

Do not open the exam until you are instructed to do so.

Directions: You have 75 minutes to complete the exam, which has 100 total possible points. Be sure to answer every question. Where numeric answers are required, you must show your work to receive credit. The formulas given below and the table on the last page may be useful for some of the questions. Where calculations are required, round to two decimal places.

Student Name: _____

Under your recitation leader's name, circle your recitation time:

Oleksandr Gromenko	Bryan Stephenson	Anthonie Nichols
10:30	8:30	8:30
11:30	12:30	10:30
12:30	1:30	11:30
		1:30

Possibly useful formulas for this exam

- calculator average: \bar{x}
- calculator SD: σ_n
- $slope = r \cdot \frac{SD \text{ for } y}{SD \text{ for } x}$
- $P(A \text{ and } B) = P(A) \times P(B|A)$
- $EV_{sum} = (\# \text{ of draws}) \times ave_{box}$
- conf. int.: estimate $\pm z_\alpha \times (SE)$
- $EV_\% = \%$ of 1's in box
- $EV_{ave} = ave_{box}$
- $SD = \sqrt{[ave. \text{ of } (value^2)] - (ave. \text{ of value})^2}$
- $r = \frac{(ave. \text{ of } x \cdot y) - (ave. \text{ of } x)(ave. \text{ of } y)}{(SD \text{ for } x)(SD \text{ for } y)}$
- rms error = $(\sqrt{1 - r^2}) \cdot (SD \text{ for } y)$
- $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$
- $SE_{sum} = \sqrt{\# \text{ of draws}} \times SD_{box}$
- $SD_{box} = \sqrt{(\text{fraction of 0's}) \times (\text{fraction of 1's})}$
- $SE_\% = \frac{SE_{sum}}{\# \text{ of draws}} \times 100\% = \frac{SD_{box}}{\sqrt{\# \text{ of draws}}} \times 100\%$
- $SE_{ave} = \frac{SE_{sum}}{\# \text{ of draws}} = \frac{SD_{box}}{\sqrt{\# \text{ of draws}}}$

1. Suppose that in a particular Stat 1040 recitation section, there are 37 students, of whom 9 are left-handed and 28 are not left-handed. The recitation leader calls 2 students (selected at random without replacement) to work an example at the board.

(a) (6 points) What is the probability that both students are left-handed?

(b) (6 points) What is the probability that that the first student is left-handed, but the second student is not?

(c) (6 points) What is the probability that at least one of the two students is left-handed?

2. Suppose that in the same recitation section of the previous question (37 total students, 9 left-handed and 28 not left-handed), there are 12 male students and 25 female students, and all the left-handed students are male. Again 2 students are selected at random without replacement.

(a) (2 points) Let event A be “the first student selected is female”, and event B be “the first student selected is left-handed.” Then events A and B are (circle one):

- i. independent
- ii. mutually exclusive
- iii. none of the above

(b) (2 points) Let event A be “the first student selected is female” and event B be “the second student selected is left-handed.” Then events A and B are (circle one):

- i. independent
- ii. mutually exclusive
- iii. none of the above

3. (8 points) A fair coin is to be tossed many times – either 100 or 1000. Which number of tosses will make the following outcomes more likely? (Circle one of 100 or 1000 for each.)

(a) Exactly 50% heads

100 1000

(b) More than 60% heads

100 1000

(c) Between 40% and 60% heads

100 1000

(d) More than 50% heads but less than 60% heads

100 1000

4. (10 points) According to the 2000 U.S. Census, the average household size of a renter-occupied unit in Utah was 2.75. In the same year, a team of researchers took a SRS of 1200 rental units in Utah and found an average household size of 2.85. Clearly identify each of the following here:

(a) population

(b) parameter

(c) sample

(d) statistic

(e) absolute chance error

5. (6 points) Manhattan, Kansas has a population of about 53,000, while Manhattan, New York has a population of about 1.6 million. A SRS of 500 residents of Manhattan, Kansas is selected, and their average weight is calculated. Assuming the average (and SD) weight of residents in the two Manhattans is essentially the same, what sample size would be needed in a SRS of Manhattan, New York residents to achieve the same accuracy as the result of the Manhattan, Kansas sample? Give your answer and explain briefly.

6. (5 points) If you wanted to obtain a representative sample of 100 property owners in Salt Lake County, Utah, explain clearly what you would do to make your sample a SRS.

7. According to the U.S. Census Bureau, 85% of Utah residents have health insurance. Suppose you are going to take a SRS of 500 Utah residents.

(a) (6 points) Fill in the blanks: The number of Utah residents in your sample that have health insurance will be around _____, give or take _____ or so.

(b) (6 points) What is the chance that more than 415 Utah residents in your sample have health insurance?

8. (5 points) An October 2010 Associated Press article (posted on capitolhillblue.com) reported on a pre-election survey of about 1,000 likely voters, which found that 49 percent intended to vote Republican, compared to 43 percent Democrat (and 8 percent other). The margin of error was reported as plus or minus 3.5 percentage points. A reader posted the following comment on the website:

If the margin of error is 3.5 points, and the difference [between percent Republican and percent Democrat] is six points, that's the same as no difference. This poll is essentially saying they're neck and neck. When will reporters ever learn to interpret polls correctly?

The reader is essentially calling this a statistical tie. Is it a statistical tie? Answer yes or no, and explain briefly.

9. In a SRS of 1000 U.S. adult males, the average height was 69.1 inches, with an SD of 3 inches.
- (a) (8 points) Construct a 95 percent confidence interval for the average height of U.S. adult males.

- (b) (6 points) An observer comments, "So approximately 95 percent of U.S. adult males have heights in this interval." Is the observer correct? If yes, explain why. If no, give a correct interpretation of the confidence interval.

10. In a poll of 400 likely voters in Utah's second congressional district just before the November 2010 elections, 48 percent responded they would vote for Jim Matheson (compared to 35 percent for Morgan Philpot, 7 percent for another candidate, and 10 percent undecided).

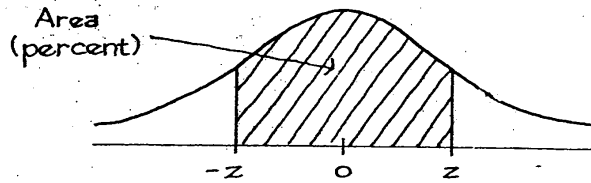
(a) (8 points) Based on the polling result (and treating these 400 likely voters like a SRS), construct a 90% confidence interval for the percentage of voters for Matheson in the actual election.

(b) (4 points) What is the correct interpretation of this confidence interval?

(c) (1 point) In the actual election, 51 percent voted for Matheson. Is this in your interval?

11. (5 points) Fill in the blank: Even when the distribution of box contents (or population values) is not approximately normal, we can use the normal approximation to address the chances of the sum (or percentage or average) of a large number of draws (or sample size) because of the _____ limit theorem.

Tables



A NORMAL TABLE

<i>z</i>	<i>Area</i>	<i>z</i>	<i>Area</i>	<i>z</i>	<i>Area</i>
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