

Test the indicated claim about the means of two populations. Assume that the two samples are independent simple random samples selected from normally distributed populations. Do not assume that the population standard deviations are equal.

μ

5) A researcher was interested in comparing the amount of time (in hours) spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected, and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows.

μ_1 Women	μ_2 Men
$\bar{x}_1 = 11.8$ hr	$\bar{x}_2 = 13.5$ hr
$s_1 = 3.9$ hr	$s_2 = 5.2$ hr
$n_1 = 14$	$n_2 = 17$

Use a 0.05 significance level to test the claim that the mean amount of time spent watching television by women is smaller than the mean amount of time spent watching television by men. Use the traditional method of hypothesis testing.

① Claim $H_0: \mu_1 = \mu_2$

$\mu_1 < \mu_2$ $H_1: \mu_1 < \mu_2$ ✓

②

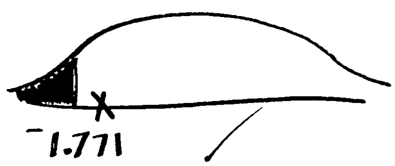
$$t = \frac{(11.8 - 13.5)}{\sqrt{\frac{(3.9)^2}{14} + \frac{(5.2)^2}{17}}} = -1.04$$ ✓

③ C.V

Fail to Reject Ho. ✓

$df = 13$

$\alpha = 0.05.$



✓

④ There is not sufficient evidence to support the claim that the mean amount of time spent watching t.v by women is smaller than that of men. ✓

σ

Assume that the population is normally distributed and that the sample has been randomly selected.

6) The standard deviation of math test scores at one high school is 16.1. A teacher claims that the standard deviation of the girls' test scores is smaller than 16.1. A random sample of 22 girls results in scores with a standard deviation of 13.2. Use a significance level of 0.01 to test the teacher's claim.

$n = 22 \quad df = 21$

$s = 13.2$

$\alpha = 0.01$

$\sigma = 16.1$

① Claim $\sigma < 16.1$ $\quad H_0: \sigma = 16.1$

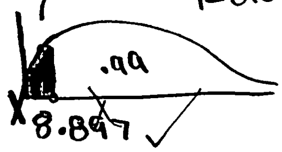
$H_1: \sigma < 16.1$

② T.S

$$\chi^2 = \frac{(21)(13.2^2)}{16.1^2} = 14.12$$

③ C.V $\quad df = 21$

0.01 $\quad$ 1−0.01



Reject H_0.

④ There is sufficient evidence to support the claim that the standard deviation of girls' test scores is smaller than 16.1.

Assume that the samples are independent and that they have been randomly selected.

7) A marketing survey involves product recognition in New York and California. Of 558 New Yorkers surveyed, 193 knew the product while 196 out of 614 Californians knew the product. Construct a 99% confidence interval for the difference between the two population proportions.

New York	California
$n_1 = 558$	$n_2 = 614$
$x_1 = 193$	$x_2 = 196$
$\hat{p}_1 = .346$	$\hat{p}_2 = .319$
$\hat{q}_1 = .654$	$\hat{q}_2 = .681$

② $$E = 2.575 \cdot \sqrt{\frac{(.346)(.654)}{558} + \frac{(.319)(.681)}{614}} = .071$$

③ $$\hat{p}_1 - \hat{p}_2 = .346 - .319 = .027$$

$$.027 - .071 < p_1 - p_2 < .027 + .071$$

$$-.044 < p_1 - p_2 < .098$$

$\ominus \quad \oplus$

① CL. 99%

$z_{\frac{\alpha}{2}} = 2.575$

④ Since the interval contains 0, it is suggested that $p_1 = p_2$.

−2

Assume that the samples are independent and that they have been randomly selected

8) In a random sample of 360 women, 65% favored stricter gun control laws. In a random sample of 220 men, 60% favored stricter gun control laws. Test the claim that the proportion of women favoring stricter gun control is higher than the proportion of men favoring stricter gun control. Use a significance level of 0.05.

p_1 women	p_2 men
$n_1 = 360$	$n_2 = 220$
$\hat{p}_1 = .65$	$\hat{p}_2 = .60$
$x_1 = n_1\hat{p}_1 = 234$	$x_2 = 132$
$\hat{q}_1 = .35$	$\hat{q}_2 = .40$

$n_1 p' \geq 5$, $n_1 q_1 \geq 5$ > normal

$n_2 \hat{p}_2 \geq 5$, $n_2 \hat{q}_2 \geq 5$ > normal

① Claim $p_1 > p_2$

$H_0: p_1 = p_2$

$H_1: p_1 > p_2$

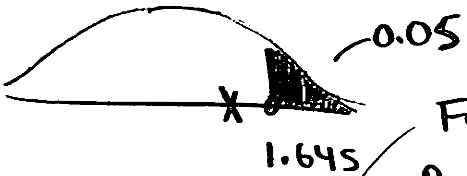
$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{234 + 132}{360 + 220} = .631$$

$$\bar{q} = 1 - .631 = .369$$

② T.S

$$z = \frac{(.65 - .60) - 0}{\sqrt{\frac{(.631)(.369)}{360} + \frac{(.631)(.369)}{220}}} = 1.21$$

③ C.V $\alpha = 0.05$



Fail to Reject H_0.

④ There is not sufficient evidence to support the claim that the proportion of women favoring gun control is higher than the proportion of men.

Construct the indicated confidence interval for the difference between the two population means. Assume that the two samples are independent simple random samples selected from normally distributed populations. Do not assume that the population standard deviations are equal.

9) A researcher was interested in comparing the amount of time spent watching television by women and by men. Independent simple random samples of 14 women and 17 men were selected, and each person was asked how many hours he or she had watched television during the previous week. The summary statistics are as follows.

Women	Men
$\bar{x}_1 = 12.5$ hrs	$\bar{x}_2 = 14.3$ hrs
$s_1 = 3.9$ hrs	$s_2 = 5.2$ hrs
$n_1 = 14$	$n_2 = 17$

Construct a 99% confidence interval for $\mu_1 - \mu_2$, the difference between the mean amount of time spent watching television for women and the mean amount of time spent watching television for men.

$df = 13$

$C.L = 99\%$

$\alpha = 0.05$

1

$t_{\frac{\alpha}{2}} = 3.012$

2

$E = 3.012\sqrt{\frac{(3.9)^2}{14} + \frac{(5.2)^2}{17}} = 4.928$

3 $\bar{x}_1 - \bar{x}_2 = 12.5 - 14.3 = -1.8$

$-1.8 - 4.928 < \mu_1 - \mu_2 < -1.8 + 4.928$

4 Since the interval $-6.728 < \mu_1 - \mu_2 < 3.128$ contains 0, it is suggested $\mu_1 = \mu_2$.

$\ominus$ $\oplus$

Assume that a simple random sample has been selected from a normally distributed population.

10) A cereal company claims that the mean weight of the cereal in its packets is 14 oz. The weights (in ounces) of the cereal in a random sample of 8 of its cereal packets are listed below.

14.6 13.8 14.1 13.7 14.0 14.4 13.6 14.2

Test the claim at the 0.01 significance level.

-3

$n = 8$

$\bar{x} = 14.05$

$s = .346$

$\alpha = 0.01$

1 Claim $\mu = 14$

$H_0: \mu = 14$

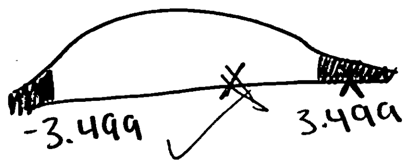
$H_1: \mu \neq 14$

3 C.V

$\alpha = 0.01$

$df = 7$

Reject H_0.



2 T.S

$t = \frac{\bar{x} - \mu}{\left(\frac{s}{\sqrt{n}}\right)} = \frac{14.05 - 14}{\left(\frac{.346}{\sqrt{8}}\right)} = .409$

4 There is NOT sufficient evidence to warrant rejection of the claim that the mean weight of cereal in its packets is 14oz.

-3