UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION PAPER 2006

TITLE OF PAPER: **QUANTITATIVE METHODS IN DEMOGRAPHY**

COURSE CODE : **DEM 206**

TIME ALLOWED : **TWO (2) HOURS**

INSTRUCTIONS : **THIS PAPER HAS FIVE QUESTIONS. ANSWER ANY THREE (3) QUESTIONS.**

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QUESTION 1 **(8+6+6 marks)**

a. The probability that a man will be alive in 25 years is 3/5, and the probability that his wife will be alive in 25 years is 2/3. Find the probability that in 25 years:
   i. both will be alive;
   ii. only the man will be alive;
   iii. only the wife will be alive; and
   iv. at least one will be alive.

b. Out of 500 families with 4 children each, what percentage would be expected to have:
   i. 2 boys and 2 girls;
   ii. at least one boy; and
   iii. at most 2 girls?
   Assume equal probabilities for boys and girls.

c. A recent study of robberies for a certain geographic region showed an average of one robbery per 20,000 people. In a city of 80,000 people, find the probability of the following:
   i. At least one robbery?
   ii. At most two robberies?

QUESTION 2 **(5+5+5+5 marks)**

Random samples of size 3 are drawn from the finite population which consists of the numbers 5, 6, 7, 8, 9, and 10.

a. Compute the population mean and standard deviation.

b. List all the possible random samples of size 3 that can be drawn from this finite population and calculate their means.

c. Construct the sampling distribution of the mean for random samples of size 3 from this given population.

d. Calculate the mean and standard error of the sampling distribution.

QUESTION 3 (14+6 marks)

a. A statistician claims that the average age of people who purchase lottery tickets is 70. A sample of 30 is selected, and their ages are recorded. At $\alpha = 0.05$, is there enough evidence to reject the statistician's claim?

49	80	24	61	79	68
63	72	46	65	76	91
90	56	70	71	71	67
52	82	74	39	49	69
22	56	70	74	62	45

b. Construct an interval estimate of the average age of people who purchase lottery tickets. Use a confidence level of 95 %.

QUESTION 4 (4+4+4+4+4 marks)

Explain the differences between the following in full:

i. Correlation coefficient vs coefficient of determination;

ii. sampling error vs. non sampling error;

iii. point estimates vs. interval estimates;

iv. parameter vs statistic;

v. mutually exclusive events and collectively exhaustive events.

QUESTION 5 (8+4+8 marks)

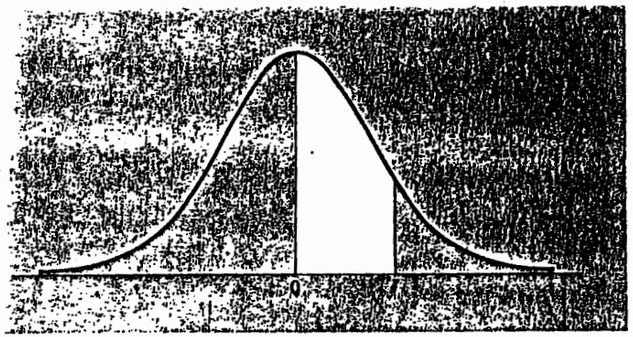
a. A study is done to see whether there is a relationship between a mother's age and the number of children she has. The data are shown below.

Number of children	2	1	3	1	2	4	3	5
Mother's age	18	22	29	20	27	32	33	36

i. Predict the number of children of a mother whose age is 34.

ii. How important is age in explaining the differences in the number of children the women bear?

b. A study on crime suggested that at least 40% of all arsonists were under 21 years of age. Checking local crime statistics, a researcher found that 30 out of 80 arson suspects were under 21 years. At $\alpha = 0.01$, should the crime statistics be rejected?



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

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	.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

Also, for $z = 4.0$, 5.0, and 6.0, the areas are 0.49997, 0.4999997, and 0.499999999.