

Howard University
Department of Mathematics

Comprehensive Final (Spring 2007) Wednesday, May 2nd, 2007 (4pm-6pm).

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. (Exam will be graded out of 200 points. Your score will then be divided by 2 then 30% of this figure will go towards your final grade).

Do not write in the columns below.

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

Q1)

(a) Using the data set: 95, 52, 55, 62, 49, 71, 69, 85, 60, 54, 92, 48, 76, and 88:

- (i) find the value that corresponds to the 76th percentile.
- (ii) find the percentile rank for the value 76.

(b) The eruptions from a geyser in Europe was timed and the results obtained are as follows. A sample of 50 eruptions was observed and the mean duration of the eruptions is 3.50 minutes with a standard deviation of 1.50 minutes. Using Chebychev's Theorem, at least how many eruptions lasted between 1 minute and 6 minutes? [Hint: First find k then use formula to find percentage of eruptions]

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	$f \cdot X_m$	Cummulative Frequency	$f \cdot X_m^2$
46 - 56	6					
57 - 67	10					
68 - 78	18					
79 - 89	14					
90 - 100	7					

Q3)

(a) A company survey was undertaken to find out the marital status and gender of the employees.

The results are shown on the table. One subject was selected at random. Complete the table and find the probability that the subject is:

- (i) married given that the individual is a man.
- (ii) a woman given that the individual is divorced.
- (iii) a man given that the individual has never married.

Marital Status	Men	Women	Total
Currently Married	15	12	
Divorced	4	3	
Never Married	8	10	
Total			

(b) Find the 95% confidence interval for the variance and standard deviation of the heights of security officers if a sample of 28 security officers has a standard deviation of 1.75 inches. (*Use the Chi-Square Distribution*).

Q4) A national survey shows that 75% of all US households have cable television. What is the probability that, in a random selection of 12 households:

- (i) Exactly 5 households have cable television.
- (ii) At most one household have cable television.
- (iii) At least one household has cable television.

(*Hint: Use the Binomial Distribution*)

Q5)

(a) A recent medical magazine carried out a survey on the US population and found that 6% of the population has blood type O-negative. In a random sample of 500 people, find the probability that fewer than 40 have blood type O-negative. [*Use the normal approximation to the binomial distribution by first showing the test that this approximation can be used*]

(b) The mean age at death for athletes in a certain South American country is 72 years with a standard deviation of 5.4 years. If a sample of 50 athletes is selected from the population of 500, find the probability that the mean age at death for the sample will be more than 80 years. [*Show details with conclusion whether the correction factor is to be used*].

Q6)

(a) A publisher wants to publish home improvement books. After a survey of the market, the publisher finds that the average price for this type of book is \$50. with a standard deviation of \$1.10. The publisher wants to target the middle 40% of the market. What should be minimum and maximum prices for the book assuming the variable is normally distributed?

(b) A sample of 15 pieces of a new metal alloy was tested for their tensile strength. It was found that the mean tensile strength for the sample was 39.4 with a standard deviation of 2.8. Using the t-distribution, find the 90% confidence interval of the true mean tensile strength.

Q7)

(a) A sample of 75 restaurant workers showed that the mean weekly income was \$320. with a standard deviation of \$20. Compute the 92% confidence interval for the true mean weekly income.

[Hint: use the formula for $z_{\alpha/2}$]

(b) How large a sample is required to estimate the mean highway speed of automobiles to within 2 miles per hours with 90% confidence? The population standard deviation speed of automobiles on the highway is known to be 8 miles per hour. *[Hint: use the sample size formula for $z_{\alpha/2}$]*

Q8)

(a) In a poll conducted on a sample of 1600 adults, 1200 were in favor of tighter controls on TV content. Obtain a 95% confidence for the proportion of adults in favor of tighter control on TV content.

[Hint: use confidence interval for proportions].

(b) To estimate the percentage of the population living in poverty, what sample size should be used to be within 2 percent with a 90% confidence if:

(i) a prior census shows that 12% of population is living in poverty.

(ii) no prior estimates are known.

[Hint: use the sample size formula for proportions]