考 試 科 目	統計學	系 所 別	國際經營與貿易學系/國際經濟、國際財管、國際企管與行銷組	考 試 時 間	2 月 7 日(五) 第四節

1. (3pt) If a test of hypothesis has a Type I error probability of 0.05, this means that:
A. if the null hypothesis is true, we don't reject if 5% of the time
B. if the null hypothesis is true, we reject it 5% of the time
C. if the null hypothesis is false, we don't reject it 5% of the time
D. if the null hypothesis is false, we reject it 5% of the time

2. (3pt) Suppose we wish to test H_0: $\mu = 23$ vs. H_1: $\mu < 23$. Which of the following possible sample results gives the most evidence to support H_1?
A. sample mean is 19 and standard error is 5
B. sample mean is 20 and standard error is 8
C. sample mean is 21 and standard error is 6
D. sample mean is 19 and standard error is 11

3. (3pt) If a random sample of size n=100 fine-dining restaurants is selected and it is found that 45 restrict the use of the cell phones, give a 99% confidence interval for the true proportion of fine-dining restaurants that restrict the use of cell phone.
A. (0.3219, 0.5781)
B. (0.3525, 0.5475)
C. (0.2378, 0.4222)
D. (0.2526, 0.4073)

4. (3pt) Which of the following does the Central Limit Theorem allow us to disregard when working with the sampling distribution of the sample mean?
A. the standard deviation of the population distribution
B. the shape of the population distribution
C. the mean of the population distribution
D. all of the above can be disregarded when the Central Limit Theorem is used

5. (3pt) A man with 10 keys wants to open his door and tries the keys at random. Suppose there is exactly one key will open the door. If unsuccessful keys are eliminated from further selections. Let X be the number of trials to find the right key. What is the distribution of X?
A. Uniform distribution
B. Geometric distribution
C. Binomial distribution
D. Negative binomial distribution

備 註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

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6. (3pt) The seasonal output of a new experimental strain of pepper plants was carefully weighed. The mean weight per plant is 15.0 pounds, and the standard deviation of the normally distributed weights is 1.75 pounds. Of the 200 plants in the experiment, how many produced peppers weighing between 13 and 16 pounds?
A. 100
B. 118
C. 197
D. 53

7. (3pt) Which of the following tests is appropriate for data if the problem objective is to compare two populations and there are exactly 2 categories?
A. The z-test for the difference of two proportions
B. The chi-squared test of a contingency table
C. Both A and B
D. None of these choices

8. (3pt) In testing the hypothesis H_0: $\mu = 100$ vs. H_1: $\mu > 100$, the p-value is found to be 0.074, and the sample mean is 105. Which of the following statements is true?
A. The probability of observing a sample mean at least as large as 105 from a population whose mean is 100 is 0.074
B. The probability of observing a sample mean smaller than 105 from a population whose mean is 100 is 0.074
C. The probability that the population mean is larger than 100 is 0.074
D. None of these choices

9. (3pt) The sample size needed to within 10 units of the population mean was found to be 68. If the population standard deviation was 50, then the confidence level used was
A. 99%
B. 95%
C. 90%
D. 98%

10. (3pt) The SAT scores of entering freshmen at a certain university have mean 1215 and standard deviation 110. A random sample of 100 freshmen is taken and $\bar{X}$ is computed. The probability that $\bar{X}$ less than 1190 is
A. 0.2272
B. 0.1335
C. 0.4090
D. 0.0116

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11. (15%) The weekly oil demand X (in tons) follows the pdf

$$f(x) = \frac{1}{\theta}e^{-x/\theta},\ 0 < x < \infty.$$

However, the company can produce at most only 4 tons of the oil per week. Let Y be the oil sold per week.

(a) (3%) Find the probability that the oil will be sold out per week

(b) (7%) Find the cumulative distribution function of Y

(c) (5%) Find $\mathrm{E}(Y)$

12. (20%) Suppose that a random sample of 60 observations was drawn from a normal population. Suppose that we would like to infer whether or not the observations come from a zero mean and variance one. After drawing observations randomly, the number of observations in each of the intervals below was counted. Can we infer at the 5% significance level that the data were drawn from a hypothesized population? Ps. your answer should include: (i) the null/alternative hypothesis; (ii) the test statistic; (iii) the decision rule; (iv) the conclusion of the test

intervals	Frequency
$(-\infty, -1]$	8
$(-1, 0]$	30
$(0, 1]$	17
$(1, \infty)$	5

13. (15%) Three different models of automobiles (A, B, and C) were compared for gasoline consumption. For each model of car, 15 cars were randomly selected and subjected to standard driving procedures. The average miles/gallon obtained for each model of car and sample standard deviations are shown below. Suppose that the population variances ($\sigma_A^2 = \sigma_B^2 = \sigma_C^2 = \sigma^2$) are equal.

	Car A	Car B	Car C
Average Mile/Gallon	42	49	44
Sample Standard Deviation	4	5	3

(a) (10%) Let α= 0.05, and see if the mean gasoline consumption for all three models of cars is the same

(b) (5%) Find a 95% confidence interval for $(\mu_C - \mu_A)$. Please use $Q_{\alpha,d.f.}$ to denote the critical value. (you must specify the distribution Q and value of d.f.)

14. (20%) An insurance company is considering opening a new branch in Lansing. The company will choose the final location from two locations within the city. One of the factors in the decision is the annual family income (in thousands of dollars) from the potential locations.

Suppose that they randomly selected n families from each location (so the sample size is $2n$). Let $\bar{X}_A$ and

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S_A be the sample mean and the sample standard deviation of location A, respectively. Similarly, $\bar{X}_B$ and S_B are the corresponding statistics from location B.

Use $\alpha = 0.05$ to answer the following questions. Please state your answer step-by step, including: (i) the null/alternative hypothesis; (ii) the test statistic(use $\bar{X}_.$ And $S_.$ to define your test statistic); (iii) the decision rule(including the distribution and critical value)

(a) (5%) Suppose that we have no idea whether the variances are equal or not. So how to use a statistical method to determine the variances are equal or not?

(b) (5%) Suppose that the variances are the same. Perform a hypothesis testing to determine whether the population means differ significantly.

(c) (10%) Let Z be 1 if it comes from location B and 0 otherwise. And Y be the income. We fit a simple linear regression model to this dataset $\{(Z_i, Y_i)\}_{i=1,\ldots,2n}$ and use the least squares method to get the estimated regression equation. Show that the least squares estimates of intercept and slope parameters are $\bar{X}_A$ and $\bar{X}_B - \bar{X}_A$, respectively.

Table I: Chi-square table

Upper tail	0.3	0.2	0.1	0.05	0.02	0.01	0.005	0.001
df 2	2.41	3.22	4.61	5.99	7.82	9.21	10.60	13.82
3	3.66	4.64	6.25	7.81	9.84	11.34	12.84	16.27
4	4.88	5.99	7.78	9.49	11.67	13.28	14.86	18.47
5	6.06	7.29	9.24	11.07	13.39	15.09	16.75	20.52
6	7.23	8.56	10.64	12.59	15.03	16.81	18.55	22.46
7	8.38	9.80	12.02	14.07	16.62	18.48	20.28	24.32
8	9.52	11.03	13.36	15.51	18.17	20.09	21.95	26.12
9	10.66	12.24	14.68	16.92	19.68	21.67	23.59	27.88
10	11.78	13.44	15.99	18.31	21.16	23.21	25.19	29.59
11	12.90	14.63	17.28	19.68	22.62	24.72	26.76	31.26
12	14.01	15.81	18.55	21.03	24.05	26.22	28.30	32.91
13	15.12	16.98	19.81	22.36	25.47	27.69	29.82	34.53
14	16.22	18.15	21.06	23.68	26.87	29.14	31.32	36.12
15	17.32	19.31	22.31	25.00	28.26	30.58	32.80	37.70
16	18.42	20.47	23.54	26.30	29.63	32.00	34.27	39.25
17	19.51	21.61	24.77	27.59	31.00	33.41	35.72	40.79
18	20.60	22.76	25.99	28.87	32.35	34.81	37.16	42.31
19	21.69	23.90	27.20	30.14	33.69	36.19	38.58	43.82
20	22.77	25.04	28.41	31.41	35.02	37.57	40.00	45.31
25	28.17	30.68	34.38	37.65	41.57	44.31	46.93	52.62
30	33.53	36.25	40.26	43.77	47.96	50.89	53.67	59.70
40	44.16	47.27	51.81	55.76	60.44	63.69	66.77	73.40
50	54.72	58.16	63.17	67.50	72.61	76.15	79.49	86.66

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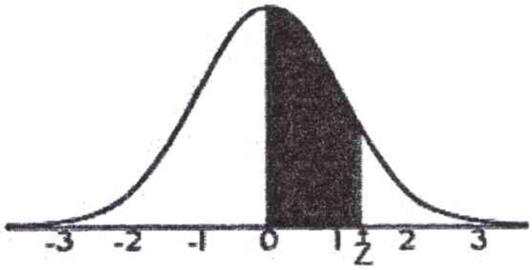

STANDARD NORMAL TABLE (Z)

Entries in the table give the area under the curve between the mean and z standard deviations above the mean. For example, for $z = 1.25$ the area under the curve between the mean (0) and z is 0.3944.

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3513	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

國立政治大學 109 學年度 碩士暨碩士在職專班 招生考試試題

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Table III: F table with $\alpha = 0.05$

Denominator DF	Numerator DF 1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。