

逢甲大學114學年度碩士班考試入學試題

編號：05

科目代碼：103

科目	統計學	適用系所	統計學系統計與精算碩士班應用統計暨計量財務組、精算組	時間	90分鐘
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※請務必在答案卷作答區內作答。

共3頁 第1頁

1. An experiment consists of throwing two six-sided dice and observing the number of spots on the upper faces. Determine the probability that
 - a. neither a one nor a six appear on each die. (6pts)
 - b. the sum of the spots is 7. (6pts)

2. An insurance company has determined that each week an average of nine claims are filed in their Taichung branch. What is the probability that during the next week
 - a. exactly seven claims will be filed? (6pts)
 - b. no claims will be filed? (6pts)

3. The Mathematics part of the SAT scores of students at UTC are normally distributed with a mean of 500 and a standard deviation of 75.
 - a. If 2.28 percent of the students who had the highest scores received scholarships, what was the minimum score among those who received scholarships? (6pts) 650
 - b. What percentage of students had scores between 575 and 650? (6pts)

4. A university planner is interested in determining the percentage of spring semester students who will attend summer school. She takes a pilot sample of 160 spring semester students discovering that 56 will return to summer school.
 - a. Construct a 95% confidence interval estimate for the percentage of spring semester students who will return to summer school. (6pts)
 - b. Using the results of the pilot study with a 0.95 probability, how large of a sample would have to be taken to provide a margin of error of 3% or less? (6pts)

5. To compare the customer satisfaction levels of two competing cable television companies, 174 customers of Company 1 and 355 customers of Company 2 were randomly selected and were asked to rate their cable companies on a five-point scale, with being least satisfied and most satisfied. The survey results are summarized in the following table:

Company 1: $n_1 = 174$, $\bar{x}_1 = 3.51$ and $\sigma_1 = 0.51$

Company 2: $n_2 = 355$, $\bar{x}_2 = 3.24$ and $\sigma_2 = 0.52$

Construct a point estimate and a 95% confidence interval for $\mu_1 - \mu_2$ the difference in average satisfaction levels of customers of the two companies as measured on this five-point scale.

 - a. Find the point estimate of $\mu_1 - \mu_2$. (5pts)
 - b. Construct the 95% confidence interval for $\mu_1 - \mu_2$. (6pts)

Note that the expression of standard error $\sigma_{\bar{x}_1 - \bar{x}_2}$ needed in constructing the 95% confidence interval is contained in z test statistic given in the Hint z test statistic.

- c. An investigator claims that customer satisfaction levels in company 1 are not the same as the satisfaction levels in company 2. She uses the following hypotheses (6pts)

$$H_0: \mu_1 - \mu_2 = 0$$

$$H_1: \mu_1 - \mu_2 \neq 0$$

Hint z test statistic:

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}, \text{ Where } D_0 \text{ is simply } \mu_1 - \mu_2 \text{ under } H_0.$$

Using the critical value approach and decide if the investigator will reject H_0 or not, at the significance level alpha (α) = 0.05.

6. Suppose a market analyst wishes to investigate whether consumers have any preference among five flavors of a new fruit drink. A sample of 100 people provided the following data:

Frequency	Cherry	Strawberry	Orange	Limon	Grape
Observed	32	28	16	14	10

Assume that the corresponding expected frequencies are equal to 20 each. A completed table for the test is shown.

Frequency	Cherry	Strawberry	Orange	Limon	Grape
Observed (O_i)	32	28	16	14	10
Expected (e_i)	20	20	20	20	20

An analyst wishes to know how close the observed data are from the expected data. She decided to use the chi-square test for goodness of fit. Hypotheses are:

H_0 : Consumers show no preference for flavors

H_1 : Consumers show preference for flavors

- Find the value of the chi-square statistics (χ^2) (6pts)
 - At level of significance 5%, use the critical value approach to decide whether H_0 should be rejected or not. (6pts)
7. For the analysis of variance, an ANOVA table is obtained as follows. Please answer the following questions.

- Find the values of the missing entries m, n, p, q and r of the partially completed one-way ANOVA table. (5pts)

Source	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F
Treatments	2.124	p	0.708	0.75
Errors	m	20	r	
Total	n	q		

- Use the critical value approach to decide whether the F statistics in ANOVA table does lead to reject H_0 or not? Use level of significance 5%. (6pts)

8. Part of the results relating X (independent variable) and Y (dependent variable) is shown below.

- Fill in all the blanks marked with "?" (6pts)

ANOVA				
	df	SS	MS	F
Regression	?	2.7500	?	?
Residual	?	?	11.45	
Total	14	?		

- Compute the R-square for the regression model of X and Y. (6pts)

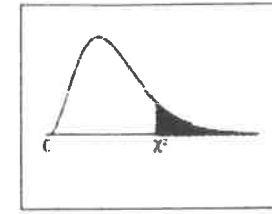
Table of the Standard Normal Cumulative Probability

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

F Distribution Table

		Right-Tail Probability = 0.05									
df ₂ ↓	df ₁ →	1	2	3	4	5	6	8	12	21	∞
1	1	161.45	199.50	215.71	224.58	230.16	233.99	238.88	243.91	249.05	251.31
2	1	18.51	19.00	19.16	19.25	19.30	19.33	19.37	19.41	19.45	19.50
3	1	10.13	9.55	9.28	9.12	9.01	8.94	8.85	8.74	8.61	8.53
4	1	7.71	6.94	6.59	6.39	6.26	6.16	6.04	5.91	5.77	5.63
5	1	6.61	5.79	5.41	5.19	5.05	4.95	4.82	4.68	4.53	4.47
6	1	5.99	5.14	4.76	4.53	4.39	4.28	4.15	4.00	3.84	3.67
7	1	5.59	4.74	4.35	4.12	3.97	3.87	3.73	3.57	3.41	3.23
8	1	5.32	4.46	4.07	3.84	3.69	3.58	3.44	3.28	3.12	2.93
9	1	5.12	4.26	3.86	3.63	3.48	3.37	3.23	3.07	2.90	2.71
10	1	4.96	4.10	3.71	3.48	3.33	3.22	3.07	2.91	2.74	2.54
11	1	4.84	3.98	3.59	3.36	3.20	3.09	2.95	2.79	2.61	2.40
12	1	4.75	3.89	3.49	3.26	3.11	3.00	2.85	2.69	2.51	2.30
13	1	4.67	3.81	3.41	3.18	3.03	2.92	2.77	2.60	2.42	2.21
14	1	4.60	3.74	3.34	3.11	2.96	2.85	2.70	2.53	2.35	2.13
15	1	4.54	3.68	3.29	3.06	2.90	2.79	2.64	2.48	2.29	2.07
16	1	4.49	3.63	3.24	3.01	2.85	2.74	2.59	2.42	2.24	2.01
17	1	4.45	3.59	3.20	2.96	2.81	2.70	2.55	2.38	2.19	1.96
18	1	4.41	3.55	3.16	2.93	2.77	2.66	2.51	2.34	2.15	1.92
19	1	4.38	3.52	3.13	2.90	2.74	2.63	2.48	2.31	2.11	1.88
20	1	4.35	3.49	3.10	2.87	2.71	2.60	2.45	2.28	2.08	1.84
21	1	4.32	3.47	3.07	2.84	2.68	2.57	2.42	2.25	2.05	1.81
22	1	4.30	3.44	3.05	2.82	2.66	2.55	2.40	2.23	2.03	1.78
23	1	4.28	3.42	3.03	2.80	2.64	2.53	2.37	2.20	2.01	1.76
24	1	4.26	3.40	3.01	2.78	2.62	2.51	2.36	2.18	1.98	1.73
25	1	4.24	3.39	2.99	2.76	2.60	2.49	2.34	2.16	1.96	1.71
26	1	4.23	3.37	2.98	2.74	2.59	2.47	2.32	2.15	1.95	1.69
27	1	4.21	3.35	2.96	2.73	2.57	2.46	2.31	2.13	1.93	1.67
28	1	4.20	3.34	2.95	2.71	2.56	2.45	2.29	2.12	1.91	1.65
29	1	4.18	3.33	2.93	2.70	2.55	2.43	2.28	2.10	1.90	1.64
30	1	4.17	3.32	2.92	2.69	2.53	2.42	2.27	2.09	1.89	1.62
40	1	4.08	3.23	2.84	2.61	2.45	2.34	2.18	2.00	1.79	1.51
60	1	4.00	3.15	2.76	2.53	2.37	2.25	2.10	1.92	1.70	1.39
120	1	3.92	3.07	2.68	2.45	2.29	2.18	2.02	1.83	1.61	1.25
∞	1	3.84	3.00	2.60	2.37	2.21	2.10	1.94	1.75	1.52	1.00

Chi-Square Distribution Table

The shaded area is equal to α for χ^2 .

df	$\chi^2_{.995}$	$\chi^2_{.990}$	$\chi^2_{.975}$	$\chi^2_{.950}$	$\chi^2_{.900}$	$\chi^2_{.800}$	$\chi^2_{.700}$	$\chi^2_{.600}$	$\chi^2_{.500}$	$\chi^2_{.400}$	$\chi^2_{.300}$	$\chi^2_{.200}$	$\chi^2_{.100}$	$\chi^2_{.050}$	$\chi^2_{.025}$	$\chi^2_{.010}$	$\chi^2_{.005}$
1	0.000	0.000	0.001	0.004	0.016	0.075	0.344	0.841	1.385	2.706	3.841	5.024	6.635	7.879	10.828	16.267	21.478
2	0.010	0.020	0.051	0.103	0.211	0.599	1.059	1.676	2.366	3.000	3.841	4.605	5.408	6.179	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	0.975	1.411	1.924	2.366	2.833	3.219	3.645	4.108	4.608	5.348	6.251	7.378
4	0.207	0.297	0.484	0.711	1.064	1.459	1.848	2.204	2.479	2.748	3.007	3.218	3.438	3.745	4.282	4.879	5.619
5	0.412	0.554	0.831	1.145	1.610	2.078	2.445	2.793	3.000	3.219	3.438	3.659	3.879	4.191	4.551	5.142	5.989
6	0.676	0.872	1.237	1.571	2.204	2.693	3.078	3.413	3.599	3.816	4.013	4.233	4.453	4.673	5.041	5.646	6.581
7	0.989	1.239	1.690	2.167	2.833	3.397	3.778	4.108	4.353	4.571	4.779	4.999	5.219	5.438	5.806	6.401	7.344
8	1.344	1.646	2.180	2.733	3.490	4.075	4.453	4.779	5.019	5.226	5.433	5.641	5.850	6.059	6.426	7.014	8.034
9	1.735	2.088	2.700	3.325	4.168	4.761	5.137	5.461	5.701	5.908	6.115	6.323	6.531	6.739	7.106	7.691	8.717
10	2.156	2.558	3.247	3.940	4.865	5.458	5.833	6.157	6.397	6.604	6.811	7.019	7.227	7.435	7.802	8.387	9.488
11	2.603	3.053	3.816	4.575	5.578	6.171	6.546	6.870	7.110	7.317	7.524	7.731	7.938	8.145	8.512	9.107	10.296
12	3.074	3.571	4.404	5.226	6.304	6.897	7.272	7.596	7.836	8.043	8.250	8.457	8.664	8.871	9.238	9.833	11.030
13	3.565	4.107	5.009	5.992	7.102	7.695	8.070	8.394	8.634	8.841	9.048	9.255	9.462	9.669	10.036	10.631	11.830
14	4.075	4.660	5.629	6.571	7.700	8.293	8.668	8.992	9.232	9.439	9.646	9.853	10.060	10.267	10.634	11.229	12.430
15	4.601	5.229	6.262	7.261	8.400	8.993	9.368	9.692	9.932	10.139	10.346	10.553	10.760	10.967	11.334	11.929	13.130
16	5.142	5.812	6.908	7.963	9.112	9.705	10.080	10.404	10.644	10.851	11.058	11.265	11.472	11.679	12.046	12.641	13.842
17	5.697	6.408	7.544	8.672	9.872	10.465	10.840	11.164	11.404	11.611	11.818	12.025	12.232	12.439	12.806	13.401	14.602
18	6.265	7.015	8.231	9.390	10.600	11.193	11.568	11.892	12.132	12.339	12.546	12.753	12.960	13.167	13.534	14.129	15.330
19	6.844	7.633	8.907	10.117	11.327	11.920	12.295	12.619	12.859	13.066	13.273	13.480	13.687	13.894	14.261	14.856	16.057
20	7.434	8.260	9.591	10.851	12.443	13.036	13.411	13.735	13.975	14.182	14.389	14.596	14.803	15.010	15.377	15.972	17.168
21	8.034	8.897	10.283	11.591	13.340	13.933	14.308	14.632	14.872	15.079	15.286	15.493	15.700	15.907	16.274	16.869	18.069
22	8.643	9.542	10.982	12.338	14.041	14.634	15.009	15.333	15.573	15.780	15.987	16.194	16.401	16.608	16.975	17.570	18.771
23	9.260	10.196	11.689	13.091	14.848	15.441	15.816	16.140	16.380	16.587	16.794	17.001	17.208	17.415	17.782	18.377	19.578
24	9.886	10.856	12.401	13.848	15.659	16.252	16.627	16.951	17.191	17.398	17.605	17.812	18.019	18.226	18.593	19.188	20.389
25	10.520	11.524	13.120	14.611	16.473	17.066	17.441	17.765	18.005	18.212	18.419	18.626	18.833	19.040	19.407	19.992	21.190
26	11.160	12.198	13.844	15.379	17.292	17.885	18.260	18.584	18.824	19.031	19.238	19.445	19.652	19.859	20.226	20.811	22.012
27	11.808	12.879	14.573	16.151	18.114	18.707	19.082	19.406	19.646	19.853	20.060	20.267	20.474	20.681	21.048	21.633	22.834
28	12.461	13.565	15.308	16.928	18.939	19.532	19.907	20.231	20.471	20.678	20.885	21.092	21.299	21.506	21.873	22.458	23.659
29	13.121	14.256	16.047	17.706	19.768	20.361	20.736	21.060	21.300	21.507	21.714	21.921	22.128	22.335	22.702	23.287	24.488
30	13.787	14.953	16.791	18.493	20.599	21.192	21.567	21.891	22.131	22.338	22.545	22.752	22.959	23.166	23.533	24.118	25.319
40	20.707	22.164	24.333	26.509	29.651	31.845	33.409	34.653	35.687	36.583	37.379	38.075	38.691	39.226	40.112	41.661	43.773
50	27.991	29.707	33.357	34.764	37.689	40.157	42.157	43.802	45.156	46.331	47.376	48.311	49.146	49.891	50.936	53.542	56.688
60	35.534	37.485	40.482	43.188	46.459	49.337	51.429	53.184	54.758	56.163	57.438	58.603	59.678	60.673	61.928	64.784	68.154
70	43.275	45.442	48.758	51.739	55.329	58.527	60.831	62.916	64.781	66.466	67.991	69.466	70.891	72.266	73.891	77.157	80.927
80	51.172	53.540	57.153	60.391	64.278	67.576	70.074	72.378	74.463	76.378	78.143	79.768	81.393	82.918	84.693	88.389	92.559
90	59.196	61.754	65.647	69.126	73.291	76.765	79.449	81.923	84.197	86.272	88.147	89.922	91.697	93.472	95.447	99.603	104.213
100	67.328	70.065	74.222	77.929	82.358	86.192	89.256	91.920	94.284	96.359	98.234	100.009	101.784	103.559	105.534	109.989	114.999