Prince Sultan University
STAT 101
Final Examination
Fall Semester 2009-10, Term 091
Saturday, February 06, 2010
Dr. Quazi Abdus Samad

Time Allowed**: 150 minutes**

Name: _____ _____ _____
(First) (Middle) (Last)

ID Number: _____

Section No.: _____

Important Instructions*:*

You may use CASIO scientific calculator that does not have programming or graphing capabilities.
You may **NOT borrow** a calculator from anyone.
There should be **NO talking** during the examination.
Your exam will be taken **immediately** without any warning if your mobile is seen or heard
You must show all your work beside the problem. 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.
This examination has **12** problems with several parts in each case. Make sure that your paper has all these problems.

Problems	Max points	Student's Points
1,2	12	
3,4	15	
5,6,7	18	
8	08	
9,10	14	
11,12	13	
Total	**80**	

Question 1 [6 points] A new surgical procedure is said to be successful 90% of the time. Suppose the operation is performed 5 times and the results are assumed to be independent of one another. Define *x* to be the number of successful operations and suppose that it is a binomial random variable.

a. Find the probability that exactly four are successful.

b. Find the probability that less than two are successful.

d. Find the mean and standard deviation of the binomial random variable, x.

Question 2 [6 points] Use cumulative binomial probability distributions to find the following probabilities:

a. $P(x < 11)$ for $n = 15$, $p = .7$

b. $P(x > 5)$ for $n = 20$, $p = .6$

c. $P(4 < x < 8)$ for $n = 15$, $p = .2$

Question 3 [8 points**]** Workers arrive at a health center, according to a Poisson distribution, at a rate of 4 every 15 minutes. Let *x* represent number of workers arriving in a 15 minute time period. use the cumulative Poisson probabilities to find the following probabilities:

a. What is the probability that no more than 3 workers arrive in a 15 minute time period?

b. What is the probability that exactly 5 workers arrive in a 15 minute time period?

c. What is the probability that more than 5 workers arrive in a 15-minute time period?

d. What is the probability that between 4 and 8 workers, inclusively, arrive in a 15-minute time period?

Question 4 [7 points] Consider the following set of measurements: 6, 3, 5, 14, 2, 6, 0, 8.

a. Find the 25^{th}, 50^{th}, and 75^{th} percentiles.

b. What is the value of the interquartile range (IQR)?

Question 5 [6 points] A distribution of measurements is relatively mound-shaped with mean 45 and variance 64.

a. What proportion of the measurements will fall between 37 and 53?

b. What proportion of the measurements will fall between 29 and 61?

c. If a measurement is chosen at random from this distribution, what is the probability that it will be greater than 53?

Question 6 [6 points] The following data represent the scores for a sample of 10 students on a 20-point chemistry quiz: **16, 14, 2, 8, 12, 12, 9, 10, 15, 13**. Calculate the *z* - score for the smallest and largest observations. Is either of these observations unusually large or unusually small? **Explain your answer.**

Question 7 [6 points] Let z be a standard normal random variable.

a. Find a z_0 value such that $P(z > z_0) = 0.46$

b. Find a z_0 such that $P(z < z_0) = 0.0281$

c. Find the 90^{th} percentile for the standard normal random variable z.

Question 8 [8 points] One hundred shoppers at a local shopping mall were categorized by age and gender as shown in the probability distribution below. One shopper is selected at random from that group of 100 shoppers.

Age Group

Gender	Under 25 years (A_1)	25 - 40 years (A_2)	Over 40 years (A_3)
Male (M)	.15	.13	.12
Female (F)	.24	.18	.18

a. What is the probability the randomly selected shopper is male and under 25 years of age? **Write the formula in all cases.**

b. If the randomly selected shopper is male, what is the probability he is under 25 years of age?

c. What is the probability the randomly selected shopper is female or over 40 years of age?

d. If the randomly selected shopper is female, what is the probability that she is 25 to 40 years old?

Question 9 [8 points] A soft drink distributor was interested in examining the relationship between the number of ads (*x*) for his product during prime time on a local television station and the number of sales per week (*y*) in 1000's of cases. He compiled the figures for 20 weeks and computed the following summary information: $n = 20$, $\sum x_i = 92$, $\sum y_i = 177$, $\sum x_i y_i = 884$, $s_x = 1.3917$, and $s_y = 2.9069$.

a. Find the correlation coefficient for the number of ads during prime time and weekly sales.

b. Find the best-fitting line relating the number of ads during prime time and weekly sales.

c. If the soft drink distributor ran 21 TV ads per week for his product, what would you predict his sales to be?

Question 10 [6 points] Let x be a binomial random variable with n = 20 and p = .6.

a. Is the normal approximation to the binomial probabilities appropriate? **Explain why or why not.**

b. Find P(x > 8) using the normal approximation.

c. Find P(12 <x <21)using the normal approximation

Question 11 [6 points] In a particular large school system, the average IQ of elementary school children is 102 and the standard deviation is 15. A sample of 80 children is randomly selected from elementary schools within the system.

a. Find the mean and standard deviation of the sampling distribution of $\bar{x}$.

b. What is the probability that the average IQ of this sample is above 100?