UNIVERSITY OF SWAZILAND

FACULTY OF SOCIAL SCIENCE

DEPARTMENT OF ECONOMICS

MAIN EXAMINATION

MAY 2013

TITLE OF PAPER: STATISTICS FOR ECONOMISTS

COURSE CODE: ECON 209

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS:

1. ANSWER FOUR (4) QUESTIONS:

   QUESTION ONE(1) IS COMPULSORY AND YOU CAN THEN CHOOSE ANY THREE (3) QUESTIONS FROM THE REMAINING QUESTIONS PROVIDED.

2. ALL QUESTIONS CARRY 25 MARKS EACH
3. ALWAYS ROUND UP THE FINAL ANSWER TO TWO (2) DECIMAL PLACES.

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QUESTION 1 (compulsory)

a) Suppose that a pair of fair dice are to.be tossed, and let the random variable X denote the sum of numbers appearing on both dice.

   i) Show the sample space **(2)**
   ii) Obtain the probability distribution for X. **(3)**
   iii) Find the cumulative distribution function for the random variable X **(4)**

b) Find the probability of getting a total of 7 at least once in three tosses of a pair of fair dice. **(4)**

c) If the heights of 300 students are normally distributed with a mean 68.0 inches and standard deviation of 3.0 inches. How many students have heights:

   i) Greater than 72 inches. **(4)**
   ii) Between 65 and 71 inches. **(4)**

d) Differentiate between mutually exclusive events and Independent events. **(4)**

QUESTION 2

a) Of two similar groups of patients, A and B, consisting of 50 and 100 individuals, respectively, the first was given a new type of sleeping pill and the second was given a conventional type. For patients in group A the mean number of hours of sleep was 7.82 with a standard deviation of 0.24 hours. For patients in group B the mean number of hours of sleep was 6.75 with a standard deviation of 0.30 hours. Find

   i) 95% confidence limits for the difference in the mean number of hours of sleep induced by the two types of sleeping pills. **(3)**
   ii) 99% confidence limits for the difference in the mean number of hours of sleep induced by the two types of sleeping pills. **(3)**

b) A sample of 10 measurements of the diameter of a sphere gave a mean of 4.38 inches and a standard deviation of 0.06 inches. Find

   i) 99% confidence limits for the actual diameter. **(3)**
   ii) 90% confidence limits for the actual diameter. **(3)**

c) Explain what is meant by the term 99% confidence interval. **(3)**

d) A random sample of 50 small businesses was selected and the management was asked if they expected to take on more staff over the next year. 20 replied that they did expect to. Set up a 95% confidence interval for the proportion of small businesses expecting to take on more staff over the next year. **(4)**

e) In a random sample of 40 medium businesses, 7 expected to take on more staff over the next year. Test whether there is a significant difference between small and medium businesses in the proportion expecting to take on more over the next year. **(6)**

QUESTION 3

a) Write short explanatory notes on the following terms: **(3 marks each)**

i) Differentiate between the Type I and Type II errors

ii) Level of significance

iii) Region of acceptance

b) A printing firm which manufactures colored labels for the packing traders has found over past years that the defective fraction on its main production line has been 3%. A random sample of colored labels containing 500 items has just been checked and is found to have 25 defective labels. Is there any evidence of a significant increase in defectiveness? **(6)**

c) A random sample of 1,000 labels from a different firm has been found to contain 60 defective items. Is this sample significantly different in its level of defectiveness from the sample of 500 items with 25 defectives? **(6)**

d) What is the link between sampling error and sampling distribution? **(4)**

QUESTION 4

The table below shows data from 10 companies relating advertising costs and sales a particular product.

Company	Sales (1,000's)	Advertising costs (100's)
A	25	8
B	35	12
C	29	11
D	24	5
E	38	14
F	12	3
G	18	6
H	27	8
I	17	4
J	30	9

a) If the dependent variable is sales and the independent variable is advertising costs then construct a scatter diagram for this question. **(4)**

b) Find the least squares regression line of sales on advertising costs. **(8)**

c) Use the regression line in b) to forecast sales if advertising costs were E1,000. **(4)**

d) Compute the coefficient of determination and interpret it. **(5)**

e) Calculate the correlation coefficient and interpret the results **(4)**

QUESTION 5

a) The table below shows the ages and systolic blood pressures of 12 women.

Age (x)	56	42	72	36	63	47	55	49	38	42	68	60
Blood Pressure	147	125	160	118	149	128	150	145	115	140	152	155

i) Determine the least squares regression line of y on x. **(8)**

ii) Find the correlation coefficient between x and y. **(6)**

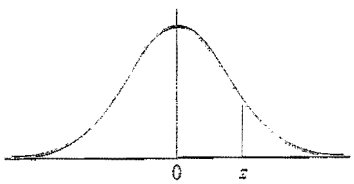
iii) Estimate the blood pressure of a woman whose age is 45 years. **(4)**

b) Outline the properties of the OLS estimator **(7)**

GOOD LUCK!!!GOOD LUCK!!

APPENDIX C

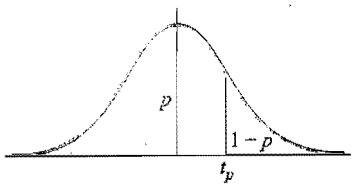
Areas under the Standard Normal Curve from 0 to z



z	0	1	2	3	4	5	6	7	8	9
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0754
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	.2258	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2996	.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
3.1	.4990	.4991	.4991	.4991	.4992	.4992	.4992	.4992	.4993	.4993
3.2	.4993	.4993	.4994	.4994	.4994	.4994	.4994	.4995	.4995	.4995
3.3	.4995	.4995	.4995	.4996	.4996	.4996	.4996	.4996	.4996	.4997
3.4	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4997	.4998
3.5	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998	.4998
3.6	.4998	.4998	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.7	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.8	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999	.4999
3.9	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000	.5000

APPENDIX D

Percentile Values t_p for Student's t Distribution with ν Degrees of Freedom



ν	$t_{.55}$	$t_{.60}$	$t_{.70}$	$t_{.75}$	$t_{.80}$	$t_{.90}$	$t_{.95}$	$t_{.975}$	$t_{.99}$	$t_{.995}$
1	.158	.325	.727	1.000	1.376	3.08	6.31	12.71	31.82	63.66
2	.142	.289	.617	.816	1.061	1.89	2.92	4.30	6.96	9.92
3	.137	.277	.584	.765	.978	1.64	2.35	3.18	4.54	5.84
4	.134	.271	.569	.741	.941	1.53	2.13	2.78	3.75	4.60
5	.132	.267	.559	.727	.920	1.48	2.02	2.57	3.36	4.03
6	.131	.265	.553	.718	.906	1.44	1.94	2.45	3.14	3.71
7	.130	.263	.549	.711	.896	1.42	1.90	2.36	3.00	3.50
8	.130	.262	.546	.706	.889	1.40	1.86	2.31	2.90	3.36
9	.129	.261	.543	.703	.883	1.38	1.83	2.26	2.82	3.25
10	.129	.260	.542	.700	.879	1.37	1.81	2.23	2.76	3.17
11	.129	.260	.540	.697	.876	1.36	1.80	2.20	2.72	3.11
12	.128	.259	.539	.695	.873	1.36	1.78	2.18	2.68	3.06
13	.128	.259	.538	.694	.870	1.35	1.77	2.16	2.65	3.01
14	.128	.258	.537	.692	.868	1.34	1.76	2.14	2.62	2.98
15	.128	.258	.536	.691	.866	1.34	1.75	2.13	2.60	2.95
16	.128	.258	.535	.690	.865	1.34	1.75	2.12	2.58	2.92
17	.128	.257	.534	.689	.863	1.33	1.74	2.11	2.57	2.90
18	.127	.257	.534	.688	.862	1.33	1.73	2.10	2.55	2.88
19	.127	.257	.533	.688	.861	1.33	1.73	2.09	2.54	2.86
20	.127	.257	.533	.687	.860	1.32	1.72	2.09	2.53	2.84
21	.127	.257	.532	.686	.859	1.32	1.72	2.08	2.52	2.83
22	.127	.256	.532	.686	.858	1.32	1.72	2.07	2.51	2.82
23	.127	.256	.532	.685	.858	1.32	1.71	2.07	2.50	2.81
24	.127	.256	.531	.685	.857	1.32	1.71	2.06	2.49	2.80
25	.127	.256	.531	.684	.856	1.32	1.71	2.06	2.48	2.79
26	.127	.256	.531	.684	.856	1.32	1.71	2.06	2.48	2.78
27	.127	.256	.531	.684	.855	1.31	1.70	2.05	2.47	2.77
28	.127	.256	.530	.683	.855	1.31	1.70	2.05	2.47	2.76
29	.127	.256	.530	.683	.854	1.31	1.70	2.04	2.46	2.76
30	.127	.256	.530	.683	.854	1.31	1.70	2.04	2.46	2.75
40	.126	.255	.529	.681	.851	1.30	1.68	2.02	2.42	2.70
60	.126	.254	.527	.679	.848	1.30	1.67	2.00	2.39	2.66
120	.126	.254	.526	.677	.845	1.29	1.66	1.98	2.36	2.62
∞	.126	.253	.524	.674	.842	1.28	1.645	1.96	2.33	2.58

Source: R. A. Fisher and F. Yates, *Statistical Tables for Biological, Agricultural and Medical Research*, published by Longman Group Ltd., London (previously published by Oliver and Boyd, Edinburgh), and by permission of the authors and publishers.