Math 282 final Spring 2011 Name_____

		Nonsmoke	Former	Moderate	Heavy	total
Primary	observed	56	54	41	36	187
	expected	(59.481)	(50.926)	(42.370)	(34.222)	
	cell chisq	[0.204]	[0.186]	[0.044]	[0.092]	
Secondary	observed	37	43	27	32	139
	expected	( )	(37.854)	(31.495)	(25.438)	
	cell chisq	[ ]	[0.700]	[0.642]	[1.693]	
University	observed	53	28	36	16	133
	expected	(42.305)	(36.220)	(30.135)	(24.340)	
	cell chisq	[2.704]	[1.865]	[1.141]	[ ]	
total		146	125	104	84	459

Use the following information for problems 1) and 2). The table above is from a SRS of 459 French men. Investigators want to test whether there was any relationship between smoking status and education level.

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.

$$exp = \frac{(row\ tot)(col\ tot)}{table\ tot} = \frac{139\ (146)}{459} = 44.214$$

$$cell\ \chi^2 = \frac{O-EP}{E} = \frac{(37-44.214)^2}{44.214} = 1.177$$

$$= \frac{(16-24.340)^2}{24.340} = 2.858$$

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

i) H_0 there is no relationship between smoking status and education level

H_A there is a relationship

ii) $\chi^2 = 1.204 + \ldots + 2.858 = 13.306$

iii) $df = (r-1)(c-1) = (3-1)(4-1) = 6$

α	.05	.025
6	12.59	14.45

$.025 < pval < .05$

iv) reject H_0 there is a relationship between smoking status and education level

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Coefficient Estimates

Label	coef	Std. Error	t-value	p-value
Constant	-1192.82	84.8615	-14.056	0.0000
size	161.855	5.58295	28.991	0.0000

Use the following information for problems 3), 4) and 5). It is desired to predict the weight of the brain (in grams) from a measurement of the size of the head. The above output uses data from 267 people.

3) Predict the brain weight if size = 13.28.

$\hat{y} = a + bx = -1192.82 + 161.855(13.28) =$ **956.614**

4) Find a 90% confidence interval for β. $n = 267$, $df = n-2 = 265$ so $t^* = z^* = 1.645$

$b \pm t^* SE_b = 161.855 \pm 1.645(5.58295)$

$= 161.855 \pm 9.184 =$ **(152.671, 171.039)**

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

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

$t_0 = 28.999$

$p\text{-val} = 0$

reject H_0 size is a useful linear predictor for brain weight

6) DES was given to pregnant woman to prevent miscarriage. Eight controlled experiments were performed to study the effectiveness of DES. The women in the treatment group received DES while the women in the control group were given a placebo. Three studies were randomized controlled experiments while five studies did not use randomization. The rate of miscarriage was about the same for all eight of the treatment groups. For the randomized controlled studies the rate of miscarriage in the control groups was about the same as that of the treatment groups. But for the five studies that did not use randomization, the control group rate was much higher than the treatment group rate. Does the drug DES help prevent miscarriage? Explain briefly.

no the randomized controlled experiment suggests that DES is no better than placebo or did not help prevent miscarriage

Use the following information for problems 7) and 8). Below is a list of the state income tax paid by a TA from 1993 to 1997.

41 296 303 276 345

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

41 276 296 303 345

median = 296

$\bar{x} = \frac{\Sigma x}{n} = \frac{1261}{5} = 252.2$

8) Find the standard deviation s of these numbers.

x	$x - \bar{x}$	$(x-\bar{x})^2$
41	−211.2	44605.44
276	23.8	566.44
296	43.8	1918.44
303	50.8	2580.64
345	92.8	8611.84

$\Sigma x = 1261$ $\quad 58282.8 = \Sigma (x-\bar{x})^2$

$s = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n-1}} = \sqrt{\frac{58282.8}{4}} = \sqrt{14570.7} = 120.709$

$n = 6$

9) Using table B, line 102, randomly select 5 of the following 9 people for the treatment group. (Use the labels shown.) The remaining are in the control group.
1 Carroll, 2 Collin, 3 Crawford, 4 Halverson, 5 Lawes, 6 McKeel, 7 Stach, 8 Wayman, 9 Wenslow

102: 7 3 6 7 6 4 7 1

Stach, Crawford, McKeel, Halverson, Carroll

or Carroll, Crawford, Halverson, McKeel, Stach

10) Suppose that the spring ACT exam is standardized to have mean $\mu = 22$ and standard deviation $\sigma = 3$. You may assume that the scores follow a normal curve. What ACT score is such that 90% of all ACT scores are worse?

$x_0 = \mu + 1.28\sigma = 22 + 1.28(3) = 25.84$

11) According to the 1998 USA TODAY, adults between the ages of 18 and 24 spend an average of $\mu = 9$ minutes per day reading the newspaper. Assume that $\sigma = 1.5$ minutes. Suppose that you obtain a simple random sample of 50 adults ages 18 to 24 and compute the sample mean $\overline{x}$ of their reading times. Find the probability that $\overline{x}$ is between 8.5 and 9.7 minutes. You may assume that the CLT holds.

$\mu_{\overline{x}} = \mu = 9 \qquad \sigma_{\overline{x}} = \frac{\sigma}{\sqrt{n}} = \frac{1.5}{\sqrt{50}} = 0.2121$

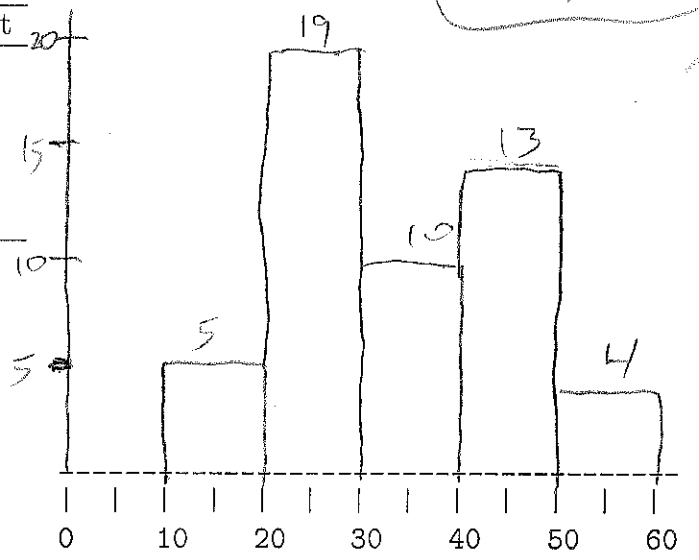
$\frac{8.5-9}{.2121} = -2.36 \qquad \frac{9.7-9}{.2121} = 3.30$

$P(0.06) = .9995 - .0091 = .9904$

12) The weights, in ounces, of malignant tumors removed from 51 patients is displayed in the table below. Make a histogram or bar graph of the data and **state which plot you used.**

Class	Count
$10 - < 20$	5
$20 - < 30$	19
$30 - < 40$	10
$40 - < 50$	13
$50 - < 60$	4

histogram



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Use the following information for problems 13), 14) and 15). A clinical psychologist believes that deaf children have lesser visual acuity than hearing children. A SRS of ten deaf children and a SRS of 10 hearing children are taken and their eye movement rates are recorded. Let μ_1 be the mean eye movement rates of deaf children and let μ_2 be the mean eye movement rates of hearing children. The investigator wanted to know whether deaf children had higher eye movement rates than hearing children. Let $\mu_d = \mu_1 - \mu_2$ be written as $mud = mu1 - mu2$.

test	alternative	T-value	p-value	95% CI for mud:
matched pairs:	mud not = 0	4.39	0.0018	(0.419, 1.311)
matched pairs:	> 0	4.39	0.0009	(0.419, 1.311)
matched pairs:	< 0	4.39	0.9991	(0.419, 1.311)
2 sample t :	mud not = mu2	4.90	0.0002	(0.49, 1.241)
2 sample t :	mu1 > mu2	4.90	0.0001	(0.49, 1.241)
2 sample t :	mu1 < mu2	4.90	0.9999	(0.49, 1.241)

13) Which procedure should be used? **Explain briefly.**

2 sample t 2 ind SRSs

14) Do a 4 step test of hypotheses.

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

$t_0 = 4.90$

$p\text{-val} = .0001$

reject H_0 deaf kids have higher mean eye movement rates than hearing kids

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

(.49, 1.241)

16) A corn soy blend was developed in 1996 to be a highly nutritious cheap food. Suppose that the amounts of vitamin C were obtained for a simple random sample of size $n = 8$ taken from a production run. Assume that the sample mean $\overline{x} = 22.50$ and the sample standard deviation $s = 7.19$, and that the distribution of x is approximately normal. Find a 99% confidence interval for the mean vitamin C content during the production run.

99%
df = n-1 = 7 | 3.499

$\overline{x} \pm t^* \frac{s}{\sqrt{n}} = 22.5 \pm 3.499 \frac{7.19}{\sqrt{8}}$

$= 22.5 \pm 8.895 = (13.605, 31.395)$

17) Researchers measured the amount of D-glucose in cockroach hindguts. Assume that these measurements follow a normal distribution. Suppose 5 measurements yielded a sample mean of 44.44 with a standard deviation of $s = 20.741$. Perform a 4 step test of hypotheses testing whether the mean amount of D-glucose is greater than 54.44.

$H_0: \mu = 54.44$ $H_A: \mu > 54.44$

$t_0 = \frac{\overline{x} - \mu_0}{s/\sqrt{n}} = \frac{44.44 - 54.44}{20.741/\sqrt{5}} = \frac{-10}{9.276} = -1.078$

-1.080

pval > .15 > .25

df = n-1
4 | .941 | 1.190
one-sided: .2 .15

Fail to reject H_0: the mean amount of D-glucose is 54.44 (or not greater than 54.44)

DNE pval wrong −5

18) The magazine *Cosmopolitan* asked its married female readers whether they had committed adultery or not. 39% of the respondents said yes. A probability sample said that 26% of married women have committed adultery. Is the true percentage of married women who have committed adultery more likely to be near 39% or 26%? Explain briefly.

26% go with the prob sample over the vol resp sample

−1

$\hat{p} = \frac{1630+1684}{7180+9916} = .1938$

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population	n	number of binge drinkers
1 (men)	7180	1630
2 (women)	9916	1684

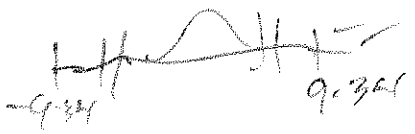
$\hat{p}_1 = .2270$
$\hat{p}_2 = .1698$

$z_0 = \frac{.2270 - .1698}{\sqrt{.1938(.8062)\left(\frac{1}{7180}+\frac{1}{9916}\right)}} = 9.34$

19) A SRS of male college students and a SRS of female college students were taken. It was determined that the number of frequent binge drinkers was 1630 for men and 1684 for women. It is desired to know whether the proportion for males is greater than the proportion for females. Suppose the test statistic is equal to 9.34 and perform the appropriate test.

$H_0: p_1 = p_2$ $H_A: p_1 \neq p_2$ ← right H or − 6

$z_0 = 9.34$ ← wrong − 6



p-val = 0

reject H_0 the prop of male binge drinkers is different from that of female

p-val ≈ 0 fail to reject − 7

20) The probabilities for animals killed in steel traps meant for coyotes is shown below. What is the probability that the steel trap killed a coyote?

filed by	Skunk	Raccoon	possum	Other	Coyote
probability	0.141	0.074	0.060	0.168	?

$1 - .141 - .074 - .06 - .168 = 1 - .443$

$= .557$