

### Assignment #3

Assignment 3 is due by 11:30 a.m. on Thursday, April 29. The assignment is a PDF file with boxes (form fields). There are two ways to submit the assignment:

The **preferred way** is to fill in the boxes on your computer, save, and upload to Blackboard. *(Note: Filling boxes (form fields) is not supported by Blackboard. You must open the document with **Adobe Acrobat Reader**.)*

The **alternative way** is to print the PDF file, fill-in by hand, scan into one PDF file, and upload to Blackboard. *(Note: There are many free scanning apps that you may download to your mobile phone, such as **Genius Scan**.)*

**(Please round numbers to the second decimal place.)**

## I. Confidence Intervals

A random sample of 429 college students was interviewed about various issues. They reported that they spent an average of \$178.23 on textbooks during the previous semester. The sample standard deviation is \$15.78.

1. Construct a 95% confidence interval around the mean. Show your calculations below. [Or show your calculations on a separate paper, scan, and upload to Blackboard.]

2. Interpret the confidence interval.

## II. Hypothesis Testing – Z Statistic (one sample mean)

The national mean for SAT scores is 500 with a standard deviation of 100. The principal of Lincoln High School claims that SAT scores of students at his school are significantly higher than the national mean. The mean SAT scores from a random sample of 100 students at Lincoln High School is 518. Based on the sample mean can we conclude that the SAT scores at Lincoln High School are significantly higher than the population mean?

**3. State the research hypothesis (one-tailed, directional).**

**4. State the null hypothesis.**

**5. Calculate the  $Z$  statistic. Show your calculations below. [Or show your calculations on a separate paper, scan, and upload to Blackboard.]**

6. Find the  $p$  value associated with the  $Z$  statistic.

7. Do you reject or fail to reject the null hypothesis using an  $\alpha$  level of .01? Why?

8. What do you conclude?

### III. $t$ Statistic (one sample mean)

The superintendent of the local school board received a complaint from the local teacher's union stating that the teachers are underpaid. The superintendent gathers the records of a random sample of 61 teachers and finds that their average salary is \$58,100, with a standard deviation of \$800. The average salary nationally is \$62,200. Is there a significant difference between the means?

9. State the research hypothesis (one-tailed, directional).

**10.** State the null hypothesis.

**11.** Calculate the  $t$  statistic. Show your calculations below. [Or show your calculations on a separate paper, scan, and upload to Blackboard.]

**12.** Find the critical  $t$  statistic ( $\alpha = .01$ , one-tailed).

**13.** Do you reject or fail to reject the null hypothesis using an alpha level of .01? Why?

14. What do you conclude?

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#### IV. Chi-square

You are studying the relationship between gender and opinions about gun laws. You design a survey and collect data from a random sample of 117 individuals. The sample data is distributed as follows in Table 1.

Table 1. Opinion on Gun Laws by Gender (frequencies).			
<i>Opinion on Gun Laws</i>	<i>Males</i>	<i>Females</i>	Total
<i>Stricter Laws are Needed</i>	25	40	65
<i>Current Laws are Fine</i>	30	22	52
Total (N)	55	62	= 117

15. Fill in Table 2.

Table 2. Calculating the Chi-Square					
<i>Gender and Opinion on Gun Laws</i>	<i>observed frequencies <math>f_o</math></i>	<i>expected frequencies <math>f_e</math></i>	$f_o - f_e$	$(f_o - f_e)^2$	$\frac{(f_o - f_e)^2}{f_e}$
Male / stricter laws					
Male / current laws					
Female / stricter laws					
Female / current laws					
$\chi^2 = \sum \frac{(f_o - f_e)^2}{f_e} =$					

16. The research hypothesis is: Women are more likely to support stricter gun laws than are men. What is the null hypothesis?

17. What is the obtained *chi-square* statistic (that you calculate)?

18. What are the degrees of freedom?

**19.** What is the critical *chi-square* statistic for an *alpha* of .05 (one-tailed test)?

**20.** What decision do you make about the null hypothesis? Why?

**21.** What do you conclude?

## **V. ANOVA**

You are doing research on the effects of family and work on stress among married women. You have divided a group of 15 married women into three groups: (1) those who both work and have children, (2) those who have children but do not work, and (3) those who work but do not have children. You collect data on the level of stress (on a scale of 1 to 22, where 1 = least stress and 22 = most stress) experienced by married women. The data are in Table 3.



Table 3. Levels of Stress among Married Women		
Work & Children	Children Only	Work Only
17.0	12.8	10.6
21.2	15.6	12.4
10.4	8.2	8.4
14.8	9.4	7.6
12.2	11.8	8.6

22. Fill in Tables 4 & 5.

**Table 4.**

	<i>Work &amp; Children</i>	<i>Children Only</i>	<i>Work Only</i>
<i>sum of scores</i>	$\Sigma X_1 =$	$\Sigma X_2 =$	$\Sigma X_3 =$
<i>mean</i>	$\bar{X}_1 =$	$\bar{X}_2 =$	$\bar{X}_3 =$
<i>sum of squared scores*</i>	$\Sigma X_1^2 =$	$\Sigma X_2^2 =$	$\Sigma X_3^2 =$
<i>overall mean</i>	$\bar{X} =$		

\* (Note: Not sum of scores squared.)

Table 5. ANOVA Table				
<i>Source of Variation</i>	<i>Sum of Squares</i>	<i>Degrees of Freedom</i>	<i>Mean Square</i>	<i>F statistic</i>
<i>Between Groups</i>	<i>a)</i>	<i>b)</i>	<i>c)</i>	<i>g)</i>
<i>Within Groups</i>	<i>d)</i>	<i>e)</i>	<i>f)</i>	
<i>Total</i>				

Show the calculations you used to attain the numbers in cells *a* to *g* in Table 54. (*Or show your calculations on separate paper, scan, and upload to Blackboard.*)

**23.** What is the research hypothesis?

**24.** What is the null hypothesis?

**25.** What is the  $F$  statistic that you calculate (obtained  $F$  statistic)?

**26.** What is the critical  $F$  statistic for an  $\alpha = .05$

**27.** What decision do you make about the null hypothesis? Why?

**28.** What do you conclude?