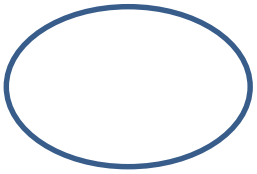
KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS AND STATISTICS
Term 161

STAT 213 STATISTICS METHODS FOR ACTUARIES

Wednesday Feb 17, 2016



Name: _____ ID #:_____

Important Note:

- Show all your work including formulas, intermediate steps and final answer

Question No	Full Marks	Marks Obtained
1	5	
2	5	
3	30	
4	6	
5	10	
6	6	
7	3	
8	3	
9	5	
Total	70	

Q1: (*5 pts.*) For each of the data below, write the data type and appropriate measurement level:

Data	Data type	Measurement level
a) Academic major (Finance, Accounting, etc)		
b) Number of credit hours		
c) Clothes size (Small, Medium, or Large)		
d) Age (in years)		
e) Temperature (in °F)		

Q2: (*5 pts.*) Select True or False for each of the following statements.

1. Descriptive statistical tools include graphs, charts, and numerical measures. (True / False)

2. A group of 50 babies born in 2000. This group is an example of a statistical population. (True / False)

3. When a company scans the bar codes on its products in an effort to count the number of products that remain in inventory, the company is collecting data through experimentation. (True / False)

4. At the end of the school term, students are asked to rate the course on a scale of 1-5 how well they liked the course. The data generated from this question are examples of ordinal data. (True / False)

5. The data level that will provide the greatest flexibility when it comes to analyzing the data is nominal data. (True / False)

Q3: Suppose the Human Resource Department of a particular company trains its employees to use a specific statistical software package. A random sample of trainees have turned the following number of errors committed by the trainees in recent weeks.

0	2	5	6	11	12	15	18	18	19
20	21	22	23	25	26	26	27	28	29
31	32	32	32	33	35	35	38	39	40
41	43	43	45	46	47	48	50	55	58

a. (*5 pts.*) Compute the mean, the median, the mode, and the standard deviation. Comment on the shape.

b. (*5 pts.*) Starting from 0, construct a grouped frequency distribution for the data with exactly 6 classes.

c. (*5 pts.*) Construct a relative frequency histogram for these data. Comment on the shape.

d. (*4 pts.*) Check the second condition of the empirical rule for the given dataset.

e. (*4 pts.*) Using the z-score, do these data contain an outlier? Explain

f. (*2 pts.*) Which is the better measure of center for these data, the mean or the median? Explain.

g. (*5 pts.*) Construct The Box plot. Comment on variability of the data set.

Q4: A consumer research organization has studies the services under warranty provided by 50 new-car dealers in a certain city and its finding are summarized in the following table.

	Good service under warranty	Poor service under warranty
In business 10 years or more	16	4
In business less than 10 years	10	20

a. (1 *pt.*) Defined a sample space for this experiment.

b. (*1 pt.*) If a person randomly selects one of these now-car dealers, what is the probability that he gets one provides good service under warranty?

c. (*2 pts.*) If a person randomly selects one of these now-car dealers who have been in business for 10 years or more, what is the probability that he gets one who provides good service under warranty?

d. (*2 pts.*) What is the probability that one dealers who have been in business less than 10 years will provide poor service under warranty?

Q5: Of 120 students, 60 are studying French, 50 are studying Spanish, and 20 are studying French and Spanish. If a student is chosen at random, Find the probability that the student?

a. (*2 pts.*) is studying French or Spanish.

b. (*2 pts.*) is studying neither French nor Spanish.

c. (*3 pts.*) is studying exactly one subject.

d. (*3 pts.*) If a student studying Spanish, what is the probability that the student studying French?

Q6: The quality control department in a manufacturing company employs two actuaries, Ahmad and Ali. Ahmad inspects 70% of the products. The probability of Ahmad committing an error is 0.02, while that of Ali is 0.04.

a. (*3 pts.*) What is the probability that an item passes by mistake?

b. (*3 pts.*) If an item passed the inspection by mistake. Which actuaries would you guess did the work? Explain your answer using a proper probabilistic argument, showing all your work.

Q7: (*3 pts.*) If the probability are, respectively, 0.09, 0.15, 0.21, and 0.23, that a person purchasing a new automobile will choose the color green, white, red, or blue, what is the probability that a buyer will purchase a new automobile that comes in one of those colors?

Q8: (*3 pts.*) Three students A,B and C are in a swimming race. A and B have the same probability of winning and each is twice as likely to win as C. Find the probability that B or C wins**.**

Q9: (*5 pts.*) Assume that A, B and C events with $P(A) = 0.3,\ \ P(B) = 0.4,\ \ P(C) = 0.5$, A and B are disjoint, A and C are independent and $P(A \mid B) = 0.1$. Find $P(A \cup B \cup C)$

Formula Sheet

Descriptive Statistics

- Sample Mean $\bar{X} = \frac{\sum X_k}{n}$ or $\frac{\sum x_i^* f_i}{\sum f_i}$
- Sample Variance $s^2 = \frac{\sum (X_i - \bar{X})^2}{n-1} = \frac{\sum x^2 - \frac{1}{n}\left(\sum x\right)^2}{n-1}$ or $\frac{\sum x_i^{*2} f_i - \left(\sum x_i^* f_i\right)^2 / n}{n-1}$
- Percentiles: $R_\alpha = \frac{\alpha}{100}(n+1) = i.d$ and $P_\alpha = X_{(i)} + d\left(X_{(i+1)} - X_{(i)}\right)$

Probability

- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- $P(A|B) = \frac{P(A \cap B)}{P(B)}$, $P(B) > 0$

$$P(B_j|A) = \frac{P(B_j \cap A)}{P(A)} = \frac{P(A|B_j)P(B_j)}{\sum_{i=1}^{k} P(A|B_i)P(B_i)} \quad \text{for } j = 1,2,\ldots,k$$