Statistics 1040, Section 008, Quiz 1 (20 Points)

Friday, January 11, 2008

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 008, Quiz 2 (20 Points)

Friday, January 18, 2008

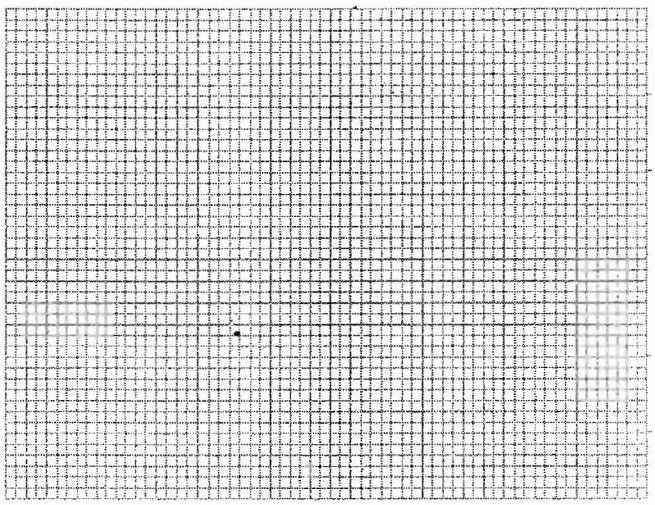
Your Name: _____

Question 1: Histograms (**20 Points**)

The age distribution of people in the U.S. in 2004 is shown below.

Age	Percent of population
0-5	7
5-15	14
15-20	7
20-25	7
25-30	7
30-35	7
35-45	15
45-55	14
55-65	10
65-75	6
75 and over	6

1. (**12 Points**) Draw a histogram for these data on the graph paper provided. (The class intervals include the left endpoint, not the right; for instance, on the second line of the table, 14% of the people were age 5 years or more but had not yet turned 15. The interval "75 and over" can be ended at 85. Men and women are combined in the data.) Make sure to label the axes.



Use your histogram to answer the following questions on the next page:

Please turn over!

2. **(2 Points)** Are there more children age 1, or elders age 71?
Circle your answer.

3. **(2 Points)** Are there more 21–year–olds, or 61–year–olds?
Circle your answer.

4. **(2 Points)** Are there more people age 0–4, or 65–69?
Circle your answer.

5. **(2 Points)** The percentage of people age 35 and over is around 25%, 50%, or 75%?
Circle your answer.

Statistics 1040, Section 008, Quiz 3 (20 Points)

Friday, January 25, 2008

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 008, Quiz 4 (20 Points)

Friday, ~~January 31,~~ 2008
February 1,

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 146,000 non–US citizens who took the General GRE Test in 2001–02, the mean for the quantitative ability portion of the exam was 700 and the standard deviation was 120. We can assume that the histogram follows a normal curve. **Show your work!**

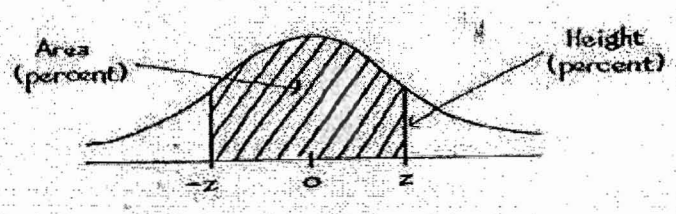
- (**7 Points**) The percentage of non–US citizens who scored **more than 670** on the GRE test is roughly _____ %.

- (**7 Points**) The percentage of non–US citizens who scored **between 340 and 580** is about _____ %.

- (**6 Points**) In order to be among the top 15% of all non–US citizens, a student must have obtained a minimum GRE score of about _____.

Please turn over!

Tables



A NORMAL TABLE

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0.45	34.73	1.95	94.88	3.45	99.944
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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
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0.95	65.79	2.45	98.57	3.95	99.992
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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 008, Quiz 5 (20 Points)

Friday, February 8, 2008

Your Name: _____

Question 1: Measurement Error (**7 Points**)

You send a yardstick to a local laboratory for calibration, asking that the procedure be repeated three times. They report the following values:

35.96 inches 36.01 inches 36.03 inches

If you send the yardstick back for a fourth calibration, you would expect to get 36 inches, give or take

(a) .01 inches or so (b) .03 inches or so (c) .06 inches or so

Circle your answer and explain.

Question 2: Correlation (**7 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 between the number of right answers and the number of wrong answers 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.

Please turn over!

Question 3: Change Of Scale (**6 Points**)

In a class experiment last week, we measured the length of a pencil (including the eraser) 13 times. The average length of our 13 measurements was 7.5 inches, with an SD of 0.07 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!

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 008, Quiz 6 (20 Points)

Friday, February 22, 2008

Your Name: _____

Question 1: Correlation / Regression (**20 Points**)

For 167 college students, the relationship between height and handspan size is summarized as follows:

height:	average = 68.0 inches	SD = 4.0 inches
handspan size:	average = 20.9 inches	SD = 1.9 inches
	r = 0.75	

Fill the blanks in the statements below and **show all the work needed to obtain the answers.**

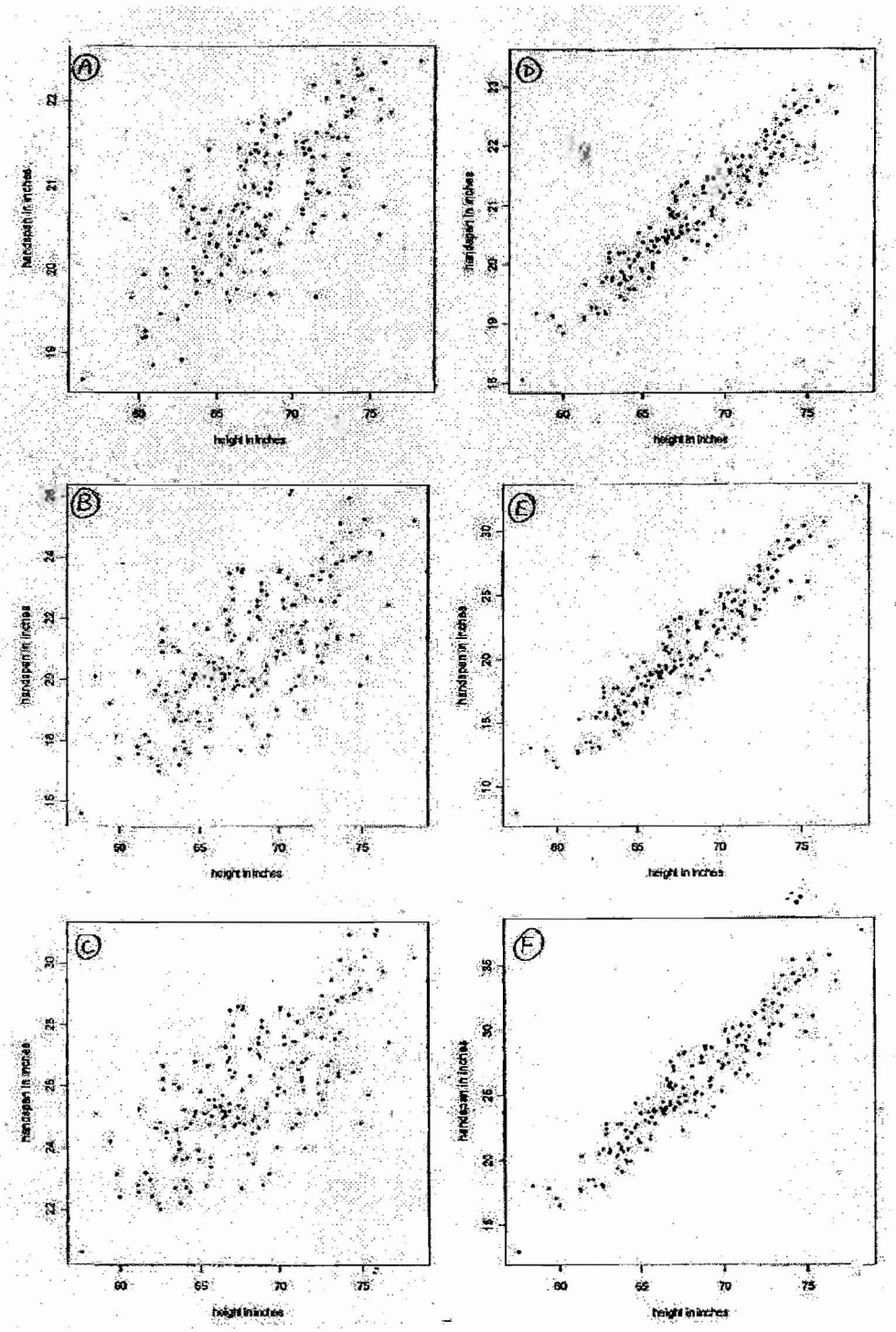
1. (4 Points) Six scatter diagrams are printed on the next page. Which of the scatter diagrams is the correct one for these data? **Circle the correct letter below (No explanation is needed for this part!):**

   A B C D E F

2. (6 Points) Using the summary statistics above, what is the regression estimate for handspan for a student who is 60 inches tall?
   The answer is: _____inches

3. (6 Points) Find the r.m.s. error for your answer in the previous part.
   The answer is: _____

4. (4 Points) What would the correlation coefficient be if we changed all the handspan measurements to centimeters? (There are 2.54 centimeters in an inch).
   The answer is: _____



Formulas:

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

Statistics 1040, Section 008, Quiz 7 (20 Points)

Friday, February 29, 2008

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 mint or orange?
   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 orange 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 008, Quiz 8 (20 Points)

Friday, March 7, 2008

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:

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

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

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

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

Statistics 1040, Section 008, Quiz 9 (20 Points)

Friday, March 21, 2008

Your Name: _____

Question 1: EV, SE, and Normal Curve (**16 Points**)

Suppose it is known that 10% of all people in Utah have a specific blood type. Suppose I take a random sample of 500 Utah residents ... **Show your work!**

1. (**4 Points**) Find the box model.

2. (**6 Points**) The expected number of Utah residents in this sample of 500 who have that specific blood type is _____ with an SE of _____.

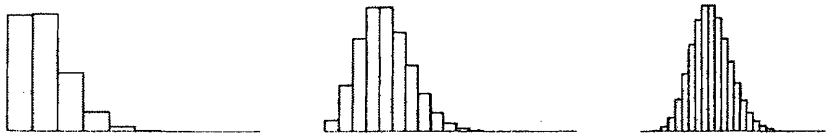
3. (**6 Points**) The chance that **fewer than** 40 Utah residents in this sample have that blood type is about _____ %.

Please turn over!

Question 2: Probability Histograms (**4 Points**)

Shown below are probability histograms for the sum of (a) 100, (b) 400, and (c) 900 draws from the box $\boxed{99 \times \boxed{0} \quad 1 \times \boxed{1}}$. Which histogram is which? **Explain briefly.**

(i) (ii) (iii)



(i) goes with sum _____

(ii) goes with sum _____

(iii) goes with sum _____

Explanation:

Formulas:

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

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

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

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

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

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

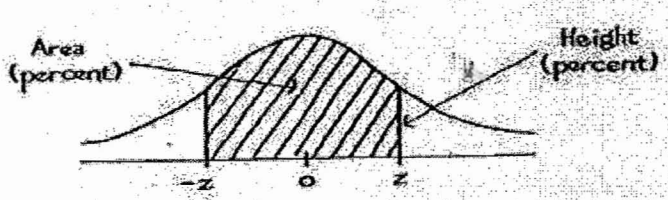
$$\text{SD} = (\text{bigger - smaller}) \times \sqrt{\frac{\text{fraction}}{\text{bigger}} \times \frac{\text{fraction}}{\text{smaller}}}$$

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



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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 008, Quiz 10 (20 Points)

Wednesday, April 9, 2008

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:

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

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

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

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

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

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

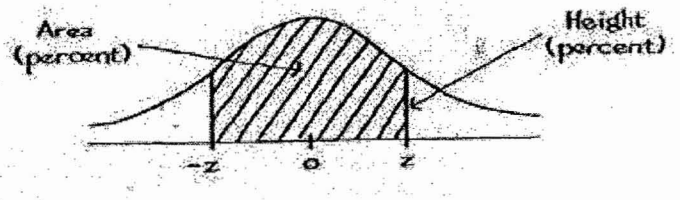
$$\text{average} = \frac{\text{number of } \boxed{1}\text{'s}}{\text{how many tickets in the box}}$$

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

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

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

Tables



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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 008, Quiz 11 (20 Points)

Wednesday, April 16, 2008

Your Name: _____

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

Many companies are experimenting with "flex–time", which is supposed to reduce absenteeism. One company employees have averaged 6.3 days off work in the past. The company introduces "flex–time" and a year later a simple random sample of 100 employees is selected. They average 5.5 days off work with a standard deviation of 2.9. Test to determine if "flex–time" reduces absenteeism. Clearly state the null and alternative hypotheses, calculate the appropriate test statistic, find the P–value, and state your conclusion.

Show your work!

1. (**2 Points**) The test that has to be used in this question is a
   z–test / t–test.
   Circle your answer and explain briefly why you chose this particular test to answer the question.

2. (**3 Points**) State the null and the alternative hypotheses for this problem, in words and in terms of the box model.

Please turn over!

3. **(5 Points)** Calculate the appropriate test statistic.

4. **(4 Points)** Obtain the (approximate) P–value (use the appropriate table!).

5. **(6 Points)** State your conclusions in terms of rejecting (or not rejecting) the null hypothesis and in your own words. (If approriate, also speak of statistically significant or highly statistically significant.)

Please turn over!

Formulas:

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

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

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

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

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

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

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

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

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

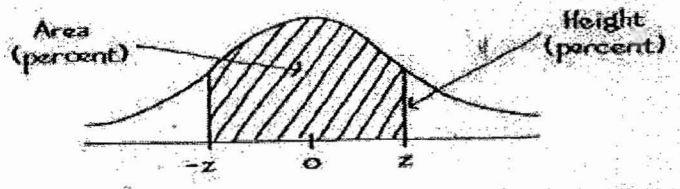
Shortcut formulas for a box that contains only $\boxed{0}$'s and $\boxed{1}$'s:

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

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

$$\text{EV}_{\%} = \%\text{ of } \boxed{1}\text{'s in the box} \qquad \text{SE}_{\%} = \frac{\text{SE}_{sum}}{\text{number of draws}} \times 100\%$$

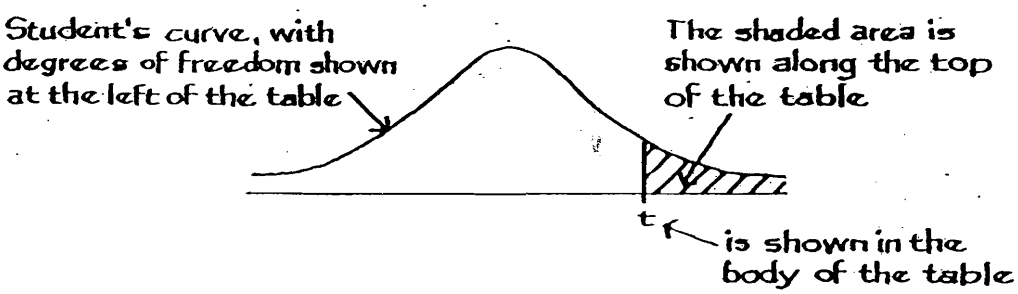
Tables



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

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

Statistics 1040, Section 008, Quiz 12 (20 Points)

Wednesday, April 23, 2008

Your Name: _____

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

In a randomized, controlled, double–blind study published in *The Journal of the American Medical Association* in October 2007, researchers followed 371 heavy drinkers for 14 weeks to try to determine whether the migraine drug Topamax could help them to quit drinking. By the end of the study, 27 of the 183 people in the Topamax group had quit drinking completely, while only 6 of the 188 people in the placebo group had quit drinking completely. Is this evidence that Topamax helps, or could the result just be due to chance error? Clearly state the null and alternative hypotheses, calculate the appropriate test statistic, find the P–value, and state your conclusion.

Show your work!

Please turn over!

Memory Aids

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

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

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

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

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

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

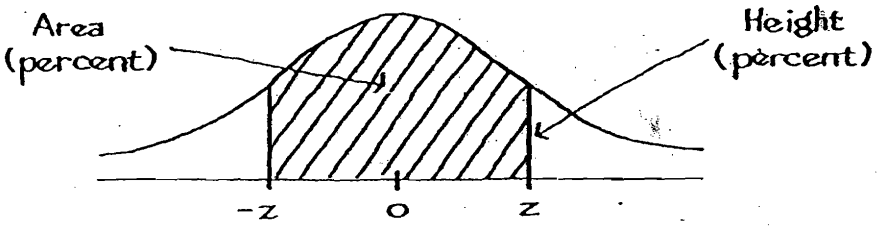
$$EV_{\text{sum}} = \text{number of draws} \times \text{ave}_{\text{box}}$$
$$SE_{\text{sum}} = \sqrt{\text{number of draws}} \times SD_{\text{box}}$$

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

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

$SE_{\text{diff}} = \sqrt{a^2 + b^2}$ 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*
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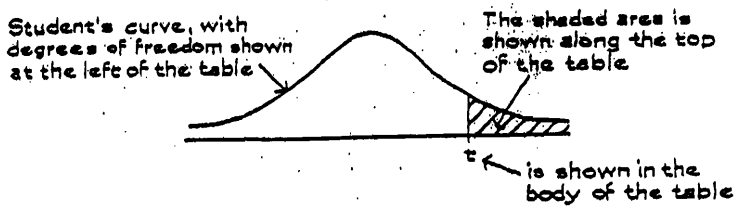
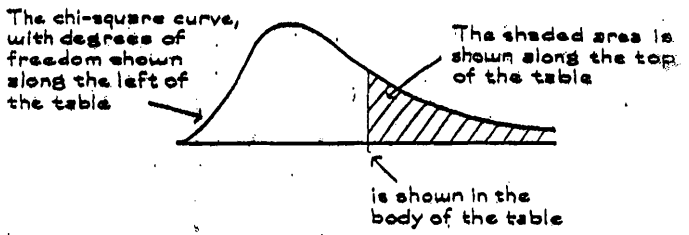
0.15	11.92	1.65	90.11	3.15	99.837
0.20	15.85	1.70	91.09	3.20	99.863
0.25	19.74	1.75	91.99	3.25	99.885
0.30	23.58	1.80	92.81	3.30	99.903
0.35	27.37	1.85	93.57	3.35	99.919
0.40	31.08	1.90	94.26	3.40	99.933
0.45	34.73	1.95	94.88	3.45	99.944
0.50	38.29	2.00	95.45	3.50	99.953
0.55	41.77	2.05	95.96	3.55	99.961
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).