

UNIVERSITY OF SWAZILAND
FINAL EXAMINATION PAPER 2007

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 (3+3+3+3+3+3+3+2 marks)

Here is a grouped frequency distribution of ideal family sizes (the number of children desired) reported by respondents in a demographic survey:

Ideal Number	Frequency
0	16
1	26
2	752
3	353
4	196
5	34
6	14
7	8

Compute the following measures: mean, median, mode, standard deviation, coefficient of skewness and coefficient of variation. Interpret your results.

QUESTION 2 (8+12 marks)

- a. Calculate the four-quarterly moving average trend of the following time series (of births in a large hospital).

Year	Quarters			
	1	2	3	4
1999	500	450	350	550
2000	350	350	200	350
2001	250	200	150	250

- b. Calculate the de-seasonalized values for each quarter. Comment on the seasonal influences per quarter.

QUESTION 3 (14+6 marks)

In a group of people on holiday it is established that there are :

- 10 males under the age of 21
- 8 females under the age of 21
- 6 males aged between 21 and 30
- 5 females aged between 21 and 30
- 7 males over the age of 30

- a. Calculate the probability that, if one person is selected at random from the group this person will be:

- i. A male under the age of 30;
 - ii. A female;
 - iii. A female over the age of 30;
 - iv. A male over the age of 21;
 - v. A person not older than 21;
 - vi. A male given that this person is over 30;
 - vii. A female or between 21 and 30 years
- b. Sixty percent of the population of a town read either magazine A or magazine B, and 10 percent read both. If 50% read magazine A, what is the probability that one person, selected at random, reads magazine B?

QUESTION 4 (8+6+6 marks)

- a. A form of malnutrition occurs in 10% of all persons. Determine the probabilities for the following malnutrition outcomes for 5 randomly chosen persons:
- i. All have it;
 - ii. At least two have it; and
 - iii. Between 2 and 4, inclusive, have it.
- b. Patients are known to arrive at a certain private clinic on a random basis, with an average of two customers per hour arriving at the facility.
- i. What is the probability that more than 3 patients will require attention during a particular hour?
 - ii. What is the probability that fewer than 4 patients will require attention during a 4 hour period in the morning on a particular day?
- c. An IQ scale has approximately a normal distribution with a mean of 100 and a standard deviation of 16.
- i. What proportion of people have an IQ of at most 115?
 - ii. What proportion of people have an IQ of between 94 and 96?

QUESTION 5 (7+6+7 marks)

- a. Unemployment at present in a certain area is said to be currently standing at not less than 15% of the economically active population. A random sample of 300 households in the area established that 34 of these households had at least

one unemployed job seeker. Is this claim about the percentage of unemployed job-seekers correct? Test at the 1% level of significance.

- b. For a random sample of 150 households in a large metropolitan area the number of households in which at least one adult is currently unemployed and seeking a full-time job is 12. Using a 95% confidence interval, estimate the proportion of households in the area in which at least one adult is unemployed.
- c. 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?

Table 4. Normal curve areas
Standard normal probability in right-hand tail
(for negative values of z areas are found by symmetry)



z	Second decimal place of z									
	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641
0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0722	.0708	.0694	.0681
1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
1.8	.0359	.0352	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
2.9	.0019	.0018	.0017	.0017	.0016	.0016	.0015	.0015	.0014	.0014
3.0	.00135									
3.5	.000233									
4.0	.0000317									
4.5	.00000340									
5.0	.000000287									

From R. E. Walpole, *Introduction to Statistics* (New York: Macmillan, 1968).

Table 6. ~~Percentages~~ Percentage points of the χ^2 -distribution

$\chi^2_{0.100}$	$\chi^2_{0.050}$	$\chi^2_{0.025}$	$\chi^2_{0.010}$	$\chi^2_{0.005}$	d.f.
2.70554	3.84146	5.02389	6.63490	7.87944	1
4.60517	5.99147	7.37776	9.21034	10.5966	2
6.25139	7.81473	9.34840	11.3449	12.8381	3
7.77944	9.48773	11.1433	13.2767	14.8602	4
9.23635	11.0705	12.8325	15.0863	16.7496	5
10.6446	12.5916	14.4494	16.8119	18.5476	6
12.0170	14.0671	16.0128	18.4753	20.2777	7
13.3616	15.5073	17.5346	20.0902	21.9550	8
14.6837	16.9190	19.0228	21.6660	23.5893	9
15.9871	18.3070	20.4831	23.2093	25.1882	10
17.2750	19.6751	21.9200	24.7250	26.7569	11
18.5494	21.0261	23.3367	26.2170	28.2995	12
19.8119	22.3621	24.7356	27.6883	29.8194	13
21.0642	23.6848	26.1190	29.1413	31.3193	14
22.3072	24.9958	27.4884	30.5779	32.8013	15
23.5418	26.2962	28.8454	31.9999	34.2672	16
24.7690	27.5871	30.1910	33.4087	35.7185	17
25.9894	28.8693	31.5264	34.8053	37.1564	18
27.2036	30.1435	32.8523	36.1908	38.5822	19
28.4120	31.4104	34.1696	37.5662	39.9968	20
29.6151	32.6705	35.4789	38.9321	41.4010	21
30.8133	33.9244	36.7807	40.2894	42.7956	22
32.0069	35.1725	38.0757	41.6384	44.1813	23
33.1963	36.4151	39.3641	42.9798	45.5585	24
34.3816	37.6525	40.6465	44.3141	46.9278	25
35.5631	38.8852	41.9232	45.6417	48.2899	26
36.7412	40.1133	43.1944	46.9630	49.6449	27
37.9159	41.3372	44.4607	48.2782	50.9933	28
39.0875	42.5569	45.7222	49.5879	52.3356	29
40.2560	43.7729	46.9792	50.8922	53.6720	30
51.8050	55.7585	59.3417	63.6907	66.7659	40
63.1671	67.5048	71.4202	76.1539	79.4900	50
74.3970	79.0819	83.2976	88.3794	91.9517	60
85.5271	90.5312	95.0231	100.425	104.215	70
96.5782	101.879	106.629	112.329	116.321	80
107.565	113.145	118.136	124.116	128.299	90
118.498	124.342	129.561	135.807	140.169	100

From "Tables of the Percentage Points of the χ^2 -Distribution," *Biometrika*, Vol. 32 (1941), pp. 188-189, by Catherine M. Thompson. Reproduced by permission of Professor R. S. Pearson.