

Name: \_\_\_\_\_  
Student No.: \_\_\_\_\_

# University of Alberta

## Department of Mathematical and Statistical Sciences

### Statistics 151 Midterm Examination – Lecture T01

Date: February 27, 2009

#### Version A

**Instructor (circle):** Alireza Simchi

**Time:** 12:00-12:50

**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 **5** 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.

- An emergency room institutes a new screening procedure to identify people suffering from life threatening heart problems so that treatment can be initiated quickly. It was found that, in the first year after its initiation, there is lower death rate due to heart failure compared to the previous year among patients seen in the emergency room. Which of the following sentences is true?
  - The study is an experiment,
  - The study is an observational study,
  - The study is neither an observational study nor experiment,
  - The new procedure can be credited with saving lives, because of lower death rate due to heart failure
  - None of the above can be concluded based on the information provided.

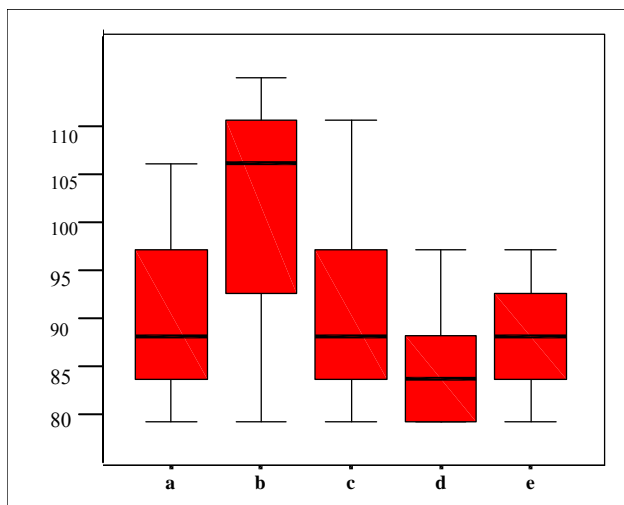
- The tensile strengths (in pounds per square inch) of twelve steel rods are determined and are displayed in the following stem-and-leaf diagram

```

7 | 9
8 | 135788
9 | 168
10| 26
    
```

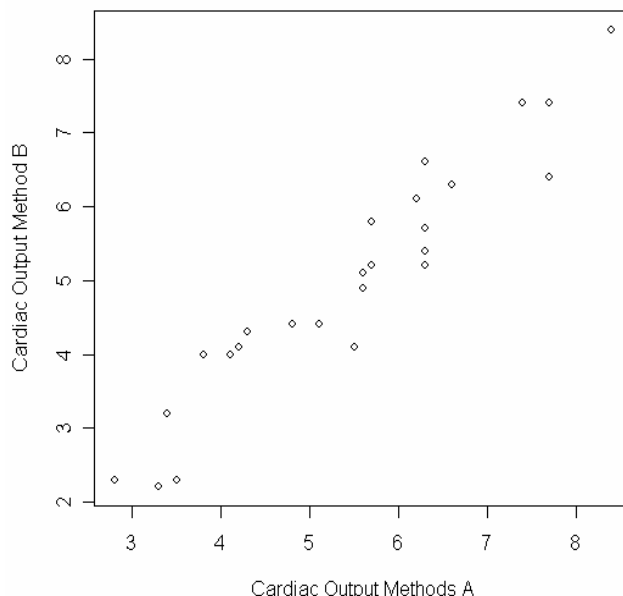
Based on the stem-and-plot diagram, you conclude that the distribution of tensile strengths is

- symmetric,
  - skewed to the right,
  - skewed to the left,
  - neither skewed to the right nor to the left,
  - there are two mode for this data.
- Refer to the data in Question 2; what is the inter-quartile range for this data?
    - 12.0
    - 12.5
    - 13.0
    - 13.5
    - 14
  - Refer to the data in Question 2; what is the sample variance of the data?
    - 8.13
    - 8.49
    - 10.41
    - 66.05
    - 72.06
  - Refer to Question 2; which of the five box-plots labelled a, b, c, d and e and displayed below is the box-plot of the twelve tensile strengths:



- (a) Boxplot a   (b) Boxplot b   (c) Boxplot c   (d) Boxplot d   (e) Boxplot e

6. Refer to the data in Question 2; based on the 1.5 IQR rule, which of the following statement is TRUE?
- (a) There are no outliers in this data
  - (b) 79 is an outlier,
  - (c) 106 is an outlier,
  - (d) Both 79 and 106 are outliers,
  - (e) There isn't sufficient information to determine the outliers.
7. A medical researcher wanted to compare two different methods A and B, for measuring cardiac output. Method A is the "gold standard" but is invasive (involves inserting a catheter into the main heart artery). Method B is less accurate but is noninvasive. The researcher wanted to find out how well the two methods correlated and whether method B can be calibrated with respect to method A. For this purpose, cardiac outputs of 26 subjects were measured by the two methods. The following plot is the scatter-plot of data.



Based on the above plot, what is the value of sample correlation between two methods?

- (a) -0.95    (b) -0.25    (c) 0.00    (d) 0.25    (e) 0.95
8. A computer network manager wants to model how access time in milliseconds ( $y$ ) for data files varies with the number of simultaneous users ( $x$ ) accessing the files. Based on 50 paired observations, the following summary statistics are obtained:

$$\bar{x} = 8.7, \quad s_x = 2.5, \quad \bar{y} = 15.3, \quad s_y = 3.8, \quad r = 0.8$$

What is the slope of the regression line of Y on X?

- (a) -0.216    (b) -0.526    (c) -1.216    (d) -1.526    (e) 14.130
  - (f) 0.216    (g) 0.526    (h) 1.216    (i) 1.526    (j) 22.750
9. Refer to Question 8; what percent of variation in Y is explained by the regression model of Y on X?
- (a) 0.02    (b) 0.16    (c) 0.28    (d) 0.35    (e) 0.40
  - (f) 0.51    (g) 0.64    (h) 0.79    (i) 0.80    (j) 0.98

10. Refer to Question 8, what is the estimated access time, using the estimated regression line, if there are 10 simultaneous users?

- (a) 6.7            (b) 7.7            (c) 8.7            (d) 10.7            (e) 12.7  
 (f) 16.9            (g) 17.9            (h) 18.9            (i) 20.9            (j) 22.9

11. A random sample of 150 adult male residents of Saskatchewan was obtained as part of a study of smoking habits of people in the province. Each sampled male provided information regarding the level of education he had achieved and his smoking habits. The information is summarized in the following table.

		Smoking Habit	
		Smoker	Non-smoker
College Graduate	Yes	25	40
	No	55	30

If a male person is selected at random from the above sample, what is the probability that he is a non-smoker or a college graduate?

- (a) 0.23            (b) 0.33            (c) 0.43            (d) 0.53            (e) 0.63  
 (f) 0.27            (g) 0.37            (h) 0.47            (i) 0.57            (j) 0.67

12. Refer to Question 11; if a male person is selected at random, what is the probability that he is college graduate given that he is a non-smoker?

- (a) 0.312            (b) 0.385            (c) 0.571            (d) 0.615            (e) 0.688

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

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

What is conditional probability of  $X=0$  given that  $-1 \leq X < 1$  or  $P(X=0 | -1 \leq X < 1)$ ?

- (a) 0.15            (b) 0.25            (c) 0.35            (d) 0.45            (e) 0.55  
 (f) 0.65            (g) 0.75            (h) 0.85            (i) 0.95            (j) 1.0

14. Refer to question 8; 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

15. Suppose 20% of people are left handed in a community. If five people are randomly selected from the community for a study of writing style, find the probability that at most four of them are not left handed. You may assume independency if it is necessary.

- (a) 0.0003            (b) 0.0016            (c) 0.1587            (d) 0.3277            (e) 0.4096  
 (f) 0.5904            (g) 0.6723            (h) 0.8413            (i) 0.9984            (j) 0.9997

16. The diameter of hail hitting the ground during a storm is normally distributed with a mean of 0.5 inch and a standard deviation of 0.1 inch. By the end of the storm, what percentage of the hailstones would have had diameters between 0.45 and 0.55 inch?

- (a) 0.02            (b) 6.68            (c) 20.16            (d) 30.85            (e) 38.30  
 (f) 61.7            (g) 69.15            (h) 79.84            (i) 93.32            (j) 99.98

**17.** The weight of the contents of a glass jar of spaghetti sauce is normally distributed with a mean of 850 g and standard deviation of 8 g. What is the probability that a random sample of 25 such jars has a mean weight between 848 and 854?

- (a) 0.0062      (b) 0.0994      (c) 0.1056      (d) 0.1118      (e) 0.2902  
(f) 0.7098      (g) 0.8882      (h) 0.8944      (i) 0.9006      (j) 0.9938

**18.** Refer to Question 17; if a sample of 400 of the jars is selected, what is the probability that 120 or more of them will have weight between 848 and 854?

- (a) 0.13          (b) 0.23          (c) 0.33          (d) 0.43          (e) 0.53  
(f) 0.63          (g) 0.73          (h) 0.83          (i) 0.93          (j) 1.00

**19.** The distribution of net typing rate in words per minute (wpm) for experienced typists can be approximated by a normal curve with mean 60 wpm and standard deviation 15 wpm. Suppose that special training is to be made available to the slowest 33% of the typists. What typing speeds would qualify individuals for this training?

- (a) 40.2 wpm      (b) 47.4 wpm      (c) 53.4 wpm      (d) 55.1 wpm      (e) 64.95 wpm  
(f) 66.6 wpm      (g) 68.7 wpm      (h) 72.6 wpm      (i) 82.9 wpm      (j) 84.95 wpm

**20.** Suppose the proportion of traffic deaths in Alberta that are alcohol related is 0.40. If 100 traffic deaths are selected at random, what is the probability that at least 35 of them are alcohol related?

- (a) 0.1539      (b) 0.1841      (c) 0.2420      (d) 0.2743      (e) 0.3632  
(f) 0.6368      (g) 0.7257      (h) 0.7580      (i) 0.8159      (j) 0.8461