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Department of Mathematical and Statistical Sciences

Statistics 151 Midterm Examination – Lecture E01 Version A

Date: October 29, 2010

Instructor (circle): Alireza Simchi

Time: 2:00-2:50

Instructions: (READ ALL INSTRUCTIONS CAREFULLY.)

1. This is a closed book exam. You are permitted to use a non-programmable calculator. Please turn off your cellular phones or pagers.
2. The exam has 20 multiple-choice questions. For each multiple-choice question choose the answer that is closest to being correct. Circle one of the letters (a)-(j) corresponding to your chosen answer for each question. All answers will be graded right or wrong (no partial credit) in this part. Each single question is worth 1 point. All numerical answers are rounded.
3. This exam has **4** pages including this cover. Please ensure that you have all pages and write your name and your student ID at the top of each page.
4. The table of the standard normal probabilities and formula sheet are provided in a separate booklet.
5. The exam is graded out of a total of **20** points.

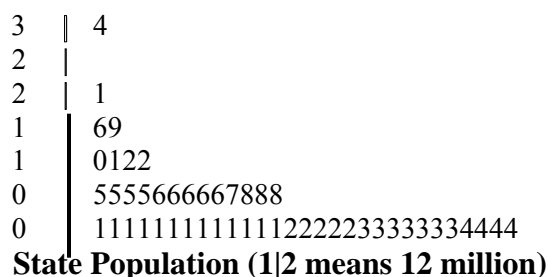
1. At St. Luke's hospital in 1998, 674 women were diagnosed with breast cancer. Five years later, 88% of the Caucasian women and 83% of the African American women were still alive. A researcher concludes that being Caucasian causes women with breast cancer to have an increased chance of surviving five years. Choose the best following options.
 - (a) The conclusion is valid, because of the large sample size (674 women).
 - (b) The conclusion is valid, because of the significant increase rate of survival among Caucasian women.
 - (c) The conclusion is not valid, since the study is too old.
 - (d) The conclusion is not valid, because of possible confounding (or lurking) variables,
 - (e) More information is necessary to decide about the validity of the conclusion.

2. The owners of a coffee shop conducted a taste test to determine whether its customers preferred a new coffee brand to the current one sold by the shop. Customers who were willing to participate were given small samples of each of the two brands in random order and were asked to select which one they preferred without knowing the brand. Of the 100 participating customers, 56% chose the new brand. Based on these results, the owners determined that a majority of their customers preferred the new brand and therefore switched their coffee supplier. Choose the best following options.
 - (a) The study is an experiment,
 - (b) The study is an observational study,
 - (c) The study is neither an observational study nor experiment, since only customers who were willing to participate were given the two brands of coffee.
 - (d) For sure, the majority of customers prefer the new brand.
 - (e) None of the above can be concluded based on the information provided.

3. Refer to Question 2; what is the population of the study?
 - (a) All customers of the coffee shop,
 - (b) All customers of the coffee shop who prefer the new brands,
 - (c) All customers of the coffee shop who participated in the study,
 - (d) All customers of all coffee shops,
 - (e) All people who drink coffee

4. Refer to Question 2; it can be stated that the proportion of the taste testers who preferred the new brand is 0.56. What is the proportion of 0.56 called, in general?
 - (a) Parameter
 - (b) Statistic
 - (c) Sample
 - (d) Population proportion
 - (e) It is just a number and there is no general name for that number.

5. The following stem-and-leaf display shows populations of 50 states and Washington, DC, in millions of people, according to the 2000 census.



Based on the stem-and-plot diagram, you conclude that the distribution of the data is:

- (a) symmetric,
- (b) symmetric with one outlier,
- (c) skewed to the right,
- (d) skewed to the left,
- (e) neither skewed to the right nor to the left,

6. The weight changes of eight horses, in kilogram, given an antibiotic for two week are given in the following.

0.4, 0.5, 1.0, 0.9, 1.1, 1.6, 1.8, 2.0

What is the median of data?

- (a) 0.90 (b) 0.95 (c) 1.00 (d) 1.05 (e) 1.10

7. Refer to question 6; what is the inter-quartile range for the data?

- (a) 0.45 (b) 0.50 (c) 0.55 (d) 0.60 (e) 0.65
(f) 0.90 (g) 0.95 (h) 1.00 (i) 1.05 (j) 1.10

8. Refer to question 6; what is sample variance of data in pound? Use $\text{Kg} \approx 2.2 \text{ lb}$

- (a) 1.20 (b) 1.29 (c) 1.46 (d) 1.67 (e) 2.85
(f) 0.07 (g) 0.24 (h) 0.27 (i) 0.55 (j) 0.59

9. The amounts of fat (X) and calories (Y) in a fast-food hamburgers are given in the following table:

Fat (g)	19	31	34	35	39	39	43
Calories	410	580	590	570	640	680	660

Find the equation of the line of regression. What is the slope of the regression line of Y on X?

- (a) 0.08 (b) 1.08 (c) 4.03 (d) 5.03 (e) 6.09
(f) 7.09 (g) 11.05 (h) 21.05 (i) 110.95 (j) 210.95

10. Refer to question 9; a new burger containing 28 grams of fat is introduced. According to the least-squares regression line, its residual for calories is +30. How many calories does the burger have?

- (a) 510 (b) 520 (c) 530 (d) 540 (e) 550
(f) 560 (g) 570 (h) 580 (i) 590 (j) 600

11. Ten students in a graduate program were randomly selected. Their grade point averages (GPA) when they entered the program (X) and their current GPA (Y) were recorded. Summary statistics for X and Y are given in the following.

$$\bar{x} = 3.7, \quad s_x = 0.19, \quad \bar{y} = 3.8, \quad s_y = 0.14, \quad r = 0.82$$

What is the y-intercept of the regression line of Y on X?

- (a) 0.06 (b) 0.32 (c) 1.56 (d) 2.32 (e) 3.56
(f) -0.06 (g) -0.32 (h) -1.56 (i) -2.32 (j) -3.56

12. Refer to question 11; what percentage of variation in Y is explained by the regression model of Y on X?

- (a) 4% (b) 15% (c) 20% (d) 38% (e) 45%
(f) 50% (g) 67% (h) 70% (i) 82% (j) 91%

13. Suppose 75% of drivers stopped on suspicion of drunk driving are given a breath test, 25% a blood test, and 20% both test. What is the probability that a randomly selected driver stopped on suspicion of drunk driving is given neither test?

- (a) 0.0 (b) 0.1 (c) 0.2 (d) 0.3 (e) 0.4
(f) 0.5 (g) 0.6 (h) 0.7 (i) 0.8 (j) 1.0

14. A recent Maryland highway safety found that 77% of all accidents the driver was wearing a seatbelt. Accident reports indicated that 92% of those drivers escaped serious injury (defined as hospitalization or death), but only 63% of the non-belted drivers were so fortunate. Suppose a driver of an accident was selected at random from all drivers of accidents. What is probability that he/she was seriously injured?

- (a) 0.0616 (b) 0.0851 (c) 0.1467 (d) 0.1627 (e) 0.1889
(f) 0.2300 (g) 0.2355 (h) 0.7084 (i) 0.7700 (j) 0.8533

15. Refer to question 14; suppose the selected driver was seriously injured. What is the probability that the deriver was not wearing a seatbelt?

- (a) 0.08 (b) 0.18 (c) 0.28 (d) 0.38 (e) 0.48
(f) 0.58 (g) 0.68 (h) 0.78 (i) 0.88 (j) 0.98

16. The random variable X has the following probability distribution.

Value of X	-3	-1	0	1	2
Probability	0.1	0.1	0.3	0.2	?

What is the mean of X or $\mu_x = E(X)$?

- (a) -0.4 (b) -0.3 (c) -0.2 (d) -0.1 (e) 0.0
(f) 0.4 (g) 0.3 (h) 0.2 (i) 0.1 (j) 1.0

17. The Wechsler Adult Intelligence Scale (WAIS) is the most common "IQ test". The scale is set separately for each age group and is approximately normal with mean 100 and standard deviation 15. What percentage of adults does have WAIS score below 115?

- (a) 13.57 (b) 15.87 (c) 17.36 (d) 19.77 (e) 21.48
(f) 78.52 (g) 80.23 (h) 82.64 (i) 84.13 (j) 86.43

18. Refer to question 17; an organization hires people with only the top 15% IQ's. What is (approximately) the minimum IQ needed to be considered for this organization?

- (a) 83 (b) 87 (c) 93 (d) 97 (e) 100
(f) 105 (g) 108 (h) 113 (i) 116 (j) 129

19. According to government reports, the heights of adult male residents of the United States are approximately normally distributed with a mean of 69.0 inches and a standard deviation of 2.8 inches. If four adult male residents of the United States are chosen randomly, what is the probability that that the mean of their heights are less than 71.8 inches? You may assume independency.

- (a) 0.0228 (b) 0.1587 (c) 0.2090 (d) 0.3300 (e) 0.4761
(f) 0.5239 (g) 0.6700 (h) 0.7910 (i) 0.8413 (j) 0.9772

20. Suppose 30% of adults visited a casino in the past 12 months. For 500 randomly selected adults, what is the probability that less than 36% of them visited a casino in the past 12 months?

- (a) 0.0017 (b) 0.0122 (c) 0.0618 (d) 0.1587 (e) 0.2643
(f) 0.7357 (g) 0.8413 (h) 0.9382 (i) 0.9878 (j) 0.9983