Prince Sultan University

Deanship of Educational Services
Department of Mathematics
and General Sciences

COURSE DETAILS:

Statistics and Probability Theory	STAT 101	MAJOR I
Semester:	Spring Semester --Term 172	
Date:	March 6, 2018	
Time Allowed:	**90 minutes**	

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	
Instructor's Name:	Dr. Mohammed Kaouache Dr. Eric Benson

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 1	Page 2	Page 3	Page 4	Page 5	Page 6	Total
Questions	**10**	**15**	**15**	**15**	**10**	**15**	**80**
Marks							

10 points

1. X and Y are two events such that $\Pr(X \mid Y) = 0.4$, $\Pr(Y) = 0.25$ and $\Pr(X) = 0.2$. Find

   a. $\Pr(Y \mid X)$ **(2 points)**

   b. $\Pr(X \cap Y)$ **(2 points)**

   c. $\Pr(Y \cup X)$ **(3 points)**

   d. Are events X and Y independent? Explain. **(3 points)**

15 points

2. Applicants for an assembly job are required to take a test of manual dexterity. The times , in seconds, taken to complete the task by 19 applicants were as follows:

63 229 165 77 49 74 67 59 66 102 81 72 59 74 61 82 48 70 86

a. Find the 80% of the data. **(3 points)**

b. Find the three quartiles. **(4 points)**

c. Identify any outliers in the data. **(3 points)**

d. Illustrate the data by a box and whisker plot. **(5 points)**

15 points

3. Dividend yield is the annual dividend per share a company pays divided by the current market price per share expressed as a percentage. A sample of 10 large companies provided the following dividend yield data (The Wall Street Journal, January 16, 2004).

Company	Yield %	Company	Yield %
Altria Group	5.0	General Motors	3.7
American Express	0.8	JPMorgan Chase	3.5
Caterpillar	1.8	McDonald's	1.6
Eastman Kodak	1.9	United Technology	1.5
ExxonMobil	2.5	Wal-Mart Stores	0.7

a. What are the mean and median dividend yields? (**4 points)**

b. What are the variance and standard deviation? **(4 points)**

c. What is the z-score for McDonald's? Interpret this z-score. **(4 points)**

d. What is the z-score for General Motors? Interpret this z-score. (**3 points)**

15 points

4. Suppose $\Pr(\bar{A}) = 0.30$, $\Pr(\bar{B} \mid A) = 0.40$ and $\Pr(\bar{B} \mid \bar{A}) = 0.50$. Use these values to fill up the rest of the contingency table and answer the questions below.

	A	$\bar{A}$	
B			
$\bar{B}$	0.28		

a. Find $\Pr(A \cup \bar{B})$ **(5 points)**

b. Find $\Pr(\bar{A} \mid \bar{B})$ **(4 points)**

c. Are A and B independent events? Explain. **(3 points)**

d. Are A and $\bar{B}$ mutually exclusive events? Explain. **(3 points)**

10 points

5. The results of a national survey showed that on average, adults sleep 6.9 hours per night. Suppose that the standard deviation is 1.2 hours.

   a. Use Chebyshev's theorem to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours. **(3points)**

   b. Use Chebyshev's theorem to calculate the percentage of individuals who sleep between 3.9 and 9.9 hours. **(3 points)**

   c. Assume that the number of hours of sleep follows a bell-shaped distribution. Use the empirical rule to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours per day. How does this result compare to the value that you obtained using Chebyshev's theorem in part (a)? **(4 points)**

15 Points

6. In a survey of MBA students, the following data were obtained on "students' first reason for application to the school in which they matriculated."

		Reason for Application			
		School Quality	School Cost or Convenience	Other	Totals
Enrollment Status	Full Time	421	393	76	890
	Part Time	400	593	46	1039
	Totals	821	986	122	1929

a. Find the probabilities of school quality, school cost or convenience, and other. **(2 points)**

b. If a student goes full time, what is the probability that school quality is the first reason for choosing a school? **(4 points)**

c. If a student goes part time, what is the probability that school quality is the first reason for choosing a school? **(4 points)**

d. Let A denote the event that a student is full time and let B denote the event that the student lists school quality as the first reason for applying. Are events A and B independent? Justify your answer. **(5 points)**