

國立彰化師範大學 101 學年度碩士班招生考試試題

系所： 商業教育學系

組別： 甲、乙組

科目： 統計學

☆☆請在答案卷上作答☆☆

共 5 頁，第 1 頁

- Let X_1, X_2, \dots, X_9 be a random sample from $N(\mu, 36)$. To test $H_0: \mu = 105$ against $H_1: \mu > 105$, we reject H_0 and accept H_1 if and only if the sample mean $\bar{X} \geq 109$.
 - Find the probability of type I error. (5%)
 - Find the probability of the type II error if in fact $\mu = 115$. (5%)
- A multiple regression analysis, based on $n=25$ data points, attempts to predict Y using the model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$ and produces $SSR = 6300$, $SS_{total} = 8000$
 - Do the data indicate that the independent variables jointly contribute significant information for the dependent variable? Using $\alpha = 0.01$. (5%)
 - Calculate the multiple coefficient of correlation and interpret this value. (5%)
- Let X and Y have the joint pdf:
$$f_{xy}(x, y) = \begin{cases} \frac{x+y}{18}, & \text{for } (x, y) = \{(1,2), (1,4), (2,2), (2,4)\} \\ 0, & \text{elsewhere} \end{cases}$$
 - Find $Cov(X, Y)$ (the covariance of X and Y). (5%)
 - Find $\rho(X, Y)$ (the correlation coefficient of X and Y). (5%)
- The company believes that 20% of the firm's orders come from the first-time customers. A simple random sample of 100 orders will be used to estimate the proportion of the first-time customers. Assume that the president is correct and $p = 0.2$. Let \bar{p} be the estimator of p . Find $P(0.15 < \bar{p} < 0.25)$. (10%)
- The following are the numbers of miles per gallon which a test driver got with four tanks for each of five brands of gasoline. Test, at the 0.01 level of significance, the null hypothesis that five brands of gasoline yield the same average mileage. (10%)

Brand A: 24, 19, 21, 20
Brand B: 26, 20, 25, 21
Brand C: 23, 28, 26, 27
Brand D: 26, 26, 29, 31
Brand E: 23, 20, 23, 22

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共 5 頁，第 2 頁

6. 彰化市公所舉辦元宵節抽獎活動，每一個參加的人都領有一張抽獎券，抽獎券的編號依序為 1, 2, 3, ..., N ，小胖參加了這次的抽獎活動，領到的抽獎券編號為 444。第一輪抽獎共有 7 人幸運獲獎，中獎號碼分別為 101, 202, 303, 404, 505, 606, 707。請協助小胖利用 M.M.E. (Method of Moment Estimator) 估計彰化市公所總共發放了多少張抽獎券。(10%)
7. 小胖參加完彰化市公所舉辦的抽獎活動之後，來到了夜市撈金魚，看著水池裡游來游去的金魚，小胖一時心血來潮，想知道水池裡頭到底有多少條金魚。於是小胖將第一次撈到的 10 條金魚做記號之後全數放回池中，接下來，小胖重新再撈一次。第二次小胖總共撈到了 8 條金魚，其中 2 條有做記號。若小胖撈金魚的這段期間內都沒有其它顧客在一旁撈金魚，請協助小胖利用 M.L.E. (Maximum Likelihood Estimator) 估計水池中總共有多少條金魚。(10%)
8. 小胖回到宿舍之後，想到上個學期的統計學差一點就被當掉，於是拿起統計學課本坐在書桌前翻閱，想不到上個月才更換的燈泡竟然燒掉了！包裝盒上明明寫著可以照亮 3000 個小時的燈泡，才使用 30 個小時就燒掉了。心中正在忿忿不平時，小胖突然想起老師說過燈泡的壽命是服從指數分配，請問 1000 個使用此品牌燈泡的消費者當中，比小胖更倒楣的人會有幾個？(10%)
9. 小胖想要用功的心情大受影響，於是去找大胖聊天。一進門，卻見大胖面色凝重，詢問之後才知道大胖上學期的投資學作業還沒有繳交，而且，明天若交不出正確答案就得重修了！大胖對小胖說：「只要你協助我不要被當掉，我就請你吃消夜！」大胖未完成的作業題目為：「已知某股票的報酬率服從期望值為 μ ，標準差為 σ 的對數常態分配，試求該股票報酬率的期望值與變異數。」請協助小胖獲得大胖提供的消夜。(20%)

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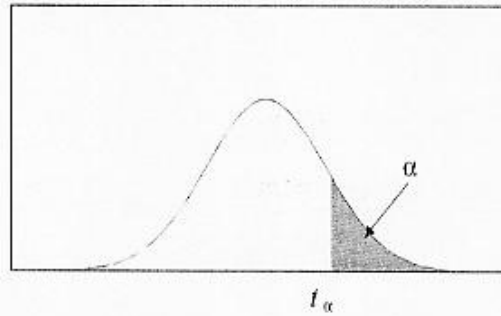
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共 5 頁，第 3 頁

t 分配臨界值表

$$P(t > t_{\alpha}) = \alpha$$



Df	$t_{.100}$	$t_{.050}$	$t_{.025}$	$t_{.010}$	$t_{.005}$	df
1	3.078	6.314	12.706	31.821	63.656	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.131	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
∞	1.282	1.645	1.960	2.326	2.576	∞

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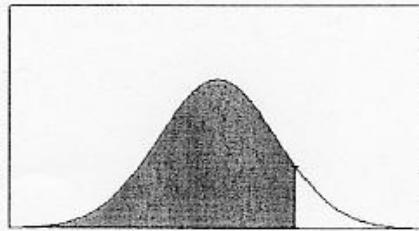
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共 5 頁，第 4 頁

常態分配表

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



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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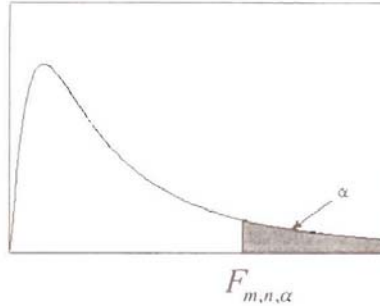
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F 分配表

(iv) $\alpha = 0.01$

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



分母自由度 n

		分子自由度 m								
		1	2	3	4	5	6	7	8	9
1		4052.18	4999.50	5403.35	5624.58	5763.65	5858.99	5928.36	5981.07	6022.47
2		98.5025	99.0000	99.1662	99.2494	99.2993	99.3326	99.3564	99.3742	99.3881
3		34.1162	30.8165	29.4567	28.7099	28.2371	27.9107	27.6717	27.4892	27.3452
4		21.1977	18.0000	16.6944	15.9770	15.5219	15.2069	14.9758	14.7989	14.6591
5		16.2582	13.2739	12.0600	11.3919	10.9670	10.6723	10.4555	10.2893	10.1578
6		13.7450	10.9248	9.7795	9.1483	8.7459	8.4661	8.2600	8.1017	7.9761
7		12.2464	9.5466	8.4513	7.8466	7.4604	7.1914	6.9928	6.8400	6.7188
8		11.2586	8.6491	7.5910	7.0061	6.6318	6.3707	6.1776	6.0289	5.9106
9		10.5614	8.0215	6.9919	6.4221	6.0569	5.8018	5.6129	5.4671	5.3511
10		10.0443	7.5594	6.5523	5.9943	5.6363	5.3858	5.2001	5.0567	4.9424
11		9.6460	7.2057	6.2167	5.6683	5.3160	5.0692	4.8861	4.7445	4.6315
12		9.3302	6.9266	5.9525	5.4120	5.0643	4.8206	4.6395	4.4994	4.3875
13		9.0738	6.7010	5.7394	5.2053	4.8616	4.6204	4.4410	4.3021	4.1911
14		8.8616	6.5149	5.5639	5.0354	4.6950	4.4558	4.2779	4.1399	4.0297
15		8.6831	6.3589	5.4170	4.8932	4.5556	4.3183	4.1415	4.0045	3.8948
16		8.5310	6.2262	5.2922	4.7726	4.4374	4.2016	4.0259	3.8896	3.7804
17		8.3997	6.1121	5.1850	4.6690	4.3359	4.1015	3.9267	3.7910	3.6822
18		8.2854	6.0129	5.0919	4.5790	4.2479	4.0146	3.8406	3.7054	3.5971
19		8.1849	5.9259	5.0103	4.5003	4.1708	3.9386	3.7653	3.6305	3.5225
20		8.0960	5.8489	4.9382	4.4307	4.1027	3.8714	3.6987	3.5644	3.4567
21		8.0166	5.7804	4.8740	4.3688	4.0421	3.8117	3.6396	3.5056	3.3981
22		7.9454	5.7190	4.8166	4.3134	3.9880	3.7583	3.5867	3.4530	3.3458
23		7.8811	5.6637	4.7649	4.2636	3.9392	3.7102	3.5390	3.4057	3.2986
24		7.8229	5.6136	4.7181	4.2184	3.8951	3.6667	3.4959	3.3629	3.2560
25		7.7698	5.5680	4.6755	4.1774	3.8550	3.6272	3.4568	3.3239	3.2172
26		7.7213	5.5263	4.6366	4.1400	3.8183	3.5911	3.4210	3.2884	3.1818
27		7.6767	5.4881	4.6009	4.1056	3.7848	3.5580	3.3882	3.2558	3.1494
28		7.6356	5.4529	4.5681	4.0740	3.7539	3.5276	3.3581	3.2259	3.1195
29		7.5977	5.4204	4.5378	4.0449	3.7254	3.4995	3.3303	3.1982	3.0920
30		7.5625	5.3903	4.5097	4.0179	3.6990	3.4735	3.3045	3.1726	3.0665
35		7.4191	5.2679	4.3957	3.9082	3.5919	3.3679	3.2000	3.0687	2.9630
40		7.3141	5.1785	4.3126	3.8283	3.5138	3.2910	3.1238	2.9930	2.8876
45		7.2339	5.1103	4.2492	3.7674	3.4544	3.2325	3.0658	2.9353	2.8301
50		7.1706	5.0566	4.1993	3.7195	3.4077	3.1864	3.0202	2.8900	2.7850
60		7.0771	4.9774	4.1259	3.6490	3.3389	3.1187	2.9530	2.8233	2.7185
70		7.0114	4.9219	4.0744	3.5996	3.2907	3.0712	2.9060	2.7765	2.6719
80		6.9627	4.8807	4.0363	3.5631	3.2550	3.0361	2.8713	2.7420	2.6374
90		6.9251	4.8491	4.0070	3.5350	3.2276	3.0091	2.8445	2.7154	2.6109
100		6.8953	4.8239	3.9837	3.5127	3.2059	2.9877	2.8233	2.6943	2.5898
120		6.8509	4.7865	3.9491	3.4795	3.1735	2.9559	2.7918	2.6629	2.5586