Statistics 1040, Section 009, Quiz 1 (20 Points)

Friday, January 13, 2006

Your Name: _____

Question 1: Controlled Experiments/Observational Studies I (**13 Points**)

The Public Health Service studied the effects of smoking on health, in a large sample of representative households. For men and for women in each age group, those who never smoked were on average somewhat healthier than the current smokers, but the current smokers were on average much healthier than those who had recently stopped smoking.

- (**6 Points**) Why did they study men and women and the different age groups separately?

- (**7 Points**) The lesson seems to be that you shouldn't start smoking, but once you've started, don't stop. Comment briefly.

Please turn over!

Question 2: Controlled Experiments/Observational Studies II (**7 Points**)

Fill the gaps in the following statements using the most appropriate words from the list below:

Statisticians want to know the effect of a _____ (like the Salk vaccine) on a response (like getting polio). To find out, they compare the responses of a _____ with a _____.

To make sure that the treatment group is like the control group, investigators put _____ into the treatment or the control group at _____.

Whenever possible, the control group is given a _____, which is neutral but resembles the treatment.

In a _____ experiment, the subjects do not know whether they are in the treatment or in the control group; neither do those who evaluate the responses.

placebo
double–blind
treatment group
observational study
random
single–blind
vaccine
confounding factor
objects
control group
controlled experiment
subjects
polio
treatment

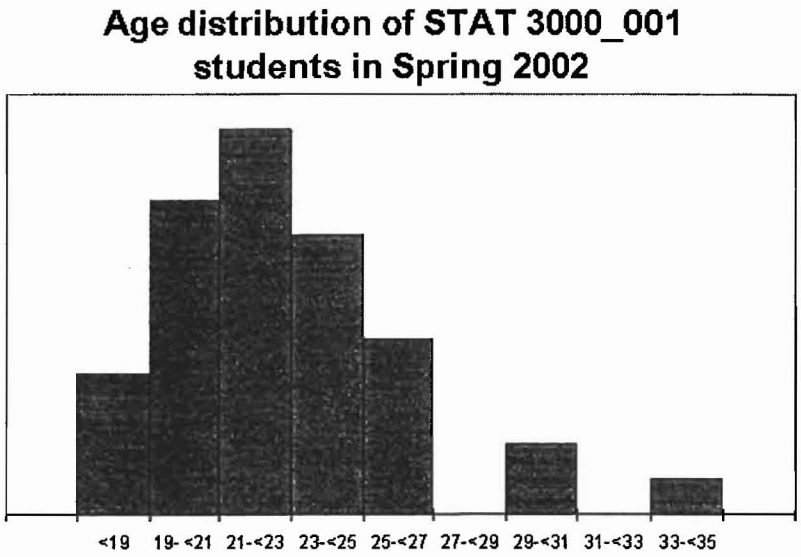
Statistics 1040, Section 009, Quiz 2 (20 Points)

Friday, January 20, 2006

Your Name: _____

Question 1: Histograms I **(12 Points)**

The histogram below shows the age distribution of Stat 3000, Section 001, students for the Spring 2002 semester. Unfortunately, the labels on the vertical axis have been deleted. However, the instructor recalls that there have been about 25% of students who were at least 21 but less than 23 years old. Try to help the instructor to fill in some of the missing percentages.



1. What approximate percentage of students were at least 25 but less than 27 years old?

2. What approximate percentage of students were younger than 21 years of age?

3. What approximate percentage of students were at least 29 years old?

Please turn over!

Question 2: Histograms II (**8 Points**)

An investigator draws a histogram for some height data, using the metric system. She is working in centimeters (cm). The vertical axis shows density, and the top of the vertical axis is 10 percent per cm. Now she wants to convert to millimeters (mm). There are 10 millimeters to the centimeter. On the horizontal axis, she has to change 175 cm to _____ mm, and 200 cm to _____ mm. On the vertical axis, she has to change 10 percent per cm to _____ percent per mm, and 5 percent per cm to _____ percent per mm.

Statistics 1040, Section 009, Quiz 3 (20 Points)

Friday, January 27, 2006

Your Name: _____

Question 1: Measures of Center and Spread I (**14 Points**)

Below are the temperatures (in degrees Celsius) for five locations in Utah on Tuesday, January 20, 2004, at 9pm SMT, as found on `www.wunderground.com`:

City	Temperature
Bryce Canyon	-15
Logan	-14
Ogden	-12
St. George	5
Salt Lake City	-4

Show your work!

1. (**5 Points**) Find the **average temperature** in degrees Celsius for these locations in Utah.

2. (**3 Points**) Find the **median temperature** in degrees Celsius for these locations in Utah.

3. (**6 Points**) Find the **standard deviation** of the temperatures for these locations in Utah.

Please turn over!

Question 2: Measures of Center and Spread II (**6 Points**)

To answer the questions below, you need to apply your knowledge about average, median, and standard deviation. **No calculation is needed!**

1. (**3 Points**) If the St. George temperature (the only positive value) is removed from the list, what will happen to the average and median? Choose the most appropriate answer and **explain** briefly:

   (a) The average will change more than the median;

   (b) The median will change more than the average;

   (c) Both average and median will stay exactly the same.

2. (**3 Points**) If the St. George temperature (the only positive value) is removed from the list, what will happen to the standard deviation? Choose the most appropriate answer and **explain** briefly:

   (a) The SD will become bigger;

   (b) The SD will become smaller;

   (c) The SD will become negative;

   (d) The SD will not change at all.

Formulas:

$$\text{avg} = \frac{\text{sum of all numbers}}{\text{how many numbers}}$$

$$\text{SD} = \sqrt{\text{average of } [(\text{deviations from avg})^2]}$$

Statistics 1040, Section 009, Quiz 4 (20 Points)

Friday, February 3, 2006

Your Name: _____

Question 1: Normal Approximation for Data (**20 Points**)

The Graduate Record Examination (GRE) is a test taken by college students who intend to pursue a graduate degree in the United States. For around 428,000 examinees who took the General GRE Test in 2001–02, the mean for the verbal ability portion of the exam was around 470 and the standard deviation was around 125 (http://ftp.ets.org/pub/gre/994950.pdf). **Show your work!**

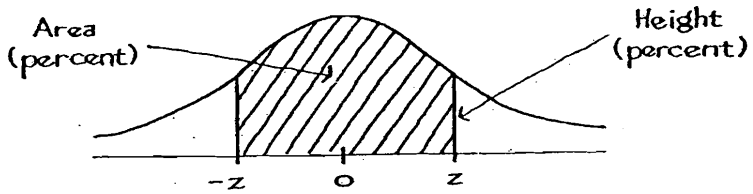
- (**7 Points**) The percentage of examinees who scored **more than 670** on the GRE test is roughly _____ %.

- (**7 Points**) The percentage of examinees who scored **between 320 and 570** is about _____ %.

- (**6 Points**) In order to be among the top 10%, a student must have obtained a minimum GRE score of about _____ %.

Please turn over!

Tables



A NORMAL TABLE

z	*Area*	*z*	*Area*	*z*	*Area*
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 009, Quiz 5 (20 Points)

Friday, February 10, 2006

Your Name: _____

Question 1: Change Of Scale (**10 Points**)

In a class experiment last week, we measured the length of a pencil (including the eraser) nine times. After adjustment of one outlier, all values looked reasonable. The average length of our nine measurements was 7.5 inches, with an SD of 0.14 inches. Recall that 1 inch = 2.54 cm.

If we translate these results into cm, the average length will be _____ cm, with a standard deviation of _____ cm.

Be precise and report **all** digits from your calculator this time (e.g., if your calculator shows 27.8835, then report this number and do not report 28 instead).

Show your work!

Question 2: Correlation (**10 Points**)

A teaching assistant gives a quiz to his section. There are 10 questions on the quiz and no part credit is given. After grading the papers, the TA writes down for each student the number of questions the student got right and the number wrong. The average number of right answers is 6.4 with an SD of 2.0; the average number of wrong answers is 3.6 with the same SD of 2.0.

The correlation coefficient is

(a) exactly 0 (b) -0.50 (c) +0.50
(d) -1.0 (e) +1.0 (f) -2.0 (g) +2.0
(h) can't tell without the data

Circle your answer and explain.

Statistics 1040, Section 009, Quiz 6 (20 Points)

Friday, February 24, 2006

Your Name: _____

Question 1: The Regression Line (**20 Points**)

In a study, reading comprehension is tested for a large number of third grade students, once at the beginning of the school year and once at the end of the school year. During the school year, the students work on reading comprehension skills. The following results are obtained:

beginning–of-year:	average score = 75;	SD = 15;
end–of–year:	average score = 80;	SD = 17; $r = 0.6$.

The scatterplot of the data shows a football–shaped cloud. **Show your work!**

1. (**10 Points**) Find the equation of the regression line for predicting the end–of–year score from the beginning–of–year score.

2. (**5 Points**) Use the regression equation from part 1. to predict the end–of–year score for a student who scored 85 on the beginning–of–year test.
   The predicted end–of–year score is: _____

3. (**5 Points**) Find the r.m.s. error for predicting the end–of–year score from the beginning–of–year score.
   The r.m.s. error is: _____

Please turn over!

Formulas:

$$\text{r.m.s. error} = \sqrt{1 - r^2} \times \text{SD}_y$$

$$\text{slope} = r \times \frac{\text{SD}_y}{\text{SD}_x}$$

$$\text{intercept} = \text{avg}_y - \text{slope} \times \text{avg}_x$$

Statistics 1040, Section 009, Quiz 7 (20 Points)

Friday, March 3, 2006

Your Name: _____

Question 1: Chance/Probability I (**15 Points**)

In a box of 15 chocolates, 5 are mint, 3 are orange, 5 are caramel, and 2 are cherry. I choose two chocolates at random (without replacement!).
Show your work!

1. (**5 Points**) What is the chance that the first is **not** mint?
   The chance is _____ %.

2. (**5 Points**) What is the chance that the first two are both orange?
   The chance is _____ %.

3. (**5 Points**) What is the chance that the first is cherry and the second is caramel?
   The chance is _____ %.

Please turn over!

Question 2: Chance/Probability II (**5 Points**)

A coin is tossed six times. Two possible sequences of results are

(i) H T T H T H (ii) H H H H H H

(The coin must land on H or T in the order given; H = heads, T = tails).

Which of the following is correct?

Circle your answer and explain:

1. Sequence (i) is more likely.
2. Sequence (ii) is more likely.
3. Both sequences are equally likely.

Statistics 1040, Section 009, Quiz 8 (20 Points)

Friday, March 10, 2006

Your Name: _____

Question 1: Box Models, EV, and SE (**12 Points**)

You are participating in a new game that consists of tossing a 10–sided die, with sides numbered from 1 to 10. The die is fair, i.e., it has the same chance of landing on any side. Every time the die shows a number that is a multiple of 3 (i.e., 3, 6, or 9) you win \$3, otherwise you lose \$1, except when the die lands on 10, in which case you win (or lose) nothing (\$0). Assume you are tossing this die 200 times.

Show your work!

1. (**3 Points**) Find the box model.

2. (**4 Points**) Find the expected value of your gain/loss.

3. (**5 Points**) Find the standard error of your gain/loss.

Please turn over!

Question 2: Law of Averages (**8 Points**)

Circle your answer for each of the following four parts. You don't have to provide any explanations.

1. (**2 Points**) A die will be rolled some number of times, and you win \$1 if it shows an ace (⚀) more than 20% of the time.

   Which is better: **60 rolls** or **600 rolls**?

2. (**2 Points**) As in 1.), but you win the dollar if the percentage of aces is more than 15%.

   Which is better: **60 rolls** or **600 rolls**?

3. (**2 Points**) As in 1.), but you win the dollar if the percentage of aces is between 15% and 20%.

   Which is better: **60 rolls** or **600 rolls**?

4. (**2 Points**) As in 1.), but you win the dollar if the percentage of aces is exactly $16\frac{2}{3}\%$.

   Which is better: **60 rolls** or **600 rolls**?

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of [(deviations from box average)}^2\text{]}}$$

$$\text{EV}_{sum} = \text{number of draws} \times \text{box average}$$

$$\text{SE}_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Statistics 1040, Section 009, Quiz 9 (20 Points)

Friday, March 24, 2006

Your Name: _____

Question 1: EV, SE, and Normal Curve (**14 Points**)

According to the U.S. Census Bureau's "QuickFacts" Web site (`http://quickfacts.census.gov/qfd/states/49000.html`), about 26% of Utah residents age 25 and older have a bachelor degree or higher. Suppose that 500 Utah residents age 25 and older have been randomly chosen to participate in a survey.

1. (**2 Points**) Find the box model.

2. (**6 Points**) Find the expected number of Utah residents in this sample of 500 who have a bachelor degree or higher. What is the corresponding SE?

3. (**6 Points**) Using the normal curve, find the chance that **at most** 120 of the Utah residents in the sample have a bachelor degree or higher.

Please turn over!

Question 2: Normal Approximation for Probability Histograms (**6 Points**)

A coin is tossed 100 times. True or false? Circle your answer. Answer each of the following questions separately. **No explanation is needed.**

1. (**1 Point**) True or false: The expected value for the number of heads is 50.

2. (**1 Point**) True or false: The expected value for the number of heads is 50, give or take 5 or so.

3. (**2 Points**) True or false: The number of heads will be 50.

4. (**2 Points**) True or false: The number of heads will be around 50, give or take 3 or so.

Please turn over!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$\text{EV}_{sum} = \text{number of draws} \times \text{box average}$$

$$\text{SE}_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

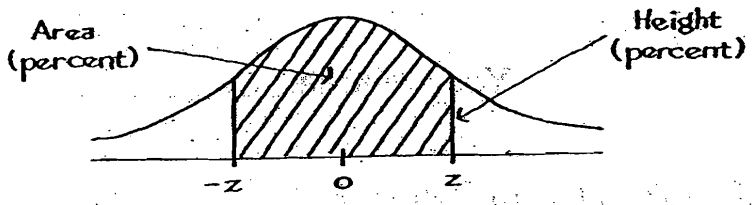
$$\text{SD} = (\text{bigger - smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

$$\text{average} = \frac{\text{number of } \boxed{1}\text{'s}}{\text{how many tickets in the box}}$$

$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1}\text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0}\text{'s}}}$$

Tables



A NORMAL TABLE

z	*Area*	*z*	*Area*	*z*	*Area*
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 009, Quiz 10 (20 Points)

Wednesday, April 12, 2006

Your Name: _____

Question 1: Confidence Intervals (**20 Points**)

Political events in the Fall of 2004 were in focus of many surveys and polls nationwide. With four members of the Bush Cabinet resigning within a few days in Fall 2004, a natural concern for every U.S. citizen at that time was: *Will the Bush Cabinet resignations have a positive or negative impact on U.S. policy?*

This question was asked to a sample of 787 U.S. citizens: 299 of them answered "Positive".

1. (**14 Points**) Construct a 87% confidence interval for the percentage of all U.S. citizens who think that the Bush Cabinet resignations will have a positive impact on U.S. policy.

   Show your work.

Please turn over!

2. **(6 Points)** For each of the following situations, explain **why** or **why not** it would be possible to constuct a 87% confidence interval for the percentage of all U.S. citizens who think that the Bush Cabinet resignations will have positive impact on U.S. policy. **Please do not construct the actual confidence interval – just answer each question with Yes or No and provide a very brief explanation.**

   - The sample of 787 U.S. citizens was obtained by using a computer to randomly generate a sufficent number of valid telephone numbers (including area code) and calling these numbers until 787 valid answers were collected.

     Is it possible to construct a 87% CI here? – **Yes** or **No**?

     Explanation:

   - The sample of 787 U.S. citizens was obtained as a SRS from all U. S. citizens, but 780 of the responders said "Positive" (i.e., thought that the Bush Cabinet resignations will have positive impact on U.S. policy).

     Is it possible to construct a 87% CI here? – **Yes** or **No**?

     Explanation:

   - The 787 answers come from the Quick Poll at the CNN Web page (http://www.cnn.com).

     Is it possible to construct a 87% CI here? – **Yes** or **No**?

     Explanation:

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of } [(\text{deviations from box average})^2]}$$

$$\text{EV}_{sum} = \text{number of draws} \times \text{box average}$$

$$\text{SE}_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

$$\text{SD} = (\text{bigger - smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

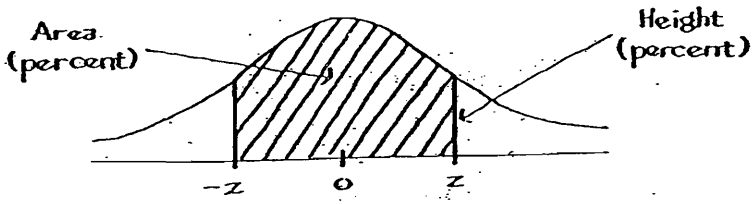
$$\text{average} = \frac{\text{number of } \boxed{1}\text{'s}}{\text{how many tickets in the box}}$$

$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1}\text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0}\text{'s}}}$$

$$\text{EV}_{\%} = \%\text{ of } \boxed{1}\text{'s in the box}$$

$$\text{SE}_{\%} = \frac{\text{SE}_{\text{sum}}}{\#\text{draws}} \times 100\%$$

Tables



A NORMAL TABLE

z	Area	z	Area	z	Area
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 009, Quiz 11 (20 Points)

Wednesday, April 19, 2006

Your Name: _____

Question 1: Tests of Significance (**20 Points**)

A journal article claims that 60% of North American adults are too sedentary. Suppose you think a lower percentage of Cache Valley adults are too sedentary. To test your belief, you take a simple random sample of 120 Cache Valley adults and find that only 68 of them are too sedentary. Test to see if your belief is correct. (You may assume that everybody is using the same definition of "too sedentary", although in practice this would be contentious). **Show your work!**

1. (**5 Points**) State the null and the alternative hypothesis for this problem, in words and in terms of the box model.

2. (**5 Points**) Calculate the appropriate test statistic.

3. (**5 Points**) Obtain the P–value (use the normal table on the back).

4. (**5 Points**) State conclusions in terms of rejecting the null hypothesis and in your own words.

Please turn over!

Formulas:

$$\text{box average} = \frac{\text{sum of all numbers in box}}{\text{how many numbers in box}}$$

$$\text{box SD} = \sqrt{\text{average of [(deviations from box average)}^2\text{]}}$$

$$\text{EV}_{sum} = \text{number of draws} \times \text{box average}$$

$$\text{SE}_{sum} = \sqrt{\text{number of draws}} \times \text{box SD}$$

$$\text{EV}_{avg} = \text{box average} \qquad \text{SE}_{avg} = \frac{\text{SE}_{sum}}{\text{number of draws}}$$

Shortcut formulas for a box that contains only *two* different numbers:

$$\text{average} = \frac{(\text{smaller} \times \text{how many}) + (\text{bigger} \times \text{how many})}{\text{how many tickets in the box}}$$

$$\text{SD} = (\text{bigger - smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

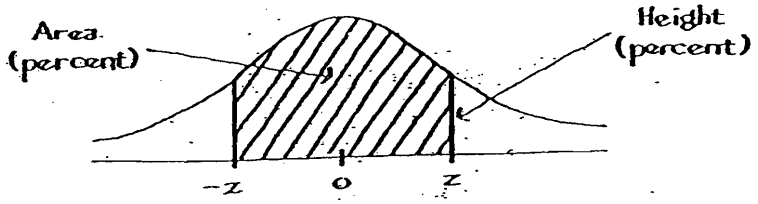
$$\text{average} = \frac{\text{number of } \boxed{1}\text{'s}}{\text{how many tickets in the box}}$$

$$\text{SD} = \sqrt{\frac{\text{fraction}}{\text{of } \boxed{1}\text{'s}} \times \frac{\text{fraction}}{\text{of } \boxed{0}\text{'s}}}$$

$$\text{EV}_{\%} = \%\text{ of } \boxed{1}\text{'s in the box}$$

$$\text{SE}_{\%} = \frac{\text{SE}_{\text{sum}}}{\text{number of draws}} \times 100\%$$

Tables



A NORMAL TABLE

z	Area	z	Area	z	Area
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

Statistics 1040, Section 009, Quiz 12 (20 Points)

Wednesday, April 26, 2006

Your Name: _____

Question 1: Tests of Significance II (**20 Points**)

Researchers think anti–epileptic drugs accelerate bone loss in elderly women. To investigate, 12 women were randomly selected from all elderly women taking anti–epileptic drugs and they were monitored for a period of 5 years. At the end of the study, researchers measured their bone mineral density on a standardized scale. The average of the 12 measurements was -0.24 with an SD of 1.22. It is known that bone density measurements follow the normal curve. (Note that negative values of bone mineral density correspond to accelerated bone loss.)

Test the hypothesis that the average for all such women is 0.0 against the alternative hypothesis that it is less than 0.0. State a null and an alternative hypothesis, find a test statistic and a P–value, and clearly state your conclusions.

Indicate whether this is a **z–test, t–test, or 2–sample z–test**. Circle your answer and explain why you haven chosen that test.

Show your work!

Memory Aids

Please note that these are provided for your convenience, but it is your responsibility to know how and when to use them.

$$\text{rms error} = \sqrt{1 - r^2} \times SD_Y$$

$$\text{slope} = r \times \frac{SD_Y}{SD_X}$$

$$\text{intercept} = \text{ave}_Y - \text{slope} \times \text{ave}_X$$

$$SD^+ = \sqrt{\frac{\text{number of draws}}{\text{number of draws} - 1}} \times SD$$

$$SD_{\text{box}} = \sqrt{\text{fraction of 0's} \times \text{fraction of 1's}}$$

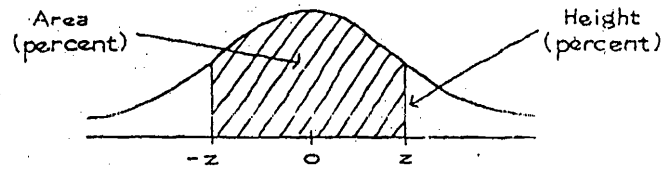
$$EV_{\text{sum}} = \text{number of draws} \times \text{ave}_{\text{box}}$$
$$SE_{\text{sum}} = \sqrt{\text{number of draws}} \times SD_{\text{box}}$$

$$EV_{\text{ave}} = \text{ave}_{\text{box}}$$
$$SE_{\text{ave}} = \frac{SE_{\text{sum}}}{\text{number of draws}}$$

$$EV_{\%} = \%\text{ of 1's in the box}$$
$$SE_{\%} = \left(\frac{SE_{\text{sum}}}{\text{number of draws}}\right) \times 100\%$$

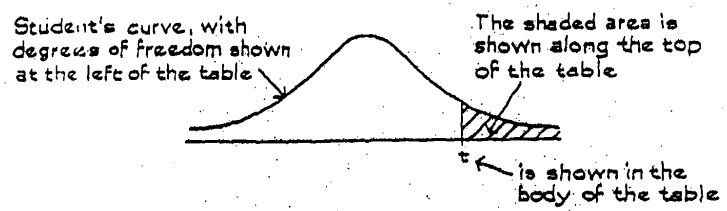
$$SE_{\text{diff}} = \sqrt{a^2 + b^2}$$ where a is the SE for the first quantity, b is the SE for the second quantity, and the two quantities are independent

A NORMAL TABLE



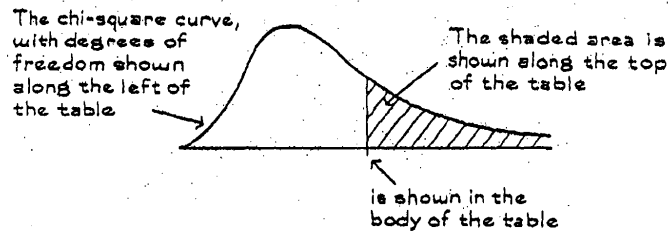
z	Area	z	Area	z	Area
0.00	0	1.50	86.64	3.00	99.730
0.05	3.99	1.55	87.89	3.05	99.771
0.10	7.97	1.60	89.04	3.10	99.806
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
0.60	45.15	2.10	96.43	3.60	99.968
0.65	48.43	2.15	96.84	3.65	99.974
0.70	51.61	2.20	97.22	3.70	99.978
0.75	54.67	2.25	97.56	3.75	99.982
0.80	57.63	2.30	97.86	3.80	99.986
0.85	60.47	2.35	98.12	3.85	99.988
0.90	63.19	2.40	98.36	3.90	99.990
0.95	65.79	2.45	98.57	3.95	99.992
1.00	68.27	2.50	98.76	4.00	99.9937
1.05	70.63	2.55	98.92	4.05	99.9949
1.10	72.87	2.60	99.07	4.10	99.9959
1.15	74.99	2.65	99.20	4.15	99.9967
1.20	76.99	2.70	99.31	4.20	99.9973
1.25	78.87	2.75	99.40	4.25	99.9979
1.30	80.64	2.80	99.49	4.30	99.9983
1.35	82.30	2.85	99.56	4.35	99.9986
1.40	83.85	2.90	99.63	4.40	99.9989
1.45	85.29	2.95	99.68	4.45	99.9991

A *t*-TABLE



Degrees of freedom	*25%*	*10%*	*5%*	*2.5%*	*1%*	*0.5%*
1	1.00	3.08	6.31	12.71	31.82	63.66
2	0.82	1.89	2.92	4.30	6.96	9.92
3	0.76	1.64	2.35	3.18	4.54	5.84
4	0.74	1.53	2.13	2.78	3.75	4.60
5	0.73	1.48	2.02	2.57	3.36	4.03
6	0.72	1.44	1.94	2.45	3.14	3.71
7	0.71	1.41	1.89	2.36	3.00	3.50
8	0.71	1.40	1.86	2.31	2.90	3.36
9	0.70	1.38	1.83	2.26	2.82	3.25
10	0.70	1.37	1.81	2.23	2.76	3.17
11	0.70	1.36	1.80	2.20	2.72	3.11
12	0.70	1.36	1.78	2.18	2.68	3.05
13	0.69	1.35	1.77	2.16	2.65	3.01
14	0.69	1.35	1.76	2.14	2.62	2.98
15	0.69	1.34	1.75	2.13	2.60	2.95
16	0.69	1.34	1.75	2.12	2.58	2.92
17	0.69	1.33	1.74	2.11	2.57	2.90
18	0.69	1.33	1.73	2.10	2.55	2.88
19	0.69	1.33	1.73	2.09	2.54	2.86
20	0.69	1.33	1.72	2.09	2.53	2.85
21	0.69	1.32	1.72	2.08	2.52	2.83
22	0.69	1.32	1.72	2.07	2.51	2.82
23	0.69	1.32	1.71	2.07	2.50	2.81
24	0.68	1.32	1.71	2.06	2.49	2.80
25	0.68	1.32	1.71	2.06	2.49	2.79

A CHI-SQUARE TABLE



Degrees of freedom	*99%*	*95%*	*90%*	*70%*	*50%*	*30%*	*10%*	*5%*	*1%*
1	0.00016	0.0039	0.016	0.15	0.46	1.07	2.71	3.84	6.64
2	0.020	0.10	0.21	0.71	1.39	2.41	4.60	5.99	9.21
3	0.12	0.35	0.58	1.42	2.37	3.67	6.25	7.82	11.34
4	0.30	0.71	1.06	2.20	3.36	4.88	7.78	9.49	13.28
5	0.55	1.14	1.61	3.00	4.35	6.06	9.24	11.07	15.09
6	0.87	1.64	2.20	3.83	5.35	7.23	10.65	12.59	16.81
7	1.24	2.17	2.83	4.67	6.35	8.38	12.02	14.07	18.48
8	1.65	2.73	3.49	5.53	7.34	9.52	13.36	15.51	20.09
9	2.09	3.33	4.17	6.39	8.34	10.66	14.68	16.92	21.67
10	2.56	3.94	4.86	7.27	9.34	11.78	15.99	18.31	23.21
11	3.05	4.58	5.58	8.15	10.34	12.90	17.28	19.68	24.73
12	3.57	5.23	6.30	9.03	11.34	14.01	18.55	21.03	26.22
13	4.11	5.89	7.04	9.93	12.34	15.12	19.81	22.36	27.69
14	4.66	6.57	7.79	10.82	13.34	16.22	21.06	23.69	29.14
15	5.23	7.26	8.55	11.72	14.34	17.32	22.31	25.00	30.58
16	5.81	7.96	9.31	12.62	15.34	18.42	23.54	26.30	32.00
17	6.41	8.67	10.09	13.53	16.34	19.51	24.77	27.59	33.41
18	7.00	9.39	10.87	14.44	17.34	20.60	25.99	28.87	34.81
19	7.63	10.12	11.65	15.35	18.34	21.69	27.20	30.14	36.19
20	8.26	10.85	12.44	16.27	19.34	22.78	28.41	31.41	37.57

Source: Adapted from p. 112 of Sir R. A. Fisher, *Statistical Methods for Research Workers* (Edinburgh: Oliver & Boyd, 1958).