

國立臺北大學九十七學年度碩士班招生考試試題

系(所)別：都市計劃研究所
科 目：統計學

組 別：甲組

第 1 頁 共 5 頁
可 不可使用計算機

Please answer each of the following problems with *explanation / calculating process* to obtain the scores.

I. MULTIPLE CHOICE. Choose the best one and explain why.(合計15%)

- 1) Which of the following is not an element of descriptive statistical problems? (5%)
- A) predictions are made about a larger set of data
 - B) information revealed in a data set is summarized
 - C) identification of patterns in a data set
 - D) graphical and numerical methods
- 2) Suppose NTPU students' ages follow a skewed right distribution with $\mu = 20$ and $\sigma = 2$ years old. If we randomly sampled 150 students, which of the following statements about the sampling distribution of the sample mean age is incorrect? (5%)
- A) The mean of the sampling distribution is approximately 20 years old.
 - B) The standard deviation of the sampling distribution is equal to 2 years old.
 - C) The shape of the sampling distribution is approximately normal.
 - D) All of the above statements are correct.
- 3) The academic advisor wants to predict the typical starting salary of a graduate at a top business school using GMAT score of the school as a predictor variable. A simple linear regression of SALARY versus GMAT using the 25 data points in the table are shown below.

$$\hat{\beta}_0 = -92040 \quad \hat{\beta}_1 = 228 \quad s = 3213 \quad R^2 = .66 \quad r = .81 \quad df = 23 \quad t = 6.67$$

- a. For the situation above, which of the following is *not* an assumption required for the simple linear regression analysis to be valid? (5%)
- A) The errors of predicting SALARY are normally distributed.
 - B) The errors of predicting SALARY have a mean of 0.
 - C) SALARY is independent of GMAT.
 - D) The errors of predicting SALARY have a variance that is constant for any given value of GMAT.
 - E) The Method of Least Squares specifies that the regression line has an average error of 0 and has an SSE that is minimized.

II. SHORT ANSWER. (合計85%)

For the situation as above in 3),

- b. Write the equation of the probabilistic model of interest, and the least squares line. (5%)
- c. Give a practical interpretation of $\hat{\beta}_0$, and $\hat{\beta}_1$. (4%)
- d. Give a practical interpretation of R^2 , r and t . (6%)

試題隨卷繳交

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4) Summary information is given for the weights (in pounds) of 1000 randomly sampled trucks that were traveling on Federal highways in 2003. (15%)

MIN: 4001 25%: 5601

MAX: 10,601 75%: 8601

AVE: 7001 Std. Dev.: 1400

- Construct a box plot for the data (including inner and outer fences).
- Comment on a truck weight of 17700 by box plot and z-score.

5) 某人欲知 A、B 兩種肥料的效果是否一樣，他將用兩種肥料所灌溉的番茄各採 41 個，量其重量，得結果如下：

	樣本數	平均重量	樣本標準差
A 肥料	41	80	5
B 肥料	41	76	4

在顯著水準 5% 之下，檢定兩種肥料的效果是否一樣 (25%) ?

6) 一項對於總統候選人支持度最新民意調查如下： (30%)

候選人	受訪選民	選民支持此候選人
A	400	192
B	450	225

請以 95 % 之信心，檢定是否受訪選民對於兩位候選人之喜好有顯著差異。

- 試述虛無及對立假設。
- 使用一般假設檢定。
- 以區間估計檢定。
- 使用 p -值檢定。
- 何謂 95 % 之信心？
- 若希望抽樣誤差不超過 4%，應該還要增加抽取多少樣本？

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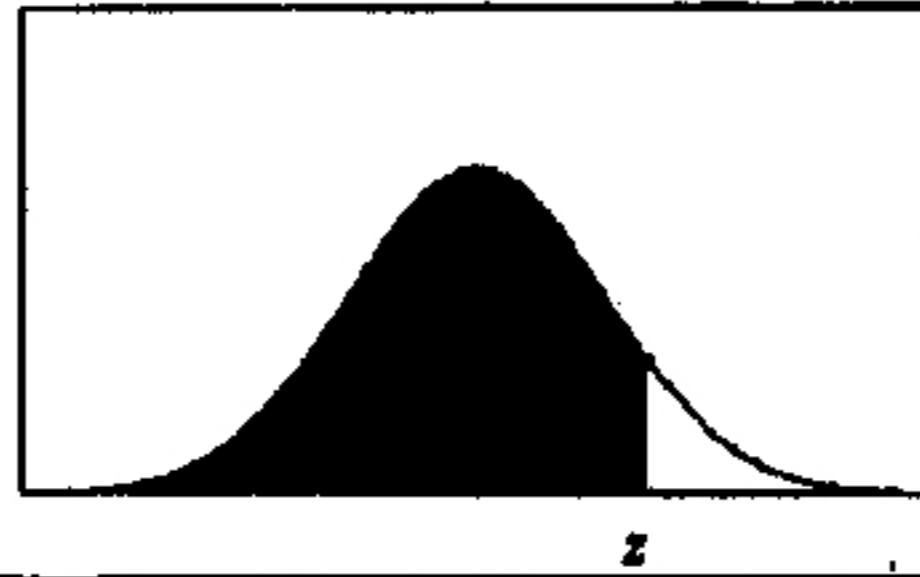
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表 1. 常態分配表

$$\Phi(z) = P(Z \leq z) = \int_{-\infty}^z \frac{1}{\sqrt{2\pi}} e^{-\frac{t^2}{2}} dt$$



z 的小數點第二位										
z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
4.0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

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表2 F分配表(續6)

(iii) $\alpha = 0.025$
 $P(F_{m,n} \geq F_{\alpha, m, n}) = \alpha$



分母自由度 n

	分子自由度 m									
	10	12	15	20	24	30	40	60	120	
1	960.43	976.71	984.57	992.70	997.78	1001.41	1003.50	1005.80	1014.82	
2	39.3980	39.4146	39.4313	39.4479	39.4562	39.4646	39.4729	39.4812	39.4896	
3	14.4189	14.3366	14.3027	14.1674	14.1241	14.0805	14.0368	13.9931	13.9473	
4	8.8439	8.7813	8.75	8.5999	8.5109	8.4613	8.4111	8.3604	8.3092	
5	6.6192	6.5248	6.5	6.3284	6.2780	6.2369	6.1788	6.1235	6.0693	
6	5.4613	5.3662	5.35	5.1684	5.1172	5.0693	5.0138	4.9589	4.9044	
7	4.7612	4.6658	4.65	4.4667	4.4158	4.3624	4.3089	4.2544	4.1989	
8	4.3951	4.1997	4.19	3.9995	3.9472	3.8940	3.8398	3.7844	3.7279	
9	3.9639	3.8682	3.86	3.6669	3.6143	3.5604	3.5058	3.4492	3.3918	
10	3.7168	3.6209	3.62	3.4184	3.3654	3.3110	3.2554	3.1984	3.1399	
11	3.5297	3.4336	3.43	3.2267	3.1725	3.1176	3.0613	2.9935	2.9441	
12	3.3736	3.2773	3.27	3.0728	3.0187	2.9633	2.9063	2.8478	2.7874	
13	3.2487	3.1523	3.15	2.9477	2.8932	2.8372	2.7797	2.7204	2.6590	
14	3.1449	3.0483	3.04	2.8437	2.7888	2.7324	2.6742	2.6142	2.5519	
15	3.0602	2.9633	2.96	2.7589	2.7036	2.6467	2.5880	2.5272	2.4641	
16	2.9862	2.8890	2.88	2.6835	2.6278	2.5703	2.5108	2.4492	2.3851	
17	2.9223	2.8249	2.82	2.6188	2.5628	2.5048	2.4432	2.3801	2.3153	
18	2.8664	2.7688	2.76	2.5590	2.5027	2.4445	2.3822	2.3184	2.2538	
19	2.8172	2.7194	2.71	2.5089	2.4523	2.3937	2.3329	2.2696	2.2032	
20	2.7737	2.6758	2.67	2.4645	2.4076	2.3486	2.2873	2.2234	2.1562	
21	2.7348	2.6368	2.63	2.4247	2.3675	2.3082	2.2465	2.1819	2.1141	
22	2.6998	2.6017	2.60	2.3890	2.3315	2.2718	2.2097	2.1446	2.0760	
23	2.6682	2.5699	2.56	2.3567	2.2989	2.2389	2.1763	2.1107	2.0415	
24	2.6396	2.5411	2.54	2.3273	2.2693	2.2090	2.1460	2.0799	2.0099	
25	2.6138	2.5149	2.51	2.3006	2.2423	2.1816	2.1183	2.0516	1.9811	
26	2.5896	2.4908	2.49	2.2759	2.2174	2.1568	2.0928	2.0257	1.9545	
27	2.5676	2.4688	2.46	2.2533	2.1946	2.1334	2.0693	2.0018	1.9299	
28	2.5473	2.4484	2.44	2.2324	2.1735	2.1121	2.0477	1.9797	1.9072	
29	2.5284	2.4295	2.42	2.2131	2.1540	2.0923	2.0276	1.9591	1.8861	
30	2.5112	2.4120	2.41	2.1952	2.1359	2.0739	2.0089	1.9400	1.8664	
35	2.4403	2.3406	2.33	2.1218	2.0617	1.9986	1.9321	1.8613	1.7851	
40	2.3882	2.2882	2.28	2.0677	2.0069	1.9429	1.8752	1.8028	1.7242	
45	2.3483	2.2480	2.24	2.0262	1.9647	1.9000	1.8313	1.7574	1.6767	
50	2.3168	2.2162	2.21	1.9933	1.9313	1.8659	1.7963	1.7211	1.6386	
60	2.2782	2.1772	2.17	1.9448	1.8817	1.8152	1.7448	1.6680	1.5819	
70	2.2374	2.1361	2.13	1.9100	1.8466	1.7792	1.7089	1.6319	1.5434	
80	2.2130	2.1116	2.11	1.8843	1.8204	1.7523	1.6790	1.5987	1.5079	
90	2.1942	2.0928	2.09	1.8644	1.8001	1.7315	1.6574	1.5758	1.4831	
100	2.1793	2.0773	2.07	1.8486	1.7839	1.7148	1.6401	1.5575	1.4631	
120	2.1579	2.0548	2.05	1.8249	1.7597	1.6899	1.6141	1.5299	1.4327	

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表3 F分配表(續4)

(ii) $\alpha = 0.05$

$P(F_{n_1, n_2} \geq F_{\alpha, n_1, n_2}) = \alpha$



分母自由度

		分子自由度									
		10	12	15	20	25	30	40	60	120	
1	241.88	243.98	245.91	248.01	249.85	250.85	251.74	252.19	252.83	253.23	
2	19.3989	19.4128	19.4291	19.4488	19.4641	19.4654	19.4707	19.4791	19.4874	19.4874	
3	8.7855	8.7446	8.7029	8.6602	8.6385	8.6266	8.5944	8.5720	8.5494	8.5494	
4	5.9644	5.9117	5.8678	5.8228	5.7744	5.7439	5.7170	5.6877	5.6581	5.6581	
5	4.7351	4.6777	4.6288	4.5881	4.5572	4.5377	4.4638	4.4314	4.3988	4.3988	
6	4.0608	3.9999	3.9381	3.8742	3.8415	3.8082	3.7743	3.7398	3.7047	3.7047	
7	3.6368	3.5747	3.5107	3.4448	3.4105	3.3768	3.3404	3.3043	3.2674	3.2674	
8	3.3472	3.2839	3.2184	3.1503	3.1152	3.0794	3.0418	3.0053	2.9689	2.9689	
9	3.1373	3.0729	3.0061	2.9368	2.9008	2.8637	2.8259	2.7872	2.7475	2.7475	
10	2.9782	2.9130	2.8450	2.7748	2.7372	2.6996	2.6609	2.6211	2.5801	2.5801	
11	2.8836	2.8176	2.7486	2.6764	2.6389	2.5789	2.5389	2.4981	2.4489	2.4489	
12	2.7934	2.7266	2.6569	2.5834	2.5458	2.4858	2.4458	2.4042	2.3410	2.3410	
13	2.7118	2.6437	2.5731	2.4989	2.4612	2.4012	2.3612	2.3186	2.2524	2.2524	
14	2.6382	2.5682	2.4960	2.4209	2.3832	2.3232	2.2832	2.2386	2.1678	2.1678	
15	2.5737	2.5023	2.4284	2.3518	2.3142	2.2542	2.2142	2.1686	2.0947	2.0947	
16	2.5185	2.4457	2.3702	2.2928	2.2552	2.1952	2.1552	2.1086	2.0319	2.0319	
17	2.4699	2.3957	2.3187	2.2404	2.2028	2.1428	2.1028	2.0552	1.9757	1.9757	
18	2.4277	2.3521	2.2746	2.1954	2.1578	2.0978	2.0578	2.0092	1.9267	1.9267	
19	2.3899	2.3130	2.2341	2.1542	2.1166	2.0566	2.0166	1.9680	1.8827	1.8827	
20	2.3567	2.2784	2.1981	2.1174	2.0798	2.0198	1.9798	1.9312	1.8437	1.8437	
21	2.3278	2.2481	2.1674	2.0861	2.0485	1.9885	1.9485	1.9000	1.8107	1.8107	
22	2.3029	2.2218	2.1407	2.0588	2.0212	1.9612	1.9212	1.8727	1.7807	1.7807	
23	2.2811	2.1996	2.1181	2.0356	1.9980	1.9380	1.8980	1.8495	1.7557	1.7557	
24	2.2621	2.1792	2.0972	2.0142	1.9766	1.9166	1.8766	1.8281	1.7327	1.7327	
25	2.2457	2.1624	2.0800	1.9966	1.9590	1.8990	1.8590	1.8105	1.7137	1.7137	
26	2.2317	2.1479	2.0650	1.9811	1.9435	1.8835	1.8435	1.7950	1.6967	1.6967	
27	2.2197	2.1354	2.0520	1.9676	1.9300	1.8700	1.8300	1.7815	1.6817	1.6817	
28	2.2094	2.1246	2.0410	1.9561	1.9185	1.8585	1.8185	1.7700	1.6687	1.6687	
29	2.2003	2.1150	2.0310	1.9456	1.9080	1.8480	1.8080	1.7595	1.6567	1.6567	
30	2.1923	2.1064	2.0220	1.9361	1.8985	1.8385	1.7985	1.7500	1.6457	1.6457	
35	2.1443	2.0479	1.9630	1.8761	1.8385	1.7785	1.7385	1.6900	1.5837	1.5837	
40	2.0772	1.9804	1.8950	1.8076	1.7700	1.7100	1.6700	1.6215	1.5137	1.5137	
45	2.0487	1.9514	1.8650	1.7771	1.7395	1.6795	1.6395	1.5910	1.4817	1.4817	
50	2.0261	1.9284	1.8410	1.7526	1.7150	1.6550	1.6150	1.5665	1.4557	1.4557	
60	1.9926	1.8944	1.8060	1.7171	1.6795	1.6195	1.5795	1.5310	1.4187	1.4187	
70	1.9689	1.8702	1.7810	1.6916	1.6540	1.5940	1.5540	1.5055	1.3917	1.3917	
80	1.9512	1.8520	1.7620	1.6721	1.6345	1.5745	1.5345	1.4860	1.3707	1.3707	
90	1.9376	1.8379	1.7470	1.6566	1.6190	1.5590	1.5190	1.4705	1.3537	1.3537	
100	1.9267	1.8264	1.7350	1.6441	1.6065	1.5465	1.5065	1.4580	1.3397	1.3397	
120	1.9105	1.8097	1.7180	1.6266	1.5890	1.5290	1.4890	1.4405	1.3207	1.3207	

試題隨卷繳交