STATISTICS/GRACEY NAME______________________________

EXAM 3/75 POINTS POSSIBLE HW_____% Q______% EXAM ______%

THE STAT FEATURE OF YOUR CALCULATOR MAY ONLY BE USED TO FIND SUMMARY STATISTICS.

1. (16 POINTS) Assume that a SRS has been selected from a normally distributed population and test the given claim. A SRS of 70 recorded speeds (in mi/h) is observed from cars traveling on a section of Highway 805 in San Diego. The sample has a mean of 73.7 mi/h and a standard deviation of 7.3 mi/h. Use a 0.01 significance level to test the claim that the mean speed of all cars is greater that the posted speed limit of 65 mi/h.

a. (1 POINT) Identify the null hypothesis

$\boxed{H_0: \mu_{\bar{x}} = 65}$

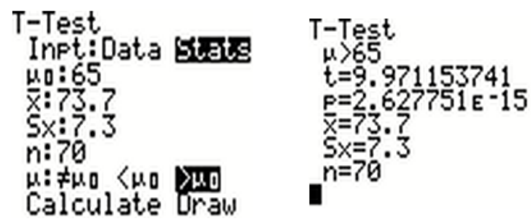
b. (1 POINT) Identify the alternative hypothesis

$\boxed{H_1: \mu_{\bar{x}} > 65}$

c. (6 POINTS) Identify the test statistic

$\bar{x} = 73.7, \ s = 7.3, \ n = 70$

$\boxed{t = 9.9712}$



d. (6 POINTS) Use the *P*-value method or the traditional method to test the claim. Be sure to specify which method you are using and identify the *P*-value or critical value(s).

$P\text{-value} \doteq 2.63 \times 10^{-15}$

$2.63 \times 10^{-15} < 0.01 = \alpha$

e. (2 POINTS) What is your final conclusion?

Reject H_0. There's sufficient evidence to support the claim that the mean speed of all cars is greater than the posted speed limit of 65 mph.

2. (16 POINTS) Assume that the two samples are independent simple random samples selected from normally distributed populations. Many studies have been conducted to test the effects of marijuana use on mental abilities. In one such study, groups of light and heavy users of marijuana in college were tested for memory recall, with the results given below.

pop 1: Items sorted correctly by light marijuana users: $n_1 = 60,\ \bar{x}_1 = 53.3,\ s_1 = 3.6$

pop 2: Items sorted correctly by heavy marijuana users: $n_2 = 64,\ \bar{x}_2 = 51.3,\ s_2 = 4.5$

Use a 0.01 significance level to test the claim that the population of heavy marijuana users has a lower mean than the light marijuana users.

a. (1 POINT) Identify the null hypothesis

$H_0: \mu_1 = \mu_2$

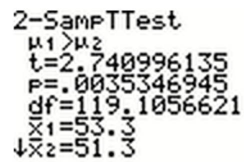
b. (1 POINT) Identify the alternative hypothesis

$H_1: \mu_1 > \mu_2$

c. (6 POINTS) Identify the test statistic, or construct the appropriate confidence interval.

t-dist.

$\boxed{t = 2.7410}$



d. (6 POINTS) Test the claim. Be sure to specify which method you are using.

P-value $\doteq 0.004$

$0.004 < 0.01 = \alpha$

e. (2 POINTS) What is your final conclusion?

Reject H_0. There's sufficient evidence at the 1% level to support the claim that the pop. of heavy marijuana users has a lower mean than light marijuana users.

3. (16 POINTS) In an Accountemps survey of 200 senior executives, 47.3% said that the most common job interview mistake is to have little or no knowledge of the company. Use a 0.02 significance level to test the claim that in the population of all senior executives, 50% say that the most common job interview mistake is to have little or no knowledge of the company.

a. (1 POINT) Identify the null hypothesis

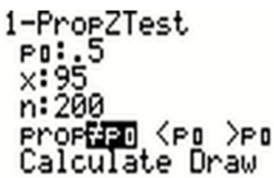
$H_0: p = 0.5$

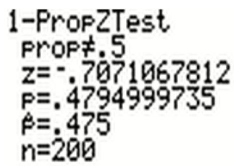
b. (1 POINT) Identify the alternative hypothesis

$H_1: p \neq 0.5$

c. (6 POINTS) Identify the test statistic

$\boxed{z \doteq -0.71}$





$\hat{p} = 0.473$

$n = 200$

$\hat{p} = \frac{x}{n}$

$x = n \cdot \hat{p}$

$x = 200(.473)$

$x \approx 95$ → need to round to nearest 1 or you get domain error

d. (6 POINTS) Use the *P*-value method or the traditional method to test the claim. Be sure to specify which method you are using and identify the *P*-value or critical value(s).

P-value $\doteq 0.479$

$0.479 > 0.02 = \alpha$

e. (2 POINTS) What is your final conclusion?

Fail to reject the null. There is not sufficient evidence at the 2% level to suggest that the percentage of the population of senior executives that say the most common job interview mistake is to have little or no knowledge of the company is different that 50%.

4. (12 POINTS) In an experiment, 16% of 734 subjects treated with Viagra experienced headaches. In the same experiment, 4% of 724 subjects given a placebo experienced headaches.

a. (10 POINTS) Construct a 95% confidence interval estimate of the difference between the proportion of headaches for those treated with Viagra and the proportion of headaches for those given a placebo.

```
2-PropZInt
 x1:117
 n1:734
 x2:29
 n2:724
 C-Level:.95
 Calculate
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```
2-PropZInt
 (.08926,.14943)
 p̂1=.159400545
 p̂2=.0400552486
 n1=734
 n2=724
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$\hat{p}_1 = 0.16,\ n_1 = 734,\ x_1 = .16(734)$

$\hat{q}_2 = 0.84 \qquad x_1 \doteq 117$

$\hat{p}_2 = 0.04,\ n_2 = 724,\ x_2 = .04(724)$

$\hat{q}_2 = 0.96 \qquad x_2 \doteq 29$

$\boxed{0.0893 < p_1 - p_2 < 0.149}$

b. (2 POINTS) What conclusion does the confidence interval suggest?

Since zero is not in the CI, there does not seem to be a significant difference in the proportion of headaches for those treated with viagra and for those given a placebo.

5. (15 POINTS) Listed below are the costs (in dollars) of repairing the front ends and rear ends of different cars when they were damaged in controlled low-speed crash tests. The cars are Toyota, Mazda, Volvo, Saturn, Subaru, Hyundai, Honda, Volkswagen, and Nissan. Construct a 95% confidence interval of the mean of the differences between front repair costs and rear repair costs. Is there a difference?

dependent

Front repair cost:	936	978	2252	1032	3911	4312	3469	2598	4535
Rear repair cost:	1480	1202	802	3191	1122	739	2769	3375	1787
difference	-544	-224	1450	-2159	2789	3573	700	-777	2748

```
1-Var Stats
 x̄=839.5555556
 Σx=7556
 Σx²=36299976
 Sx=1935.080561
 σx=1824.411449
↓n=9
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$\bar{d} = 839.6$

$s_d = 1935.1$

$n = 9$

$\bar{d} - E < \mu_d < \bar{d} + E$

$E = t_{d.f.,\alpha/2} \cdot \frac{s}{\sqrt{n}} \rightarrow E = 2.306 \cdot \frac{1935.1}{\sqrt{9}}$

$E \approx 1487.4$

$d.f. = n - 1$

$t_{8,.05} = 2.306$ ← 2-tails

$839.6 - 1487.4 < \mu_d < 839.6 + 1487.4$

$-647.8 < \mu_d < 2327.0$

Since zero is in the interval, there's no sig. diff. between front and rear repair costs.