

Name _____

Feb. 15, 2007

Math 145 - Elementary Statistics

Long Exam I

Instructions: Please write your solutions neatly and using the appropriate notations. Explanations should be written in complete sentences. Encircle your final answers.

1. The following stem-and-leaf plot summarizes the exam scores of a sample of 32 statistics students.

4	0
5	8
6	379
7	2445788
8	0013346777899
9	0111268

note that $\sum_{i=1}^{32} X_i = 2,578$ and $\sum_{i=1}^{32} X_i^2 = 212,152$.

- a. Determine the following:

i. Maximum value. _____ [2 pts.]

ii. Sample mean. _____ [3 pts.]

iii. Standard deviation. _____ [5 pts.] note : Variance = $\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$

iv. Median. _____ [2 pts.]

v. The value of first quartile (Q_1). _____ [2 pts.]

vi. The value of third quartile (Q_3). _____ [2 pts.]

vii. The value of IQR. _____ [2 pts.]

viii. The lower limit (for the boxplot). _____ [2 pts.]

ix. The upper limit (for the boxplot). _____ [2 pts.]

- b. Draw a (horizontal) **modified** boxplot for this data. Are there potential outliers? [5 pts.]
Please include all relevant values.

c. Construct the frequency table for this data using $40 < 50$, $50 < 60$, \dots , $90 < 100$, for the classes (Class $40 < 50$ includes 40 but not 50). Then draw a histogram for this table. [6 pts.]

d. What can you say about the skewness of the distribution? _____ [2 pts.]

2. Suppose that in a sample of 500 college students, 350 drink alcohol, 200 smoke, and 150 drink and smoke. If a student is chosen at random from this sample, let D represent the event of selecting someone who drinks alcohol, and let S represent the event of selecting someone who smokes.

a. Draw a Venn diagram that includes these 2 events and determine the number of students that fall in each separate regions. [6 pts.]

b. What is the probability that the randomly selected student

i. drinks alcohol but does not smoke? [4 pts.]

ii. is engaged in at least one of these two habits? [4 pts.]

iii. smokes given that he/she drinks? [4 pts.]

c. Are events D and S mutually exclusive (disjoint)? Explain. [4 pts.]

d. Are events D and S independent? Explain. [4 pts.]

3. From a lot of 12 missiles, 5 are selected at random and fired. If a lot contains 3 defective missiles that will not fire, what is the probability that
- a. all 5 will fire? [6 pts.]
- b. at least 2 will not fire? [8 pts.]
4. A company uses three different assembly lines – A_1, A_2, A_3 – to manufacture a particular component. Of those manufactured by A_1 , 5% need rework to remedy a defect, whereas 8% of A_2 's components need rework and 10% of A_3 's need rework. Suppose that 60% of all components are produced by line A_1 , 30% are produced by line A_2 , and 10% come from line A_3 . If a component is randomly selected,
- a. construct a tree diagram, showing the different possibilities. [5 pts.]
- b. what is the probability that it needs rework? [5 pts.]
- c. what is the probability it came from line A_3 given that it requires rework? [5 pts.]

5. Give two (2) examples of Categorical and Quantitative variables, then list 2 examples of actual data that you might observe from these variables. [6 pts.]

a. Categorical variables

- i. _____ (1) _____ (2) _____
ii. _____ (1) _____ (2) _____

b. Quantitative variables

- i. _____ (1) _____ (2) _____
ii. _____ (1) _____ (2) _____

6. **Essay:** Answer the following questions with at most 3 sentences. [2 pts. each]

- a. Why do we usually have to work with a sample when we are really interested with the population?

- b. Why is it important that we work with a *representative* sample?

- c. Discuss the main difference between μ and \bar{X} .
