Instructions: You may not receive any human help for completion of this quiz. You may use your book, notes and the internet or computer. Please show work. The quiz is due on Monday during the 1st 15 minutes of class. Reduction of points will result if the quiz is late as previously outlined.

Name: Key

Quiz #4 – Summer 2008

Math 5

47

1. I recently gave an exam to my Intermediate Algebra students that included a multiple choice question with choices a) through d). Of the 55 students that took the exam, 23 answered the question correctly. I gave the same question to my Statistics class and 13 out of 44 answered it correctly. If we assume all the necessary conditions are met, even though the conditions may not be, answer the following questions.

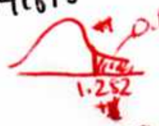
a) Using a 90% confidence level test the claim Algebra students were doing better than if they were guessing. (State H_0, H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

+4

$H_0: p \le 0.25$

$H_A: p > 0.25$ +½

$\hat{p} = \frac{23}{55} = 0.41\overline{81}$ +½



$\hat{p} \pm E$

0.418 ± 0.109

0.309,

$E = 1.645\sqrt{\frac{\frac{23}{55}\cdot\frac{32}{55}}{55}}$ 0.0665112137

$= 0.1094109465$

≈ 0.109

$Z = 2.88 = \frac{23/55 - 0.25}{\sqrt{\frac{(0.25)(0.75)}{55}}}$ +1

Reject H_0 & accept H_A +½

b) Using a 95% confidence level test the claim that the proportion of Statistics students answering the question correctly is less than $^{23}/_{55}$. (State H_0, H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

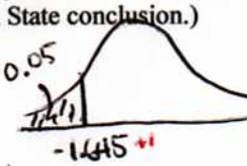
+4

$\hat{p} = \frac{13}{44}$ +½

$\hat{q} = \frac{31}{44}$

$H_0: p \ge 23/55$

$H_A: p < 23/55$ +½



T.S. $Z = \frac{13/44 - 23/55}{\sqrt{\frac{(23/55)(32/55)}{44}}}$ +1

$= -1.650407558$

Reject H_0 & Accept H_A +½

At the 95% level there is enough evidence to support the claim that the Stat students are doing more poorly than Alg. students.

c) At the $\alpha = 0.06$ level, test the claim that the proportion of Algebra students that answer the question correctly is not different from the proportion of Statistics students who answered the question correctly. (State H_0, H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

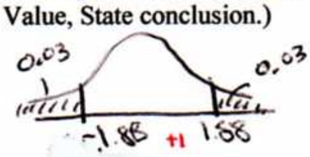
+4½

$\bar{p} = \frac{23+13}{44+55} = \frac{36}{99} = \frac{12}{33}$ +1

$\bar{q} = \frac{63}{99}$ $\frac{21}{33}$

$H_0: p_A - p_S = 0$

$H_A: p_A - p_S \ne 0$ +½ +½



$Z = \frac{\left(\frac{23}{55} - \frac{13}{44}\right) - 0}{\sqrt{\frac{\frac{36}{99}\cdot\frac{63}{99}}{55} + \frac{\frac{36\cdot 63}{99^2}}{44}}} = 1.261376794$ +1

≈ 1.261

$\sqrt{0.009466566}$ 0.0972962282

Fail to reject H_0 +½

d) Give a 90% confidence interval for the true difference in the population proportions of Statistic students and Algebra students that answer the question correctly.

+3½

$z_{\alpha/2} = 1.645$ +1

$\hat{p}_S - \hat{p}_A \pm E$

$\left(\frac{13}{44} - \frac{23}{55}\right) \pm 0.157$ +½

-0.123 ± 0.157

$(-0.28, -0.034)$ +½ +½

$E = 1.645\sqrt{\frac{\frac{23}{55}\cdot\frac{32}{55}}{55} + \frac{\frac{13}{44}\cdot\frac{31}{44}}{44}}$ +1

$\sqrt{0.0091546769}$

0.0956800076

$= 0.1573937249$

+16

2. The following data represents the number of grams of fat in 2 samples of 11 randomly sampled McDonald's breakfast meals. Compute the following for this data. You already broached the subject of approximate normality, and that has been accepted, so we will not question the possible normality.

Sample1: 2, 8, 11, 15, 16, 23, 23, 23, 31, 33, 35

Sample2: 1, 8, 11, 12, 16, 17, 23, 28, 28, 33, 40

a) Consider all 22 values as coming from one sample and give me the mean & standard deviation. You don't need to show the work.

+1

$\bar{x} = 19.9$ +½ $S = 10.9$ +½

b) Consider all 22 values as coming from one sample, and give me a 90% confidence interval for the true population mean.

If 10.7 then 2.28124765; 1.721(x) = 3.926

+3 (15.9, 23.9) $\bar{X} \pm E$; 19.9 ± 4; $t_{21,0.1}$; $E = (1.72)\left(\frac{10.9}{\sqrt{22}}\right) = 3.99410918 \doteq 4$

c) Consider all 22 values as coming from one sample, and give me a 90% confidence interval for the true population standard deviation.

+3

w/ 10.7: 8.588516901 to 14.40235711

$\sqrt{\frac{(10.9)^2(21)}{32.671}} < \sigma < \sqrt{\frac{(10.9)^2\,21}{11.591}} \Rightarrow (8.7, 14.7)$

(76.36172673; 215.2540764)

d) Miracles never cease to happen! The true population standard deviation is known to be 10.7. Calculate a 95% confidence interval for the true population mean.

+3

$\sigma = 10.7$

$Z_{\alpha/2} = 1.96$

19.9 ± 4.5 (15.4, 24.4)

$E = 1.96\ (10.7/\sqrt{22}) = 4.471245423$

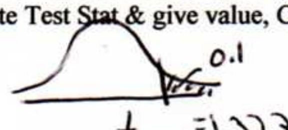
e) Consider all 22 values as coming from one sample, test the claim at the $\alpha = 0.1$ level that the average breakfast meal at Mc Donald's is not healthy. Healthy is loosely considered to be 10g of fat or less for a meal the size of an average breakfast meal at Mc Donald's. The miracle that applied in d) doesn't apply here. (State H_0,H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

w/ 10.7: 4.339730469

+3½

$H_0: \mu \leq 10$

$H_A: \mu > 10g$



$t_{21,0.1} = 1.323$ +1

$t = \frac{19.9 - 10}{10.9/\sqrt{22}} = 4.26010287 \approx 4.260$

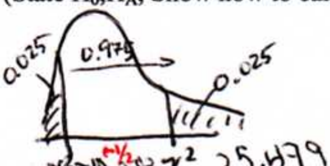
Reject H_0 & Accept HA

f) At the 95% confidence level, test the claim that the standard deviation of the population is not 10.7. (State H_0,H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

+3½

$H_0: \sigma = 10.7$

$H_A: \sigma \neq 10.7$



$\chi^2_{21} = 10.283$ χ^2_{21} 35.479

$\chi^2 = \frac{(10.9)^2\,21}{(10.7)^2} = 21.79238361$

Fail to reject

g) Compute the mean & standard deviation of Sample 1. You don't need to show me your work.

+1

$\bar{x} = 20$

$S = 10.6$

+18

$\sigma_x = 10.1$

+1

h) Compute the mean & standard deviation of Sample 2. You don't need to show me your work.

$\bar{x} = 19.7$

$s = 11.7$ $\quad \sigma_x = 11.2$

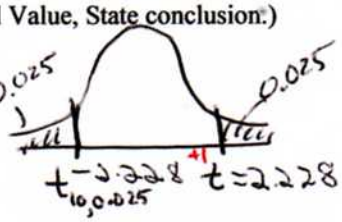
+3½

i) Considering sample 1 and sample 2, test the claim at the $\alpha = 0.05$ level, that there is a difference between the means of the populations. (State H_0,H_A, Show how to calculate Test Stat & give value, Critical Value, State conclusion.)

$H_0: \mu_1 = \mu_2$ +1

$H_A: \mu_1 \neq \mu_2$

Fail to reject +½



$t = \dfrac{(20-19.7)-0}{\sqrt{\frac{(10.6)^2}{11} + \frac{(11.7)^2}{11}}} = 0.063$ -½

$\sqrt{22.65909091} = 4.760156606$

+3

j) Considering sample 1 and sample 2, give a 95% confidence interval for the difference between the means of the populations.

$t_{10,0.025} = 2.228$ +1

$(\mu_1 - \mu_2) \pm E$

0.3 ± 10.6

$(-10.3, 10.9)$ -½ +½

$E = 2.228\sqrt{\frac{10.6^2}{11} + \frac{11.7^2}{11}}$ +½

$= 10.6056892$ +½

4.760156606

k) Based upon the confidence interval given in part j), how could you reject or fail to reject the null hypothesis based upon the claim made in part i).

+1

Since the interval contains zero fail to reject

4. Assume that the following table the letters A, B, C, & D represent the choices on the first question of a multiple choice quiz.

	A	B	C	D
Observed	66	80	82	75
Expected	75.75 (0.25(303))	75.75	75.75	75.75 +1

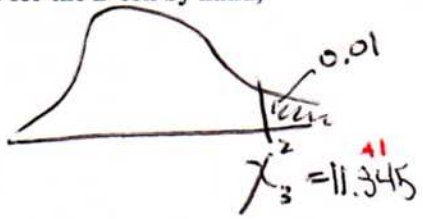
303

+4½

Test the hypothesis at the $\alpha = 0.01$ level that the responses were not guesses. (State H_0,H_A, Show how to calculate Test Stat (using the correct calculations for the A & D portions and using an ellipsis in between) & the value is 2.017, **Calculate Expected Value for the D cell by hand**, Critical Value, State conclusion.)

+1 $H_0: P_A = P_B = P_C = P_D = 0.25$

$H_A:$ At least one diff



$\chi^2 = \dfrac{(66-75.75)^2}{75.75} + \cdots + \dfrac{(75-75.75)^2}{75.75} = 2.017$ +1

Fail to reject +½

3

+13