

國立臺北大學九十七學年度碩士班招生考試試題

系(所)別：自然資源與環境管理研究所
科目：統計學

組別：甲組
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可 不可使用計算機

1. Let X be a Poisson random variable with parameter λ , $\lambda > 0$. That is

$$P\{X = x\} = \frac{\lambda^x}{x!} e^{-\lambda}, x = 0, 1, 2, \dots$$

- (a) (4%) Evaluate $P\{X \neq 0\}$.
(b) (6%) Evaluate $E(X)$.

2. Suppose that a population contains five element : 2,4,10,16,18.

- (a) (8%) Find the population mean μ and the population variance σ^2 .
(b) (7%) List all possible random sample of size 2 selected without replacement.
(c) (5%) Let \bar{X} be the sample mean. An interval $[\bar{X} - 6, \bar{X} + 6]$ is treated as a confidence interval of the population mean μ . What is the probability that such confidence interval of a random sample in (b) contains μ

3. A Poll Company conducts a poll for an election. Suppose that 600 citizens are selected at random. 360 citizens decide to vote for candidate A and 240 citizens decided to vote for candidate B. Let p be the ratio that the citizens vote for A.

- (a) (4%) Conduct a point estimate \hat{p} of p .
(b) (8%) Conduct a 95% confidence interval of p .
(c) (8%) What is the confidence coefficient of a confidence interval $[\hat{p} - 0.03, \hat{p} + 0.03]$?

4. The monthly average household disposable income X and consumption expenditure Y from 1971 to 2003 are listed below in 1,000 NT Dollars. A linear regression model $Y = \alpha + \beta X + \varepsilon$ was established for the data. The ANOVA table and parameter estimates are also shown below.

Year	income	expenditure	Year	income	expenditure	Year	income	expenditure
1971	50	46	1982	275	211	1993	728	504
1972	58	50	1983	296	226	1994	770	546
1973	71	60	1984	314	244	1995	811	591
1974	93	81	1985	320	246	1996	826	614
1975	102	87	1986	342	258	1997	863	634
1976	116	96	1987	366	275	1998	873	646
1977	131	105	1988	410	302	1999	889	655
1978	156	122	1989	465	337	2000	891	663
1979	188	147	1990	520	370	2001	869	658
1980	233	180	1991	587	412	2002	876	673
1981	266	200	1992	640	445	2003	882	666

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Analysis of Variance

Source	DF	SSE	MSE	F Value	Pr > F
Model	1	1600689	1600689	C	<.0001
Error	31	A	B		
Corrected Total	32	1610247			

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > t
Intercept	1	14.62943	5.49859	2.66	0.0122
x	1	0.71567	0.00993	72.05	<.0001

- (a) (6%) Evaluate the value of A and B in the ANOVA table.
- (b) (6%) Evaluate the value of R^2 and C in the ANOVA table.
- (c) (8%) Give an explanation of the regression model.
- (d) (5%) Find the correlation coefficient of X and Y .

5. Because of more people earn a college degree today a college degree has lost some advantages. In a study of this issue 400 people were randomly selected from Taipei City. 200 of them earned a college degree and the other 200 did not. The monthly incomes of those people are shown below.

Education	income		
	<25,000	25,000 ? 40,000	>40,000
No college degree	80	110	10
With college degree	40	130	30

Conduct a statistical test to test whether the monthly income depends on college degree earned.

- (a) (5%) Give the null and alternative hypotheses of the test.
- (b) (5%) What statistics will you apply for the test?
- (c) (8%) Determinate whether the monthly income depends on college degree earned at significant lever 0.05.
- (d) (7%) If you reject the null hypothesis in (a), how can you determinate whether the data suggest monthly income increases or decreases when earning a college degree?

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Cumulative Probabilities of the Standard Normal Distribution.

Entry is area A under the standard normal curve from $-\infty$ to $z(A)$.



z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9685	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9994	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998

試題隨卷繳交

接背面

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Percentiles of the χ^2 Distribution.

Entry is $\chi^2(A; \nu)$ where $P(\chi^2(\nu) \leq \chi^2(A; \nu)) = A$



ν	A									
	.001	.010	.025	.050	.100	.900	.950	.975	.990	.995
1	0.000393	0.00157	0.00482	0.00983	0.0158	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0306	0.103	0.211	4.61	5.99	7.38	9.21	10.60
3	0.072	0.115	0.218	0.352	0.584	6.25	7.81	9.35	11.34	12.84
4	0.207	0.297	0.484	0.711	1.064	7.78	9.49	11.14	13.28	14.86
5	0.412	0.554	0.831	1.145	1.61	9.24	11.07	12.83	15.09	16.75
6	0.676	0.872	1.24	1.64	2.20	10.64	12.59	14.45	16.81	18.55
7	0.989	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48	20.28
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09	21.96
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67	23.59
10	2.16	2.36	3.25	3.94	4.87	15.99	18.31	20.48	23.21	25.19
11	2.60	2.65	3.82	4.57	5.58	17.28	19.68	21.92	24.72	26.76
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.73	27.69	29.82
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	10.09	24.77	27.59	30.19	33.41	35.72
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	11.63	27.20	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57	40.00
21	8.03	8.90	10.28	11.59	13.24	29.62	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	14.04	30.81	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	14.85	32.01	35.17	38.08	41.64	44.18
24	9.89	10.86	12.40	13.85	15.66	33.20	36.42	39.34	42.98	45.56
25	10.52	11.52	13.12	14.61	16.47	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	18.11	36.74	40.11	43.19	46.96	49.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.03	17.71	19.77	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	29.05	51.81	55.76	59.34	63.69	64.77
50	37.99	29.71	32.36	34.76	37.59	63.17	67.30	71.42	76.15	79.49
60	55.33	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38	91.95
70	73.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.4	104.2
80	91.17	53.54	57.15	60.39	64.28	96.58	101.9	106.6	112.3	116.3
90	109.20	61.75	65.65	69.13	73.29	107.6	113.1	118.1	124.3	128.3
100	127.33	70.06	74.22	77.93	82.36	118.5	124.3	129.6	135.8	140.2

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