

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER 2006

TITLE OF PAPER: QUANTITATIVE METHODS IN DEMOGRAPHY

COURSE CODE : DEM 206

TIME ALLOWED : TWO (2) HOURS

INSTRUCTIONS : ANSWER ANY THREE (3) QUESTIONS.

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GRANTED BY THE INVIGILATOR**

QUESTION 1 (8+6+6 marks)

- a. The probabilities that the serviceability of a new X-ray machine will be rated very difficult, difficult, average, easy, or very easy are, respectively, 0.12, 0.17, 0.34, 0.29, and 0.08. Find the probabilities that the serviceability of the machine will be rated:
- difficult or very difficult;
 - neither very difficult nor very easy;
 - average or worse;
 - average or better.
- b. For married couples living in a certain suburb, the probability that the husband will commit adultery is 0.21, the probability that his wife do the same is 0.28, and the probability that both will commit adultery is 0.15. What is the probability that at least one of them will commit adultery? What is the probability that none will commit adultery?
- c. If three persons, selected at random, are stopped on a street, what are the probabilities that:
- all were born on a Friday;
 - two were born on a Friday and the other on a Tuesday; and
 - none were born on a Monday?

QUESTION 2 (6+6+8 marks)

- a. Records show that the probability is 0.0004 that a car will break down while driving through a certain tunnel. Use the Poisson approximation to the binomial distribution to determine the probability that among 2,000 cars driving through the tunnel at most two will break down.
- b. If 23 percent of all patients with high blood pressure have side effects from a certain kind of medicine, use the normal approximation to find the probability that among 120 patients with high blood pressure treated with this medicine more than 32 will have bad side effects.
- c. An IQ scale has approximately a normal distribution with a mean of 100 and a standard deviation of 16.
- What proportion of people have an IQ of at most 120?
 - What proportion of people have an IQ of between 84 and 96?

QUESTION 3 (7+6+7 marks)

- a. The manufacturer of a patent medicine claimed that it was 90% effective in relieving an allergy for a period of 8 hours. In a sample of 200 people who had the allergy, the medicine provided relief for 160 people. Determine

whether the manufacturer's claim is legitimate using a level of significance of 0.01.

- b. A coin which is tossed 35 times comes up heads 20 times. Can we conclude at significance level 0.01 that the coin is not fair?
- c. A child welfare officer claims that the mean sleeping time for babies is 14 hours a day. A random sample of 64 babies shows that their mean sleeping time is 13 hours and 20 minutes with a standard deviation of 3 hours. Test at 5 % level of significance if the officer's claim is true.

QUESTION 4 (8+8+4 marks)

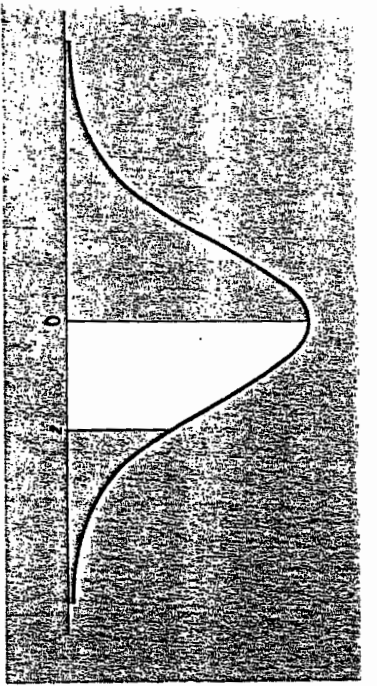
A sociologist was studying the relationship between work experience (as expressed by the number of years worked) and number of errors done at work by an employee. A study of nine employees gave the following results:

No. of years worked	1	2	2	4	5	7	7	8	9
No. of errors done	5	3	4	5	4	2	1	2	1

- a. Use the data to calculate the correlation coefficient and coefficient of determination between the two variables and interpret them.
- b. Compute a least squares regression line of the number of errors committed on the number of years worked.
- c. According to the regression line computed, how many errors would a person of six years experience be expected to make?

QUESTION 5 (12+8 marks)

- a. Four factors or forces influence a time series. Discuss each of these four components.
- b. Describe two methods of estimating a trend in a time series and their shortcomings.



entries in Table I are the probabilities that a random variable having a standard normal distribution takes on a value between 0 and z; they are given by the area of the white region under the curve in the figure shown above.

TABLE I Normal-Curve Areas

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	.2088	.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	.4978	.4979	.4979	.4980	.4981	.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

Also, for $z = 4.0, 5.0,$ and $6.0,$ the areas are $0.49997, 0.499997,$ and $0.499999999.$