KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS

STAT 213: Statistical Methods for Actuaries

Semester 181
Major Exam One
Tuesday, October 2, 2018
Allowed time 75 minutes

Name: Student ID#: Serial #:

Directions:

1) You must **show all your work** to obtain full credit.
2) Round your answers **to at least 4 decimal places**.
3) You are allowed to use electronic calculators and other reasonable writing accessories that help write the exam.
4) Do not keep your mobile with you during the exam, turn off your mobile and leave it aside.

Question No	Full Marks	Marks Obtained
Q1	*5*	
Q2	*9*	
Q3	*6*	
Q4	*5*	
Q5	*4*	
Q6	*4*	
Q7	*4*	
Q8	*4*	
Q9	*4*	
Q10	*9*	
Q11	*6*	
Total	***60***	

1. At New York State University, 800 students are randomly selected and asked the distance of their commute to campus. From this group a mean of 14.6 miles is computed.

a. What is the statistic?

b. What is the variable of interest?

c. What is the parameter?

d. What is the sample?

e. What is the population?

2. Data were collected on the number of people entering an electronics store each hour. The data are presented below.

23	35	42	28	29	17	38	21	49	52
46	37	25	49	37	25	28	13	29	43

Construct cumulative relative frequency distributions of the data. Also make cumulative relative frequency curve, then use this curve to approximate the median and the 90^{th} percentile and interpret.
(Note: Use the starting point 10 and width of the intervals 7).

3. A company has determined that there are seven possible defects for one of its product lines. Construct a Pareto diagram for the following defect frequencies and comment on the vital few and trivial many:

Defect Code	*Frequency*
A	10
B	70
C	15
D	90
E	8
F	4
G	3

4. Over the past 10 years, the return on Stock A has averaged 8.4% with a standard deviation of 2.1%. The return on Stock B has averaged 3.6% with a standard deviation of 0.9%. Which stock has smaller relative variation? Why?

5. The police lieutenant in charge of the traffic division has reviewed the number of traffic citations issued per day by each of the 10 police officers in his division. The data were: 13, 21, 12, 34, 31, 13, 22, 26, 25, and 23.

   What is the mean, median, mode, and the third quartile of the number of citations issued per day?

6. A set of data has a bell shape distribution, with a mean of 500 and a variance of 576. Approximately what proportion of the observations is between 452 and 548? Reason?

7. For any distribution, what percentage of the observations lie within four standard deviations of the mean? Why?

8. For a sample of size 5, if $x_1 - \bar{x} = -5, x_2 - \bar{x} = 9, x_3 - \bar{x} = -7,$ and $x_4 - \bar{x} = -2,$ then what is the sample standard deviation?

9. In a recent survey, 200 top executives were asked how many hours they spend each year in community service. The data are presented below.

No. of Hours	0 - 20	20 - 40	40 - 60	60 - 80	80 -100	100 -120	120 -140
No. of Executives	11	27	33	53	47	22	7

What is the approximated mean amount of time spent by these executives in community service?

10. The probability that a person has an Internet connection at home is 34%. The probability that he has access to the Internet at work is 40%. The probability that a person who has access to the Internet at work also has access at home is 55%.
    a. What is the probability that a person has an Internet connection at home and at work?

    b. What is the probability that a person has an Internet connection at home or at work?

c. What is the probability that a person with an Internet connection at home also has one at work?

11. A company wishes to evaluate the effectiveness of a marketing campaign. Seventy five percent of all potential professors were reached in a focused advertising program. Twenty eight percent of those contacted adopted the book while 8% of the adoptions came from professors who did not receive the promotional material. Define the following events of interest:

B_1 = Professor received advertising material
B_2 = Professor did not receive advertising material
A = Professor adopts the book

What is the probability that a professor who adopts the book received the advertising material?

Some Useful Formulas

- $\bar{x} = \frac{\sum x_i}{n}$ *or* $\bar{x} = \frac{\sum x_i f_i}{n}$
- $S^2 = \frac{\sum\left(x - \bar{x}\right)^2}{n-1}$ *or* $S^2 = \frac{\sum f\left(x - \bar{x}\right)^2}{n-1}$
- $P(A \text{ or } B) = P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A \cap B') = P(A) - P(A \cap B)$
- $P(A \mid B) = \frac{P(A \cap B)}{P(B)}$, $P(B) > 0$
- $P(A \cap B) = P(A) \times P(B \mid A) = P(B) \times P(A \mid B)$
- $P(B_j \mid A) = \frac{P(B_j \cap A)}{P(A)} = \frac{P(A \mid B_j)P(B_j)}{\sum_{i=1}^{k} P(A \mid B_i)P(B_i)}$ for $j = 1,2,\ldots,k$