Name Key
(Please ALSO write your name on the back of the last page.)

Ag 400 - Quiz II
Makeup - Fall 2008

(16) A. The number of hours per night that adults sleep in this country is known to be normally distributed with a mean of 7.5, a standard deviation of 2.0 and a variance of 4.0. Using this information, answer the following. Show your work.

1. What is the probability of selecting a random sample of 36 people and obtaining a sample with a mean hours of sleep of 8.0 hours or less?

$$Z = \frac{\bar{X}-\mu}{\sigma/\sqrt{N}} = \frac{8.0-7.5}{2/\sqrt{36}} = \frac{.5}{.333} = 1.50$$

$$p = .5 + .4332 = .9332$$

2. How many persons in a random sample of 64 people would you expect to sleep more than 7 hours?

$$Z = \frac{X-\mu}{\sigma} = \frac{7-7.5}{2} = \frac{.5}{2} = .25$$

$p = .5000 + .0987$

$p = .5987$

$$.5987 \times 64 = 38.32$$

3. What proportion of the total population sleep between 4 and 6 hours a night?

$$Z = \frac{6-7.5}{2} = \frac{1.5}{2} = .75$$

$$Z = \frac{4-7.5}{2} = \frac{3.5}{2} = 1.75$$

$$\begin{array}{r} .4599 \\ -\ .2734 \\ \hline .1865 \end{array}$$

4. What is the probability of selecting a person at random from this population and obtaining an individual who sleeps between 10 and 12 hours a night?

$$Z = \frac{10-7.5}{2} = \frac{2.5}{2} = 1.25$$

$$Z = \frac{12-7.5}{2} = \frac{4.5}{2} = 2.25$$

$$\begin{array}{r} .4878 \\ -\ .3944 \\ \hline .0934 \end{array}$$

(12) B. Suppose that a random sample of Mudville 25 adults is surveyed to determine the number of hours they sleep. The following sample statistics are obtained:

Mean hours of sleep per person = 8.0
Estimate of population variance $(\hat{\sigma}^2) = 1.0$
Sum of the squares of the deviation about the mean = 24

Based on these data and the information presented in (A) above what can you conclude abut the amount of sleep that Mudville residents have relative to the general population? Use the .05 level and a two-tailed test.

1. State the Null Hypothesis and the Alternative Hypothesis in words, not statistical symbols.

$H_0: \mu_{Mudville} = \mu_{Gen\ Pop}$

$H_A: \mu_{Mudville} \neq \mu_{Gen\ Pop}$

2. Show the necessary calculations.

$$Z = \frac{8.0 - 7.5}{2/\sqrt{25}} = \frac{.5}{.4} = 1.25$$

3. Indicate the critical value of the test statistic at the .05 level.

$Z = 1.96$

4.. Reject or do not reject the Null Hypothesis.

Do Not Reject H_0

5. Make your conclusion precisely in terms of the problem. What can you conclude abut the amount of sleep that Mudville residents have relative to the general population?

Based on these data we cannot conc. that Mudville residents differs from the general population in regard to # hours of sleep

C. Suppose you are interested in determining whether there are differences between men and women in regard to the number of hours they sleep. Because you expect that various household characteristics (number of household members, number and ages of children, etc.) might influence sleep patterns, you choose 10 households and collect information on both the male and female household heads concerning the number of hours each slept on a certain night.

You obtain the following data:

Household	Female Head	Male Head	D	D^2
	---------Hrs. of Sleep---------			
1	8.0	7.5	.5	.25
2	8.5	9.5	−1.0	1.0
3	7.0	8.0	−1.0	1.0
4	7.5	7.0	.5	.25
5	6.0	6.5	−.5	.25
6	6.0	6.5	−.5	.25
7	9.0	9.0	0	0
8	6.5	7.5	−1.0	1
9	7.0	8.0	−1.0	1
10	7.5	8.5	−1.0	1
			$\Sigma D = 5$	$\Sigma D^2 = 6$
ΣX	73.0	78.0		
ΣX^2	542.0	617.5		
Σx^2	9.1	9.1		

$$\Sigma d^2 = 6 - \frac{(5)^2}{10} = 3.5$$

$$\bar{D} = \frac{5}{10} = .5$$

(24) 1. Test the statistical significance of the difference between the number of hours of sleep of husbands and wives. Use a two-tailed test and the .05 level to determine statistical significance. Specify the following:

a. State the Null Hypothesis and the Alternative Hypothesis in words, not statistical symbols.

H_0: male and female HH heads have the SAME number of hours of sleep.

H_A: males and female HH heads differ in the hours of sleep they have.

b. Show the necessary calculations.

$$t = \frac{.5}{\sqrt{\frac{3.5}{(16)(9)}}} = 2.536$$

c. Indicate the critical value of the test statistic at the .05 level.

2.262

d. Reject or do not reject the Null Hypothesis.

Reject Ho

e. What is the probability that you have made a Type I error in (d) above?

$.02 < \alpha < .05$

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e. What is the probability that you have made a Type II error in (d) above?

$\beta = 0$

e. Make your conclusion precisely in terms of the problem. What can you conclude about the difference between wives and husbands in regard to number of hours of sleep?

Male and female HH heads differ in the hours of sleep they get. Males get significantly more sleep than females.

(20) 2. Indicate whether each of the following statements is true (T) or false (F) in terms of these data.

F a. The statistical unit in this analysis is a ~~person~~ household.

F b. The independent variable in this analysis, number of hours of sleep, is measured by an interval scale.

T c. The mean number of hours of sleep for the 10 women in the sample and the mean number of hours sleep for the 10 men in the sample are descriptive statistics; the t-value calculated to test the statistical significance of the difference between these means is an inferential statistic.

F d. The Null Hypothesis and the Alternative Hypothesis for the above test can be stated as follows:

$$H_o: \quad \bar{X}_{Males} = \bar{X}_{Females}$$

$$H_o: \quad \bar{X}_{Males} \neq \bar{X}_{Females}$$

where $\overline{X}$ is the mean number of hours of sleep for the two samples.

F e. Since the estimates of the population variances for males and females are the same, the Pooled Formula that assumes that the variances are equal can be used to test the statistical significance of the difference between the mean number of hours of sleep for males and females.

F f. The estimate of the standard error of the mean for females calculated from the above data would equal 1.01. $\hat{\sigma}^2 = \frac{9.1}{9} = 1.011$

$\hat{\sigma}_{\bar{x}} = \sqrt{1.011/10} = .318$

F g. Based on the above data, the 99% confidence interval estimating the mean number of hours of sleep for females equals:

73

$$7.3 \pm (2.82)\sqrt{\frac{9.1}{10}}$$

F h. A 95% confidence interval estimating the mean number of hours of sleep for males based on the above data would contain 95% of the "scores" for hours of sleep for males in the sample.

F i. If you reject the Null Hypothesis, you make a Type I error. If you do not reject the Null Hypothesis, you make a Type II error.

T j. If you reject a Null Hypothesis at the .05 level, α cannot be greater than .05.

(28) D. The attached output was obtained using SPSS and data compiled from a random sample of 448 Mudville residents concerning the extent to which they are satisfied with their community as a place to live. The following variables are used:

Gender
- 1 Male
- 2 Female
- 0 No information on gender

SCORE

This is an attitude scale designed to measure the extent to which subjects were satisfied with their community of residence. The higher the score, the more satisfied the person was. Assume that this score is an interval scale.
00 = Missing Data

Indicate whether each of the following statements is true (T) or false (F) in terms of this output. If any part of a statement is untrue, it should be marked false (F). Add comments if you wish to clarify your answers.

T 1. The statistical unit here is a person.

T 2. In this analysis, males were more satisfied with their community than were females, but this difference was not statistically significant at the .05 level.

F 3. There are more females than males in this data set and therefore the t-test is invalid..

T 4. The estimate of the population variance in SCORE for the males is 34.35

T 5. The dispersion in satisfaction scores is greater for males than for females in the sample.

F 6. Based on the Levene's Test here, and using the .05 level to determine significance, you should conclude that the variances are significantly homogeneous.

F 7. Based on the analysis on the output, you should conclude that the Homogeneity of Variance assumption is true.

F 8. The Null Hypothesis for the "t" reported on this output can be stated as follows:

H_o: there is no significant difference between the mean satisfaction scores of males and females in this sample.

F 9. If you reject the following Null Hypotheses $\alpha = .055$, $\beta \geq 0$

H_o: $\mu_{Males} = \mu_{Females}$

H_A: $\mu_{Males} \neq \mu_{Females}$

T 10. If a one tailed test for the significance of the difference between the mean SCORES for males and females were justified on the basis of previous theory and/or research, you would reject the Null Hypotheses at the .05 level.

T 11. Based on this analysis, you should reject the following Null Hypotheses at the .001 level using a two-tailed test.:

$$H_o : \sigma^2_{Males} = \sigma^2_{Females}$$

F 12. *A 95% confidence interval estimating the mean SCORE for males* would be:

$$26.53 \pm (1.66)(.411)$$

T 13. The "95% confidence interval" reported on the output is an interval estimate of the difference between the mean SCORE for males and the mean SCORE for females in the population.

F 14. A 95% confidence interval estimating the mean SCORE for females will contain 95% of the females' population means.