

考 試 科 目	統計學	所 別	統計學系	考 試 時 間	7 月 11 日 星 期 五	第 2 節
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Note: Statistical tables are attached in the last pages. Please round your answer to 3 decimal points.

- Last year, Brand A microwaves had 45% of the market, Brand B had 30%, and Brand C had 25%. This year the makers of brand C launched a heavy advertising campaign. A random sample of appliance stores shows that of 100 microwaves sold, 38 were Brand A, 35 were Brand B, and 27 were Brand C.

 - Using $\alpha = 0.05$, what is the appropriate statistical decision for testing $H_0: p_1 = p_2 = p_3$ vs. H_1 : not all the proportions are the same?
 - What happens to the test statistic when you double the sample size (i.e., The random sample now shows that of 200 microwaves sold, 76 were Brand A, 70 were Brand B, and 54 were Brand C). You need to explain why. (10%+10%)
- A researcher is interested in estimating the difference in two population proportions. A sample of 400 from each of the first population and the second population results in sample proportions of .61 and .64, respectively. What is what is the appropriate statistical decision for testing $H_0: p_1 = p_2 + .1$ vs. $H_1: p_1 \neq p_2 + .1$ at the $\alpha = .05$? (10%)
- $n_1 = 5, n_2 = 16, s_1 = 2.78, s_2 = 4.68$. Assume the populations are normally distributed. Test $H_0: \sigma_1^2 \geq \sigma_2^2$ vs. $H_1: \sigma_1^2 < \sigma_2^2$ at $\alpha = .01$. (10%)
- It can be divided into 4 regions, namely, Northeast, Midwest, South, and West, in USA. Suppose we created several dummy variables as follows:

R1 = 1 if Northeast; otherwise, R1 = 0. R2 = 1 if Midwest; otherwise, R2 = 0.
R3 = 1 if South; otherwise, R3 = 0. Gender = 1 if male; otherwise Gender=0.

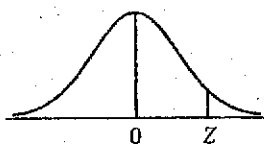
The regression equation is

Salary (in 1000 dollars) = $0.732 + 0.111 \text{ Age} + 0.459 \text{ Gender} + 0.3 \text{ R1} - 0.8 \text{ R2} - 1.2 \text{ R3}$

 - What is the meaning of the coefficient for Gender?
 - What is the difference between a 30 years-old western male's salary and a 40 years-old southern female's salary? (5%+5%)

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5. The Taipei Labors Bureau wishes to estimate the proportion of the workforce that has two or more jobs. How large a random sample of the workforce must be examined to be 95% certain that the estimate does not differ from the true proportion by more than 0.02? (10%) 6. An elevator carries nine people in a load. The weights of people vary according to many factors but may be described by a distribution with mean 150 pounds and standard deviation 42 pounds. Over many loads, each of nine people, about what percentage of loads will exceed the safe load limit of 1800 pounds? (10%) 7. The number of hours of 8 NCCU students spent in studying the day before the Statistics final exam was recorded as follows: 4 3 0 5 2 9 4 5 Is the coefficient of skewness positive or negative? Why? (Assume the distribution of the studying hours is unimodal.) (10%) 8. To test $H_0 : p = .65$ vs. $H_1 : p < .65$, a sample of 400 is taken and α is set at 0.05. If the true proportion is $p = 0.60$, what is power of the test? (10%) 9. Denote Y is the response variable and X is the independent variable. Suppose you are to fit a simple regression model. (a) What is the least squares fitted regression line when the $\beta=0$? You need to explain why. (b) The least squares fitted regression line for a simple linear regression model always pass through what point? Why? (5%+5%)						
備	考試	題	隨	卷	繳	交

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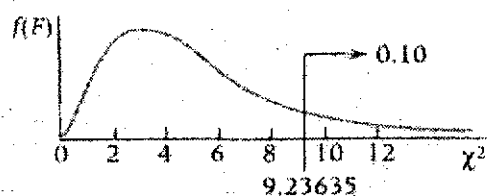


The entries in this table are the probabilities that a standard normal random variable is between 0 and Z (the shaded area).

Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
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	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
0.7	.2580	.2611	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.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

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The Chi-Square Table

Values of χ^2 for Selected Probabilities

Example: df (Number of degrees of freedom) = 5, the tail above $\chi^2 = 9.23635$ represents 0.10 or 10% of area under the curve.

Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.9	.1	.05	.025	.01	.005
1	0.0000393	0.0001571	0.0009821	0.0039322	0.0157907	2.7055	3.8415	5.0239	6.6349	7.8794
2	0.010025	0.020100	0.050636	0.102586	0.210721	4.6052	5.9915	7.3778	9.2104	10.5965
3	0.07172	0.11483	0.21579	0.35185	0.58438	6.2514	7.8147	9.3484	11.3449	12.8381
4	0.20698	0.29711	0.48442	0.71072	1.06362	7.7794	9.4877	11.1433	13.2767	14.8602
5	0.41175	0.55430	0.83121	1.14548	1.61031	9.2363	11.0705	12.8325	15.0863	16.7496
6	0.67573	0.87208	1.23734	1.63538	2.20413	10.6446	12.5916	14.4494	16.8119	18.5475
7	0.98925	1.23903	1.68986	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.34440	1.64651	2.17972	2.73263	3.48954	13.3616	15.5073	17.5345	20.0902	21.9549
9	1.73491	2.08789	2.70039	3.32512	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55820	3.24696	3.94030	4.86518	15.9872	18.3070	20.4832	23.2093	25.1881
11	2.60320	3.05350	3.81574	4.57481	5.57779	17.2750	19.6752	21.9200	24.7250	26.7569
12	3.07379	3.57055	4.40378	5.22603	6.30380	18.5493	21.0261	23.3367	26.2170	28.2997
13	3.56504	4.10690	5.00874	5.89186	7.04150	19.8119	22.3620	24.7356	27.6882	29.8193
14	4.07466	4.66042	5.62872	6.57063	7.78954	21.0641	23.6848	26.1189	29.1412	31.3194
15	4.60087	5.22936	6.26212	7.26093	8.54675	22.3071	24.9958	27.4884	30.5780	32.8015
16	5.14216	5.81220	6.90766	7.96164	9.31224	23.5418	26.2962	28.8453	31.9999	34.2671
17	5.69727	6.40774	7.56418	8.67175	10.08518	24.7690	27.5871	30.1910	33.4087	35.7184
18	6.26477	7.01490	8.23074	9.39045	10.86494	25.9894	28.8693	31.5264	34.8052	37.1564
19	6.84392	7.63270	8.90651	10.11701	11.65091	27.2036	30.1435	32.8523	36.1908	38.5821
20	7.43381	8.26037	9.59077	10.85080	12.44260	28.4120	31.4104	34.1696	37.5663	39.9969
21	8.03360	8.89717	10.28291	11.59132	13.23960	29.6151	32.6706	35.4789	38.9322	41.4009
22	8.64268	9.54249	10.98233	12.33801	14.04149	30.8133	33.9245	36.7807	40.2894	42.7957
23	9.26038	10.19569	11.68853	13.09051	14.84795	32.0069	35.1725	38.0756	41.6383	44.1814
24	9.88620	10.85635	12.40115	13.84842	15.65868	33.1962	36.4150	39.3641	42.9798	45.5584
25	10.51965	11.52395	13.11971	14.61140	16.47341	34.3816	37.6525	40.6465	44.3140	46.9280
26	11.16022	12.19818	13.84388	15.37916	17.29188	35.5632	38.8851	41.9231	45.6416	48.2898
27	11.80765	12.87847	14.57337	16.15139	18.11389	36.7412	40.1133	43.1945	46.9628	49.6450
28	12.46128	13.56467	15.30785	16.92788	18.93924	37.9159	41.3372	44.4608	48.2782	50.9936
29	13.12107	14.25641	16.04705	17.70838	19.76774	39.0875	42.5569	45.7223	49.5878	52.3355
30	13.78668	14.95346	16.79076	18.49267	20.59924	40.2560	43.7730	46.9792	50.8922	53.6719
40	20.70658	22.16420	24.43306	26.50930	29.05052	51.8050	55.7585	59.3417	63.6908	66.7660
50	27.99082	29.70673	32.35738	34.76424	37.68864	63.1671	67.5048	71.4202	76.1538	79.4898
60	35.53440	37.48480	40.48171	43.18797	46.45888	74.3970	79.0820	83.2977	88.3794	91.9518
70	43.27531	45.44170	48.75754	51.73926	55.32894	85.5270	90.5313	95.0231	100.4251	104.2148
80	51.17193	53.53998	57.15315	60.39146	64.27784	96.5782	101.8795	106.6285	112.3288	116.3209
90	59.19633	61.75402	65.64659	69.12602	73.29108	107.5650	113.1452	118.1359	124.1162	128.2987
100	67.32753	70.06500	74.22188	77.92944	82.35813	118.4980	124.3221	129.5613	135.8069	140.1697

備 考 試 題 隨 卷 繳 交

7月11日 星期五		第2節		考試時間		統計學系		系別		統計學		考試科目	
Percentage Points of the F Distribution (Continued)													
α = .01													
v1		Numerator Degrees of Freedom											
v2		1	2	3	4	5	6	7	8	9	10	12	15
1	4052.18	4999.34	5403.53	5624.26	5763.96	5858.95	5928.33	5980.95	6022.40	6055.93	6106.68	6156.97	
2	98.50	99.00	99.16	99.25	99.30	99.33	99.36	99.38	99.39	99.40	99.42	99.43	
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.34	27.23	27.05	26.87	
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.37	14.20	
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.89	9.72	
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72	7.56	
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47	6.31	
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67	5.52	
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11	4.96	
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71	4.56	
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40	4.25	
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16	4.01	
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96	3.82	
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80	3.66	
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67	3.52	
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55	3.41	
17	8.40	6.11	5.19	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46	3.31	
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37	3.23	
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30	3.15	
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.23	3.09	
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17	3.03	
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12	2.98	
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07	2.93	
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03	2.89	
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	2.99	2.85	
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18	3.09	2.96	2.81	
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15	3.06	2.93	2.78	
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12	3.03	2.90	2.75	
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09	3.00	2.87	2.73	
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70	
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66	2.52	
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35	
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	
20	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	
交 繳 卷 題 試 考													
備													

考試科目	微積分	系別	統計系	考試時間	7 月 11 日 星期五	第 4 節
1. (20 %) Write down the final answers only. (a) Find $\lim_{x \rightarrow 0^+} (x - \sin(x))^{-1/2} (1 - \cos(x))$. (b) Find $\int_0^1 x \ln x dx$. (c) Find $\lim_{n \rightarrow \infty} n^{-1} \sum_{i=1}^n (i/n)^{1/3}$. (d) Suppose that $x < 1$. Find $\sum_{k=1}^{\infty} kx^{k-1}$. 2. (20 %) Suppose that $f(x) = \begin{cases} 2e^x & \text{if } x \geq 0; \\ e^{x^2} & \text{if } x < 0. \end{cases}$ Let $g(h) = h^{-1} \int_0^h f(x) dx$ for $h \neq 0$. Determine whether $\lim_{h \rightarrow 0} g(h)$ exists. If so, find the limit. If not, show that the limit does not exist. 3. (20 %) Suppose that f is a differentiable function defined on R^2 such that $f_x(x, y) = 1 + y$ and $f_y(x, y) = x$. Let $g(u, v) = f\left(v \int_0^{2u} e^{-t^2} dt, -v \int_{-u}^0 e^{-t^2} dt\right).$ Find $g_u(0, 1)$. 4. (20%) Let $D = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq 2 \text{ and } 2x + y \leq 2\}$ and $f(x, y) = x + y^2 - xy$. Find the maximum of f on D. 5. (20%) Let $D = \{(x, y) : x^2 + y^2 < 1, \sqrt{3}x + y \geq \sqrt{3}\}$. Find $\iint_D xy dx dy$.						
備	考	試 題 隨 卷 繳 交				