Howard University
Department of Mathematics

Introduction to Statistics (009 – 01/02/03)

Spring 2003

Comprehensive Final Exam

Wednesday – April 30th, 2003.
4pm – 6pm

Show all work.

All work must be neat and legible OTHERWISE POINTS WILL BE DEDUCTED.

Partial credit will be given for work which demonstrates a working knowledge of the concepts.

Answer all questions.

Each question is worth 12 points.

Q1) The years of service for a company with 80 employees were compiled. The results are shown below in the form of a table. Complete this table and construct a histogram, frequency polygon, and ogive for the data.

Class limits	Frequency (f)	Class boundaries	Midpoints X_M	Cumulative frequency (cf)
1 - 5	10			
6 - 10	20			
11 - 15	26			
16 - 20	12			
21 - 25	8			
26 - 30	4			

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

Class limits	f	Class boundaries	Midpoints X_M	$f \cdot X_M$	$f \cdot X_M^2$	Cumulative frequency
46 - 56	5					
57 - 67	8					
68 - 78	15					
79 - 89	7					
90 - 100	4					
101 - 111	2					

Q3) (a) In a Calculus class there are 18 freshmen and 16 sophomores. 7 of the sophomores are females, and 9 of the freshmen are males. If a student is selected at random, what is the probability of selecting:

(i) a freshman or a female.

(ii) a sophomore given that he is a male.

(iii) a male given that he is a sophomore

(Hint: create a chart with columns representing gender, freshman, and sophomore)

(b) In a class of 11 students, 5 are females and 6 are males. If 2 students are selected, what is the probability that at least one is male?

Q4) (a) The probability that John will live on campus and buy a new car is 0.31. If the probability that he will live on campus is 0.74, find the probability that he will buy a new car given that he lives on campus.

(b) A fan has 8 batteries, two of which are defective. If two are selected at random without replacement, find
(i) the probability that both are defective
(ii) the probability that the first is good and the second is defective.

Q.5) A survey found that people keep their television sets for an average of 4.8 years. The standard deviation is 0.82 year. A person decides to buy a new television set to replace the old one. Assuming the variable is normally distributed, find the probability that the person has owned the old set for:
   (a) Less than 4.2 years.
   (b) Between 4 and 5 years.
   (c) More than 4.5 years.

Q.6) 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 $23 with a standard deviation of $0.85. The publisher wants to target the middle 30% of the market. What should the minimum and maximum prices for the book be assuming the variable is normally distributed?

Q.7) A new-car salesperson knows from past experience that, on the average, she will make a sale to about 22% of her customers. What is the probability that, in 8 randomly selected presentations, she makes a sale to:
   (a) Exactly 3 customers.
   (b) At most one customer.
   (c) At least one customer.
(Hint: Use the Binomial Distribution)

Q8) In an study of 100 toasters, a manufacturer found that the average lifetime was 18 months. The standard deviation was 5 months. If 22 toasters were selected, find the probability that the mean lifetime of the sample will be more than 16 months. Assume the variable is normally distributed.
(Note: show your check to determine if the correction factor is to be used).

Q9) In a corporation, 30% of the people elect to enroll in the investment program offered by the company. Find the probability that of the 800 randomly selected people, at least 260 have enrolled in the investment program.
(Hint: Show the test that the Normal Approximation to the Binomial Distribution can be used.)

Table E   The Standard Normal Distribution

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.0288	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

Source: Frederick Mosteller and Robert E. K. Rourke. *Sturdy Statistics*, Table A–1 (Reading. Mass.: Addison-Wesley. 1973).
Reprinted with permission of the copyright owners.
Note: Use 0.4999 for z values above 3.09.

Area given in table