Bonus Assignment #5
Business Probability (201-934-DW)
December 2nd 2009

Question 1

Many students have complained that the server in the 2nd floor cafeteria serves smaller portions than the server in the 3rd floor cafeteria. To test this belief, a student randomly sampled several servings from each cafeteria and carefully weighed them. The results are shown below:

Cafeteria	Sample Size	Mean	Standard Deviation (for sample)
2nd Floor	10	5.38	1.59
3rd Floor	12	5.92	0.83

Does this evidence support the students' claim? Assume serving sizes are normally distributed, complete a test with significance level 0.10.

Question 2

A random sample of 200 Dawson students has a current average of 62% in their English class (with standard deviation of $\sigma = 7\%$). Can we conclude that the average Dawson student English mark is a passing one (60%)? Conduct a test at 5% significance level.

Question 3

Construct a 90% confidence interval for $\mu_1 - \mu_2$ based on the following data:

	Sample Size	Mean	Standard Deviation (σ)
Population 1	34	2.38	0.85
Population 2	37	2.98	1.12

Question 4

A random sample of 250 Dawson students is asked if they love their math class, 175 students respond "Yes". Dawson Math Teachers claim that more than 75% of students love their math class. Test this claim at 0.05 significance.

Question 5

Samples are taken of students from two CEGEPS regarding IQ scores. Test the claim that the average IQ score of Vanier students is lower than that of Dawson students based on the following data: $\alpha = 0.01$

	Sample Size	Mean IQ Score	Standard Deviation (σ)
Dawson	41	95.3	6.9
Vanier	38	96.4	7.2

BONUS ASSIGNMENT #5 (201-934-DW) SOLUTIONS

① $P_{2ND\ FLOOR} = P_2$ $\quad$ $P_{3rd\ FLOOR} = P_3$

$n_2 = 10$ $\quad$ $n_3 = 12$

$\bar{x}_2 = 5.38$ $\quad$ $\bar{x}_3 = 5.92$

$S_2 = 1.59$ $\quad$ $S_3 = 0.83$

$H_0: \quad \mu_2 - \mu_3 \geq 0$

$H_a: \quad \mu_2 - \mu_3 < 0$

SINCE SERVING SIZES ARE NORMALLY DISTRIBUTED WE CAN USE the t-test

$t = -1.356$

$$df = \frac{\left(\frac{S_2^2}{n_2} + \frac{S_3^2}{n_3}\right)^2}{\frac{S_2^4}{n_2^2(n_2-1)} + \frac{S_3^4}{n_3^2(n_3-1)}}$$

$$= \frac{\left(\frac{1.59^2}{10} + \frac{0.83^2}{12}\right)^2}{\frac{1.59^4}{10^2 \cdot 9} + \frac{0.83^4}{12^2 \cdot 11}} = 13.00295$$

ROUND down to 13

Test statistic

$$t = \frac{\bar{x}_2 - \bar{x}_3}{\sqrt{\frac{S_2^2}{n_2} + \frac{S_3^2}{n_3}}} = \frac{5.38 - 5.92}{\sqrt{\frac{1.59^2}{10} + \frac{0.83^2}{12}}} = -0.97$$

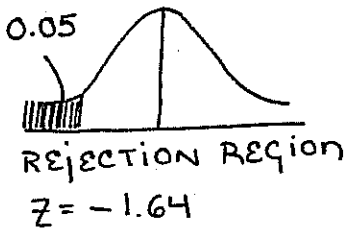
DO NOT REJECT H_0

2ND FLOOR servings ARE NOT SMALLER THAN 3rd FLOOR servings.

② $n = 200$
$\bar{x} = 62$
$\sigma = 7$
$\alpha = 5\%$

$H_0 : \mu \geq 60$
$H_a : \mu < 60$

Since $n \geq 30$ we can use z-table



test statistics

$$z = \frac{62 - 60}{7/\sqrt{200}} = 4.04$$

REJECT H_0

The grade is not a passing one

③

$$E = Z_{\alpha/2} \cdot \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$$

$\sigma_1 = 0.85$ $n_1 = 34$
$\sigma_2 = 1.12$ $n_2 = 37$

$\alpha/2 = 0.05$

$Z_{0.05} = 1.64$

Since n_1 & $n_2 \geq 30$ we can use z-table

$$E = 1.64\sqrt{\frac{0.85^2}{34} + \frac{1.12^2}{37}}$$

$$= 0.385$$

$$\bar{x}_1 - \bar{x}_2 = 2.38 - 2.98 = -0.6$$

$$(\bar{x}_1 - \bar{x}_2) - E \leq \mu_1 - \mu_2 \leq (\bar{x}_1 - \bar{x}_2) + E$$

$$-0.6 - 0.385 \leq \mu_1 - \mu_2 \leq -0.6 + 0.385$$

$$\boxed{-0.985 \leq \mu_1 - \mu_2 \leq -0.215}$$

(4) $n = 250$

$x = 175$

$p' = \frac{x}{n} = 0.70$

$\alpha = 0.05$

$H_0: \quad p \leq 0.75$

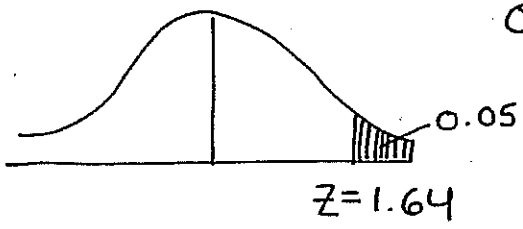
$H_a: \quad p > 0.75$

$np_0 = 250(0.75) = 187.5 \geq 5$

$n(1-p_0) = 250(0.25) = 62.5 \geq 5$

we can use the z-table

$$\sigma_0 = \sqrt{\frac{(0.75)(0.25)}{250}} = 0.0274$$



test statistic

$$Z = \frac{p' - p_0}{\sigma_0}$$

$$= \frac{0.7 - 0.75}{0.0274} = -1.826$$

DO NOT REJECT H_0

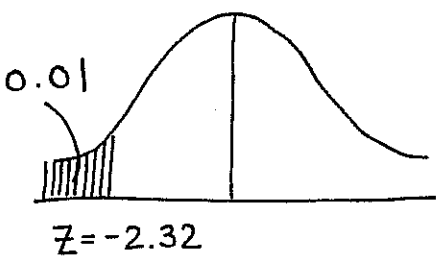
THE MATH TEACHER'S CLAIM IS INCORRECT

(5)

$H_0: \quad \mu_V - \mu_D \geq 0$

$H_a: \quad \mu_V - \mu_D < 0$

Since both sample sizes are larger than 30



test stat

$$Z = \frac{96.4 - 95.3}{\sqrt{\frac{(7.2)^2}{38} + \frac{(6.9)^2}{41}}} = 0.692$$

DO NOT REJECT H_0

VANIER IQs ARE NOT lower THAN DAWSON ONES.