online

Math 282 Exam 3 Spring 2011 Name_____

Use the following information for problems 1), 2) and 3). A study on the drug captopril measured (diastolic) blood pressure before taking the drug (μ_1) and after taking the drug (μ_2). Researchers hoped to show that the drug lowered blood pressure, so that blood pressure was higher before taking the drug. Assume that the appropriate procedure can be used. The output below is the data collected from the fifteen patients. Let $\mu_d = \mu_1 - \mu_2$ be written as $mud = mu1 - mu2$.

test	alternative	T-value	p-value	95% CI for mud = mu1 - mu2:
matched pairs:	mud not = 0	4.76	0.000	(6.22, 16.44)
matched pairs:	mud > 0	4.76	0.000	(6.22, 16.44) ←
matched pairs:	mud < 0	4.76	1.000	(6.22, 16.44)
2 sample t :	mu1 not = mu2	0.92	0.36	(-14.0, 36.7)
2 sample t :	mu1 > mu2	0.92	0.18	(-14.0, 36.7)
2 sample t :	mu1 < mu2	0.92	0.82	(-14.0, 36.7)

e 1) Which procedure should be used? **Explain briefly.**

matched pairs before and after

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2) Do a 4 step test of hypotheses.

H_0 $\mu_D = 0$ H_A $\mu_D > 0$

$t_0 = 4.76$

$p\text{val} = 0$ ← or -4

reject H_0 the drug lowered the mean blood pressure

10 so the mean blood pressure is higher before taking the drug

3) Give a 95% confidence interval for the difference in mean blood pressure.

(6.22, 16.44)

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e 4) Assume the distribution of x is rather highly skewed. If the sample size is 110, would you be able to use one sample t procedures? Explain briefly.

yes $n > 100$

10 or -9

5) Let x be the amount of plaque buildup 14 days after having teeth cleaned by a dentist. During this time the $n = 7$ subjects used an oral antiplaque rinse but did not brush their teeth. Assume that the distribution of x is approximately normal, that the sample mean $\overline{x} = 0.78$, and the sample standard deviation $s = 0.32$. Find a 95% confidence interval for μ if possible. 1.96 → 7

$\overline{x} \pm t^* \frac{s}{\sqrt{n}} = 0.78 \pm 2.447 \frac{0.32}{\sqrt{7}}$

$= 0.78 \pm 0.2960$

$= (0.4840, 1.0760)$

$n-1 = df$	95%
6	2.447

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6) Let x be the amount of plaque buildup 14 days after having teeth cleaned by a dentist. During this time the $n = 7$ subjects used an oral antiplaque rinse but did not brush their teeth. Assume that the distribution of x is highly skewed, that the sample mean $\overline{x} = 0.78$, and the sample standard deviation $s = 0.32$. Find a 95% confidence interval for μ if possible.

not possible

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7) A manufacturer for hard hats for construction workers wants the mean force the hard hat transmits to the worker to be less than 800 pounds (well under the legal limit), when the helmet is subjected to a standard force. A simple random sample of 40 hard hats from the manufacturer's production is taken and it is found that the sample mean force is 825 with a standard deviation of $s = 48.48$. Assume the CLT holds and perform the appropriate 4–step test.

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i) $H_0: \mu \geq 800$ $H_A: \mu < 800$

ii) $t_0 = \frac{\overline{x} - \mu_0}{s/\sqrt{n}} = \frac{825 - 800}{48.48/\sqrt{40}} = \frac{25}{7.6654} = 3.2614$

iii) $df = n - 1 = 39 \to 30$

$p\text{-val} = .9994$

06
3.2 | .9994

3.26

p-val = .9994

iv) fail to reject H_0, the mean force is equal to (or not less than) 800

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8) Suppose that 50 90% confidence intervals are made for the proportion of SIU students under age 24 who catch the flu in the fall. About how many confidence intervals will contain the true proportion p?

$50(.9) = 45$

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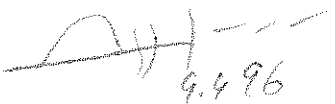
alternative		Z-value
p not =	0.15	9.996
p >	0.15	9.996 ←
p <	0.15	9.996

9) In 1979, 15% of primary liver cancer patients had cancer that would go into remission. A new treatment using radioactive antibodies had 52 of 104 patients go into remission. Using the above output, test whether the proportion of remissions for the new treatment is higher than 0.15.

$H_0: p = .15$ $H_A: p > .15$

$Z_0 = 9.996$

$p\text{-val} = 0$



reject H_0, the prop of remissions is higher than 0.15

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10) Roughly 50% of sexually active young adults contract a sexually transmitted disease (STD). How large a sample must you test in order to estimate the proportion of Southern Illinois sexually active 25 year olds who have had a sexually transmitted disease to within ± 0.05 with 95% confidence?

$$\left(\frac{z^*}{m}\right)^2 p^*(1-p^*) = \left(\frac{1.96}{.05}\right)^2 (.5)(.5) = 384.16 \leftarrow -3$$

so 385

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11) An experimental brand of corn was fed to a simple random sample of 20 male chicks (baby chickens). The usual brand of corn was fed to another simple random sample of 20 male chicks. The weight gains after 20 days were recorded. Test whether the population mean weight gain from the experimental corn is greater than the population weight gain from the usual brand. The two sample t test statistic was $t_0 = 2.47$ with pvalue = 0.0092.

i) $H_0: \mu_1 = \mu_2$ $H_A: \mu_1 > \mu_2$

ii) $t_0 = 2.47$

iii) $p\text{-val} = .0092$

iv) reject H_0: the mean weight gain from the expt brand was higher than that of the usual brand

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Use the following information for problems 12) and 13). Suppose that 40% of business majors at US universities are women and that a simple random sample of 100 business majors is selected. Let $\hat{p}$ be the proportion of women in the sample.

12) Find the mean and standard deviation of the sampling distribution of $\hat{p}$. (Hint: $\mu_{\hat{p}} = p,\ \sigma_{\hat{p}} = \sqrt{p(1-p)/n}$.)

e

$\mu_{\hat{p}} = 0.40$

$\sigma_{\hat{p}} = 0.0490 = \sqrt{\frac{.4(.6)}{100}} = \sqrt{.0024}$

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13) If possible, use the normal approximation to find $P(\hat{p} > 0.5)$. (Hint: this is a forwards calculation.)

.4 .5

$z = \frac{.5-.4}{.049} = 2.04$

	.04
2.0	.9793

$P(\hat{p} > .5) = 1 - .9793 = 0.0207$

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2.04

14) Suppose $n = 17$ and the test statistic for a one sample t test of $H_o : \mu = 100$ vs $H_A : \mu > 100$ was $t_o = -25.48$. What is the pvalue for the test?

-25.48

pval = 1

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15) Suppose $n = 17$ and the test statistic for a one sample t test of $H_o : \mu = 100$ vs $H_A : \mu < 100$ was $t_o = -25.48$. What is the pvalue for the test?

-25.48

pval = 0

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