

HW 10 is due on Friday, Nov. 1. Quiz 6: one sample t tests and CI's possibly from computer output. See HW 9 and Problem H) from this HW. **Two pages: problems A)- H)**

A) A bank wonders whether omitting the annual credit card fee for customers who charge at least \$2400 in a year will increase the amount charged on its credit cards. The bank makes this offer to a SRS of 200 of its credit card customers. It then compares how much these customers charge this year with the amount that they charged last year. The mean increase in the sample was \$332 and the standard deviation was \$108.

a) With  $\alpha = \delta = 0.01$  carry out a 4 step test for whether the mean amount charged increased under the no-fee offer.

b) Give a 99% confidence interval for the mean amount of the increase.

c) The distribution of the amount charged is skewed to the right, but outliers are prevented by the credit limit that the bank enforces on each card. Use of the  $t$  procedures is justified in this case even though the pop. distribution is skewed. Explain why.

comment: a) and b) Matched pairs because before and after. See p. 453-6. a) Use  $\delta = 0.01$ , not  $\delta = 0.05$ . For c) how large does  $n$  need to be for the CLT to hold?

**For B) 18.1, C) 18.3 and D) 18.4, inference about the mean is required. Identify each as (1) a single sample, (2) matched pairs or (3) two independent samples.**

B) 18.1 Choose 40 romantically attached couples in their twenties. Interview the man and woman separately about a romantic attachment they had at age 15 or 16. Compare the attitudes of men and women.

comment: Explain your choice briefly.

C) 18.3 To check a new analytical method, a chemist obtains a reference specimen of known concentration from the National Institute of Standards and Technology. She then makes 20 measurements of the concentration of this specimen with the new method and checks for bias by comparing the mean result with the known concentration.

comment: Explain your choice briefly.

D) 18.4 Another chemist is checking the same new method. He has no reference specimen, but a familiar analytic method is available. He wants to know if the new and old methods agree. He takes a specimen of unknown concentration and measures the concentration 10 times with the new method and 10 times with the old method.

comment: Assume that measurements with the old procedure are independent of measurements with the new (so not matched pairs). Explain your choice briefly.

E) Randomly selected drivers are interviewed about road rage. The respondents' answers produced scores on an "angry/threatening driving scale" with values between 0 and 19. Below are summaries of the scores. We suspect that men are more susceptible to road rage than women. Carry out a 4 step test for this hypothesis.

group	n	$\bar{x}$	$s$
Male	596	1.78	2.79
Female	769	0.97	1.84

comment: See two sample t procedure on p. 475-480. Let male =  $x_1$ , female =  $x_2$ .

F) A group of students received a daily subliminal message. The treatment group  $x_1$  of 10 students chosen at random received the message "Each day I am getting better at math." The control group  $x_2$  of 8 students received the neutral message "People are walking down the street." The means for each sample are based on improvement, ie post – pre test scores. See p. 464-469 and use the following Minitab output.

```
Two sample T for diff
Group Variable   N    Mean   Stdev   SE Mean
  1  treatment   10   11.40   3.17    1.0
  2  control     8    8.25   3.69    1.3
90% CI for mu 1 - mu 2: (0.2, 6.1)
T-Test mu 1 = mu 2 (vs >): T = 1.91, p = 0.039  DF = 13
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a) Do a 4 step test for whether the treatment brought about greater improvement in math scores than the neutral message. Use alpha = delta = 0.05.

b) Find a 90% CI from output.

G) 18.32 A random sample of students who took the SAT twice found 427 who were coached and 2733 who were uncoached. Summary statistics are shown below. Let's test if students who are coached significantly increased their scores.

a) You could use the information to carry out a two sample  $t$  test comparing Try 1 with Try 2 for coached students or a matched pairs test using Gain. Which is the correct test? Why?

b) Carry out the proper 4 step test.

c) Give a 99% confidence interval for the mean gain of all students who are coached.

	Try 1		Try 2		Gain	
	$\bar{x}$	$s$	$\bar{x}$	$s$	$\bar{x}$	$s$
Coached	500	92	529	97	29	59
Uncoached	506	101	527	101	21	52

comment: Matched pairs so use Coached row of the table with the Gain columns.

H) Minitab problem. Double click on the "shortcut to math programs icon." After a window opens, double click on the icon marked "Student Minitab." After Minitab opens, move the cursor to "File" in the NW corner. Drag down "Open Worksheet." (Double click on the icon "Student" or) then a window will appear. Double click on "homes.mtw." Click on "OK." Click on the "Stat" menu and drag down "Basic Statistics" then "1 Sample t." Stat>Basic Statistics>1 Sample t. A window will appear. Double click on "C1 price" to get it in variables. Move your cursor to the dot to the left of "test mean." To the right of "test mean" change 0.0 to 143000. Use the output to perform a 4 step test of the problem described below.

Several years ago, the mean house price was \$143000. Test to see whether the mean price has changed. (Assume that the 4 step t-test can be used on the data.)