Howard University
Department of Mathematics

Comprehensive Final (Fall 2006)   *Tuesday, December 12th, 2006.*

Introduction to Statistics

Name:_____

(*Please **PRINT** your name*)

Signature:_____

I.D. # _____

Show all work otherwise NO POINTS WILL BE AWARDED. All work must be neat and legible OTHERWISE POINTS WILL BE DEDUCTED. Partial credits will be given for work which demonstrates a working knowledge of the concepts.

Answer all questions. Each question is worth 25 points.
Begin each question on a new page.

Do not write in the columns below.

Question 1			**Question 7**	
Question 2			**Question 8**	
Question 3			**Question 9**	
Question 4				
Question 5			**Comprehensive Final Exam Total**	
Question 6			**Comprehensive Final Exam Grade**	
			Course grade	

Q1)

(a) A list of the 50 most powerful women in America was published. The average age of these women was 49.74 years old with a standard deviation of 6.12 years. Using Chebyshev's Theorem, what is the range of ages in which at least 84% of the data lie?

(b) Of the members of a bowling league, 10% are widowed. If 200 bowling league members are selected at random, find the probability that 16 or more will be widowed. [*Use the normal approximation to the binomial distribution by first showing the test that this approximation can be used*]

Q2) The distribution on a Mathematics Test was obtained and the results are shown on the table below. Complete the table and find the mean, median, modal class, variance, and standard deviation for the data:

Class Limits	Frequency f	Class Boundaries	Midpoints X_m	$f.X_m$	Cummulative Frequency	$f.X_m^2$
46 - 56	4					
57 - 67	7					
68 - 78	1 5					
79 - 89	8					
90 - 100	5					

Q3)

(a) The table below shows the average grades and degrees for graduates.

DEGREE	GRADES			TOTAL
	C	B	A	
B.S	10	20	14	
B.A	15	10	12	
TOTAL				

Complete the table. If a graduate is selected at random, find the probability that:

    (i)   The graduate has a B.A. degree given that he or she has a B average.

    (ii)   Given that the graduate has a B.S. degree, he or she has an A average.

(b) Find the 95% confidence interval for the variance and standard deviation of the nicotine content of cigarettes manufactured if a sample of 24 cigarettes has a standard deviation of 1.5 milligrams. (*Use the Chi-Square Distribution*).

Q4) A sales person from an auto dealership knows from past experience that, on the average, she will make a sale to 24% of her customers. What is the probability that, in 10 random selected presentations, she makes a sale to:

    (i)   Exactly 5 customers.

    (ii)   At most one customer.

    (iii)   At least one customer.

(*Hint: Use the Binomial Distribution*)

Q5)

(a) A sports researcher claims that female distance runners tend to be taller than women in general who, have an average height of 64 inches. A sample of 45 female distance runners has an average height of 65.6 inches with a standard deviation of 3.5 inches. State the null and alternative hypothesis and test the claim at $\alpha = 0.05$. State your conclusion. (Assume that the variable is normally distributed)

(b) A special cable has a breaking strength of 800 pounds and the standard deviation of the population is 12 pounds. A sample of 20 cables was tested and it was found that the average breaking strength is 793 pounds. State the null and alternative hypothesis. Find the P-value and determine if the null hypothesis should be rejected at $\alpha = 0.01$ (Assume that the variable is normally distributed)

Q6)

(a) The average weight of young adult males is 160 pounds. The standard deviation is 10 pounds. If a sample of 32 people is selected from the population of 300, find the probability that the mean for the sample will be more than 156 pounds. *[Determine whether the correction factor is to be used]*.

(b) In an automobile service shop, the supervisor timed 8 employees and found that the average time it took them to change a tire was 24 minutes. The standard deviation of the sample was 3 minutes. Using the t-distribution, find the 99% confidence interval of the true mean.

Q7) Research at Florida State University was carried out to determine the effects of alcohol on the reactions of people to threat of electric shock. The "startle" response time for each subject was measured in milliseconds (ms) from which the mean was 37.9 ms and the standard deviation was 12.4 ms. Assuming the variable (blood alcohol level) is normally distributed:

    i.   Find the probability that the response time is between 40 ms and 50 ms.

    ii.   Find the probability that the response time is less than 35ms.

    iii.   Find the interval centered about the mean so that the probability that the response time falls in the interval is 0.94.

    iv.   What is the cut off response time for the highest 10% of the subjects?

Q8)

(a) In a survey of 32 adults, it was found that the mean age of a person's primary vehicle is 5.6 years. Assuming the standard deviation of the population is 0.8 year, find the 92% confidence interval of the population mean.

(b) A restaurant owner wishes to find the 90% confidence interval of the true mean cost of red wine. How large should the sample be if the owner wishes to be accurate within $0.06? A previous study showed that the standard deviation of the price was $0.10.

Q9)

(a) In a poll of 1000 likely voters, 550 say that the United States spends too little on fighting hunger at home. Find a 95% confidence interval for the true proportion of voters who feel this way. (*Hint: Use the confidence intervals for proportions*).

(b) A recent study indicates that 18% of the 100 women over age 62 were widows.

    (i)How large a sample must be taken to be 90% confident that the estimate is within 0.05 of the true proportion of women over 62 who are widows?

    (ii) If no estimate of the sample proportion is available, how large should the sample be?

(*Hint: Use Sample Size for Proportions*)