Prince Sultan University
STAT 101
Final Examination
Fall Semester 2008, Term 081
Saturday, February 7, 2009
Dr. Quazi Abdus Samad

Time Allowed**: 120 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 **10** problems with several parts in each case. Make sure that your paper has all these problems.

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

Question 1. (8 points) When the price of gasoline gets high, consumers become very concerned about the gas mileage obtained by their cars. One consumer was interested in the relationship between car engine size (in cylinder) and gas mileage (measured in miles per gallon). The consumer took a random sample of 7 cars and recorded the following information: $n = 7$, $\Sigma x_i = 24.7$, $\Sigma y_i = 177$, $\Sigma x_i y_i = 600.7$, $s_x = 1.2406$, $s_y = 4.3861$.

a. Would you expect the correlation between engine size and gas mileage to be positive or negative? **Justify your answer**.

b. Find the correlation between engine size and gas mileage **using the computing formula**.

c. Find the best fitting line relating car engine size (x) and gas mileage (y) **using the computing formula**.

d. What would you predict the gas mileage to be for a car with 6-cylinder engine size?

e. Would the best fitting line be upward sloping or downward sloping? **Explain why?**

Question 2 (12 points) The random variable *x* is defined as the number of mistakes made by a steno typist on a randomly chosen page of a mathematics dissertation. The probability distribution is as follows:

| **X** | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| **P(x)** | 0.2 | 0.2 | 0.3 | 0.2 | 0.1 |

a. Find the mean value of the random variable x **by using the formula**

b. Find the standard deviation of the random variable x **by using the formula**

c. Find the probability that at most two mistakes will occur

d. Find the probability that more than three mistakes will occur

e. Find $P(0 \leq x < 4)$

f. In what fraction of pages in the dissertation would the number of mistakes made be within two standard deviations of the mean?

Question 3. (6 points) Suppose that in a particular city, airport A handles 50% of all airline traffic and airports B and C handle 30% and 20% respectively. That is, P(A) = 0.50, P(B) = 0.30 and P(C) = 0.20. The detection rates for weapons at the three airports are 0.7, 0.9 and 0.5 respectively. That means, P(D/A) = 0.7, P(D/B) = 0.9 and P(D/C) = 0.5. If a passenger at one of the airports is found to be carrying a weapon through the boarding gate,

a. What is the probability that the passenger is using the airport A?

b. What is the probability that the passenger is using the airport C?

Question 4 (12 points) The lifetime of salmon flies is normally distributed with a mean of 60 days and a standard deviation of 20 days.

a. What percentage of salmon flies lives less than 12 days?

b. What percentage of salmon flies lives more than 15 days?

c. What percentage of salmon flies lives between 80 and 101 days?

d. Find the value $x_0$ such that 6.3% of salmon flies live less than $x_0$ days.

Question 5. (6 points) Find the following probabilities for the standard normal random variable z:

a. $P(-1.75<z<-0.68)$

b. $P(z>1.69)$

c. $P(z<-3.32)$

Question 6. (9 points)

a. Find the value of $z_0$ such that $P(-z_0<z<z_0) = 0.78$

b. Find $z_0$ such that $P(z<z_0) = 0.92$

c. Find $z_0$ such that $P(z>z_0) = 0.70$

Question 7 (6 points) A recent survey of university faculty reported 55% were considering going into another profession.

a. Based on this information, what is the expected number of faculty who would be considering going into another profession if we randomly sampled 200 faculty members?

b. What is the approximate probability that 70 or more faculty from a random sample of 200 would be considering going into another profession?

Question 8 (8 points) Calculate the Poisson approximate values for P(0) and P(1) for a binomial probability distribution with n = 25 and p = 0.05.

a. P(0) =

b. P(1) =

c. Compare the above answers with the exact values obtained from **Cumulative Binomial Probabilities (Table 1 in Appendix I)**

Question 9 (8 points) The distribution of scores for the third exam in a statistics course has a mean of 74 and a standard deviation of 15. A random sample of 36 exam papers is selected.

a. What is the probability that the sample mean is higher than 77?

b. What is the probability that the sample mean will lie between 70 and 80?

Question 10 (5 points) Suppose public opinion is split 65% against and 35% for increasing taxes to help balance the federal budget. 500 people from the population are selected randomly and interviewed.

a. Can we say that the sampling distribution of the sample proportion is approximately normally distributed? **Justify your answer**.

b. What is the probability the proportion favoring a tax increase is more than 30%?

*Best of luck!*