Math 282 Final fall 2010 Name_____

		No Shot	One Shot	Two Shots	total
Flu	observed	24	9	13	46
	expected	(14.40)	(5.01)	(26.59)	
	cell chisq	[6.404]	[3.169]	[6.944]	
No Flu	observed	289	100	565	954
	expected	( )	(103.99)	(551.41)	
	cell chisq	[ ]	[0.153]	[ ]	
total		313	109	578	1000

Use the following information for problems 1) and 2). The table above is a SRS of 1000 people from a community hospital. A new flu vaccine was provided free of charge in a two shot sequence over a period of two weeks. Some people received the two shot sequence, some appeared for one shot, and others received neither. It is desired to test whether there was any relationship between the number of flu shots and whether a person gets the flu.

1) Find the value of the expected count that is not given in the table. Find the 2 cell chi square contributions that need to be computed. Show work.

$exp = \frac{(\text{row total})(\text{col total})}{\text{table total}} = \frac{954\,(313)}{1000} = 298.602$

$\text{cell } \chi^2 = \frac{O-E|^2}{E} = \frac{(289-298.602)^2}{298.602} = 0.3038$

$\frac{(565-551.41)^2}{551.41} = 0.3349$

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2) Do a 4 step of hypotheses. Show how the appropriate table is used.

H_0 there is no relationship between flu and number of shots

H_A there is a relationship

$\chi^2 = 6.404 + \cdots + 0.3349 = 17.314$

$df = (r-1)(c-1) = (2-1)(3-1) = 2$

df	.0005
2	15.2

$p\text{-val} = 0 < .0005$

reject H_0 there is a relationship between flu and number of shots

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Coefficient Estimates

Label	Estimate	Std. Error	t-value	p-value
Constant	-11.2262	6.74092	-1.665	0.1024
m750	1.00369	0.0140630	71.371	0.0000

Use the following information for problems 3), 4) and 5). Consider studying extremely high SAT verbal scores by state. Suppose that it is desired to predict the number of female students *f750* who get a 750 or higher on the SAT verbal score from the number of male students who got a 750 or higher on the SAT verbal score $= x = m750$. The data was obtained from $n = 50$ states.

3) Predict *f750* if $m750 = 1740$.

$\hat{y} = a + bx = -11.2262 + 1.00369(1740) =$ **1735.194**

4) Find a 99% confidence interval for β. $b \pm t^* SE_b$ | $n-2=df$ | 99% | 48 | 2.576

$1.00369 \pm 2.576(.0140630) = 1.00369 \pm 0.03623$

$= (0.9675, 1.0399)$

5) Do a 4 step test for $\beta \neq 0$.

$H_0: \beta = 0 \quad H_A: \beta \neq 0$

$t_0 = 71.371$

$pval = 0.000$

reject H_0 m750 is a useful linear predictor for f750

6) The first large completely randomized controlled experiment for breast cancer screening by mammography was the HIP (health insurance plan) study done in New York in the early 1960s. The HIP study suggested screening by mammography would significantly reduce deaths by breast cancer. 31000 patients were controls and 31000 were offered mammography screening (the patients offered the mammography could refuse treatment). The 62000 women were randomly assigned to the control and treatment groups. Suppose an earlier observational study suggested that mammography did not reduce deaths by breast cancer. Based on the two studies, did mammography reduce deaths by breast cancer? Explain briefly.

Yes the completely randomized controlled study says deaths were reduced

Use the following information for problems 7) and 8). The time in seconds for five rats to complete a maze were 35, 48, 29, 30, and 38.

e 7) Find the sample mean and median of these numbers.

29 30 35 38 48

$M = 35$

$\bar{x} = 36$ $= \frac{\Sigma x}{n} = \frac{180}{5}$

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8) Find the standard deviation s of these numbers.

x	$x - \bar{x}$	$(x-\bar{x})^2$
29	−7	49
30	−6	36
35	−1	1
38	2	4
48	12	144

$234 = \Sigma(x-\bar{x})^2$

15 $s = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = \sqrt{\frac{234}{4}} = \sqrt{58.5} = 7.6485$

e 9) Using table B, line 103, randomly select 4 of the following 9 people for the treatment group. (Use the labels shown.) The remaining 5 are in the control group.
1 Carroll, 2 Collin, 3 Crawford, 4 Halverson, 5 Lawes, 6 McKeel, 7 Stach, 8 Wayman, 9 Wenslow

103 | 4 5 4 6 7

Halverson, Lawes, McKeel, Stach

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10) Suppose that white tailed deer are caught, tagged and fitted with a small radio transmitter. Several months later, the deer are tracked and the distance X from the release point is recorded. The distances were approximately normal with a mean of 3200 feet and a standard deviation of 970 feet. What distance X must a randomly selected deer travel from the release point in order for the distance to be in the top 10%?

.9 .1 | .03 | 1.2 .8997 .9015 | $z^* = 1.28$

$x^* = \mu + \sigma z^* = 3200 + 1.28(970) = \boxed{4448.6}$

1.29 4451.3 −4

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11) Suppose X is the apple consumption of a randomly selected adult in 1987. Assume that the mean $\mu = 20.3$ and SD $\sigma = 5$ pounds per year. Assume that the sample mean $\overline{X}$ is computed from a sample of size $n = 36$ and that the CLT holds. Find $P(\overline{X} \geq 22)$.

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$\mu_{\overline{X}} = \mu = 20.3$ $\quad \sigma_{\overline{X}} = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{36}} = \frac{5}{6} = 0.8333$

20.3 22 $\quad z = \frac{22 - 20.3}{0.8333} = 2.04$

2.0 | .04 | .9793

22−20.3 / 5 = .34 $\quad$ 1−.6331 = .3669 −7 −0

$P(\overline{X} > 23) = 1 - .9793 = \boxed{0.0207}$

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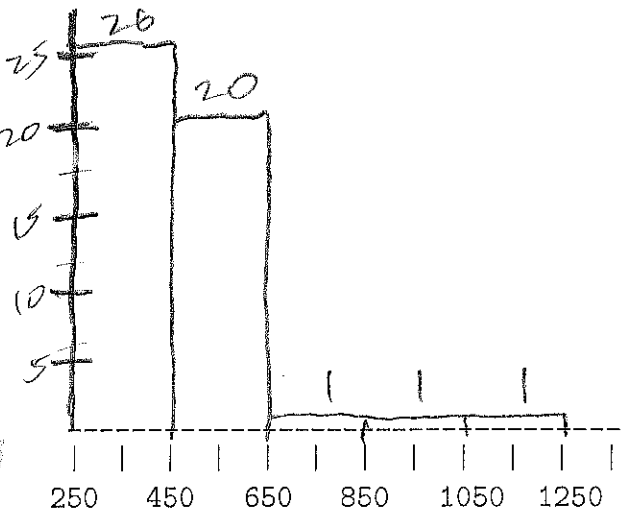
12) Data for federal aid per capita for the 50 states in 1986 is summarized below. Make a histogram or bar graph of the data and **state which plot you used.**

class	count
250 <= < 450	26
450 <= < 650	20
650 <= < 850	1
850 <= < 1050	1
1050 <= < 1250	1



histogram

4

15

Use the following information for problems 13), 14) and 15). 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 13) Which procedure should be used? **Explain briefly.**

matched pairs before and after

15 or -14

14) Do a 4 step test of hypotheses.

$H_0: \mu_D = 0$ $H_A: \mu_D > 0$ $\alpha = .05$

$t_0 = 4.76$

$p\text{-val} = 0.000$

reject H_0 the drug lowered the mean blood pressure

so mean blood pressure is higher before taking the drug

2 wrong -1

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

(6.22, 16.44)

-12 or prop

15

16) Let x be the amount of plaque buildup 14 days after having teeth cleaned by a dentist. During this time the $n = 8$ 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 $\bar{x} = 0.78$, and the sample standard deviation $s = 0.32$. Find a 95% confidence interval for μ if possible.

$\bar{x} \pm t^* \frac{s}{\sqrt{n}}$ $\quad n-1=7$ $\quad 95\%$ $\quad 2.365$

$0.78 \pm 2.365 \frac{0.32}{\sqrt{8}} = .78 \pm 0.2676 =$

$(0.5124, 1.0476)$

17) 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.

i) $H_0: \mu = 800$ $\quad H_A: \mu < 800$

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

iii) $df = n - 1 = 39 > 30$

3.2 | .00 / .9994

$P\text{val} = .9994$

iv) fail to reject H_0 $\quad$ the mean force is not less than or equal to 800

18) According to a 1992 survey in the magazine *Esquire*, out of 1000 students surveyed, 10% had committed a lewd act (such as had sex in public) in their school's library. What kind of sample was used to collect this data?

Voluntary response Sample

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

19) 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. (Note that the test statistic Z = 9.996 is given in the above output.)

H_0 $P = .15$ H_A $P > .15$

$Z_0 = 9.996$

$Pval = 0$

reject H_0

the proportion of remissions is higher than 0.15

9.996

15

e 20) The probabilities for filing a petition for divorce in 1980 are shown below. What is the probability that the petition for divorce was filed jointly?

filed by	Wife	Husband	Jointly
probability	0.634	0.302	?

$1 - .634 - .302 = 0.064$

15