國立中正大學
110 學年度碩士班招生考試
試 題

[第 4 節]

科目名稱	統計學
系所組別	財務金融學系

—作答注意事項—

※作答前請先核對「試題」、「試卷」與「准考證」之系所組別、科目名稱是否相符。

1. 預備鈴響時即可入場，但至考試開始鈴響前，不得翻閱試題，並不得書寫、畫記、作答。
2. 考試開始鈴響時，即可開始作答；考試結束鈴響畢，應即停止作答。
3. 入場後於考試開始 40 分鐘內不得離場。
4. 全部答題均須在試卷（答案卷）作答區內完成。
5. 試卷作答限用藍色或黑色筆（含鉛筆）書寫。
6. 試題須隨試卷繳還。

一、選擇題 (單選,每題 3 分)

1. Which of the following is not a required assumption for the analysis of variance?

(A) The random variable of interest for each population has a normal probability distribution.

(B) The variance associated with the random variable must be the same for each population.

(C) At least 2 populations are under consideration.

(D) Populations have equal means.

2. You are given the following information about y and x.

y	x
Dependent Variable	Independent Variable
5	1
4	2
3	3
2	4
1	5

The least squares estimate of b_0 (intercept) equals

(A) 1

(B) -1

(C) 6

(D) 5

3. The weights (in pounds) of a sample of 36 individuals were recorded and the following statistics were calculated.

mean = 160　　range = 60

mode = 165　　variance = 324

median = 170

The coefficient of variation equals

(A) 0.1125%

(B) 11.25%

(C) 203.12%

(D) 0.20312%

4. Two events with nonzero probabilities

(A) can be both mutually exclusive and independent

(B) can not be both mutually exclusive and independent

(C) are always mutually exclusive

(D) are always independent

5. If $P(A) = 0.4$, $P(B \mid A) = 0.35$, $P(A \cup B) = 0.69$, then $P(B) =$

(A) 0.14

(B) 0.43

(C) 0.75
(D) 0.59

6. Oriental Reproductions, Inc. is a company that produces handmade carpets with oriental designs. The production records show that the monthly production has ranged from 1 to 5 carpets. The production levels and their respective probabilities are shown below.

Production Per Month	Probability
x	f(x)
1	0.01
2	0.04
3	0.10
4	0.80
5	0.05

The standard deviation for the production is
(A) 4.32
(B) 3.74
(C) 0.374
(D) 0.612

7. When a continuous probability distribution is used to approximate a discrete probability distribution
(A) a value of 0.5 is added and/or subtracted from the area
(B) a value of 0.5 is added and/or subtracted from the value of x
(C) a value of 0.5 is added to the area
(D) a value of 0.5 is subtracted from the area

8. Z is a standard normal random variable. The P ($-1.20 \leq Z \leq 1.50$) equals
(A) 0.0483
(B) 0.3849
(C) 0.4332
(D) 0.8181

9. Use the normal approximation to the binomial distribution to answer this question. Fifteen percent of all students at a large university are absent on Mondays. If a random sample of 12 names is called on a Monday, what is the probability that four students are absent?
(A) 0.0683
(B) 0.0213
(C) 0.0021
(D) 0.1329

10. In computing the standard error of the mean, the finite population correction factor is used when
(A) $N/n > 0.05$
(B) $N/n \leq 0.05$
(C) $n/N > 0.05$

(D) n/N ≤ 30

11. Whenever the population has a normal probability distribution, the sampling distribution of $\bar{x}$ is a normal probability distribution for
    (A) only large sample sizes
    (B) only small sample sizes
    (C) any sample size
    (D) only samples of size thirty or greater
12. A population has a mean of 300 and a standard deviation of 18. A sample of 144 observations will be taken. The probability that the sample mean will be between 297 to 303 is
    (A) 0.4332
    (B) 0.8664
    (C) 0.9332
    (D) 0.0668
13. Doubling the size of the sample will
    (A) reduce the standard error of the mean to one-half its current value
    (B) reduce the standard error of the mean to approximately 70% of its current value
    (C) have no effect on the standard error of the mean
    (D) double the standard error of the mean
14. A sample of 20 items from a population with an unknown σ is selected in order to develop an interval estimate of μ. Which of the following is not necessary?
    (A) We must assume the population has a normal distribution.
    (B) We must use a t distribution.
    (C) Sample standard deviation must be used to estimate σ.
    (D) The sample must have a normal distribution.
15. To construct a confidence interval for the population mean, it is known that the population variance equals 484. With a 0.95 probability, the sample size that needs to be taken if the desired margin of error is 5 or less is
    (A) 25
    (B) 74
    (C) 189
    (D) 75
16. If a hypothesis test leads to the rejection of the null hypothesis,
    (A) a Type II error must have been committed
    (B) a Type II error may have been committed
    (C) a Type I error must have been committed
    (D) a Type I error may have been committed
17. For a one-tailed test (upper tail) at 93.7% confidence, Z =
    (A) 1.50

(B) 1.96
(C) 1.645
(D) 1.53

18. In order to determine whether or not there is a significant difference between the hourly wages of two companies, the following data have been accumulated.

Company 1	Company 2
$n_1 = 80$	$n_2 = 60$
$\bar{x}_1 = \$10.80$	$\bar{x}_2 = \$10.00$
$\sigma_1 = \$2.00$	$\sigma_2 = \$1.50$

The test statistic has a value of
(A) 1.96
(B) 1.645
(C) 0.80
(D) 2.7

19.

	Sample A	Sample B
s^2	12.1	5
n	11	10

We want to test the hypothesis that population A has a larger variance than population B.
The test statistic for this problem equals
(A) 0.4132
(B) 1.96
(C) 2.42
(D) 1.645

20. The owner of a car wash wants to see if the arrival rate of cars follows a Poisson distribution. In order to test the assumption of a Poisson distribution, a random sample of 150 ten-minute intervals was taken. You are given the following observed frequencies:

Number of Cars Arriving in a 10-Minute Interval	Frequency
0	3
1	10
2	15
3	23
4	30
5	24
6	20
7	13
8	8
9	4

The calculated value for the test statistic equals

(A) -0.18

(B) 0.18

(C) 1.72

(D) 2.89

二、計算題 (每題 10 分, 需詳列計算過程)

1. (10 points) You are given the following sample of 6 observations.

4　　6　　3　　4　　3　　10

Construct a 95% confidence interval for the population standard deviation.

2. (10 points) Last year, 30% of employees in a company were female. This year, in a random sample of 500 employees, 160 were female. At 95% confidence using the critical value approach, determine if there has been a significant increase in the proportion of females.

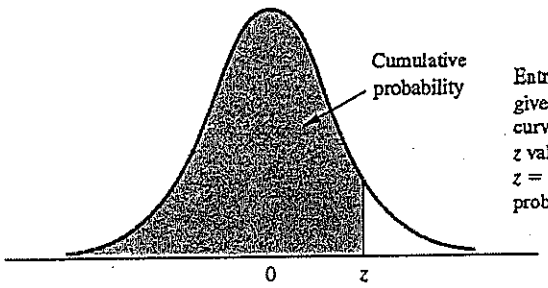
3. (10 points) The following table shows the results of a recent study regarding gender and three types of illness.

Illness	Males	Females	Totals
Type I	50	150	200
Type II	50	150	200
Type III	100	500	600
Totals	200	800	1000

We are concerned about whether or not illness is independent of gender. The null hypothesis is to be tested at 95% confidence. What do you conclude?

4. (10 points) Consider $\{X_i\}_{i=1}^{20}$ which independently and identically follow a uniform distribution U(0,1). Let $\bar{X} = \sum_{i=1}^{20} X_i/20$. Try to find an approximating value of $P(\bar{X} \leq 0.6)$.

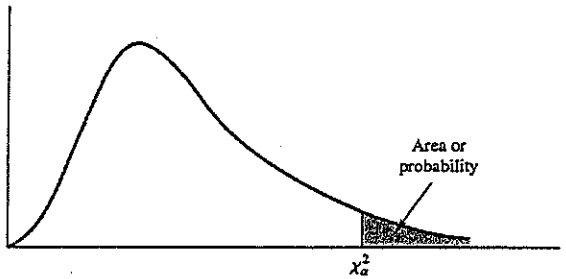
TABLE 1 Cumulative Probabilities for the standard Normal Distribution (*Continued*)



Entries in the table give the area under the curve to the left of the z value. For example, for $z = 1.25$, the cumulative probability is .8944.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990

TABLE 3 Chi-Square Distribution



Entries in the table give χ^2_α values, where α is the area or probability in the upper tail of the chi-square distribution. For example, with 10 degrees of freedom and a .01 area in the upper tail, $\chi^2_{.01} = 23.209$.

Degrees of Freedom	Area in Upper Tail									
	.995	.99	.975	.95	.90	.10	.05	.025	.01	.005
1	.000	.000	.001	.004	.016	2.706	3.841	5.024	6.635	7.879
2	.010	.020	.051	.103	.211	4.605	5.991	7.378	9.210	10.597
3	.072	.115	.216	.352	.584	6.251	7.815	9.348	11.345	12.838
4	.207	.297	.484	.711	1.064	7.779	9.488	11.143	13.277	14.860
5	.412	.554	.831	1.145	1.610	9.236	11.070	12.832	15.086	16.750
6	.676	.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.647	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.041	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.558
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.878	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.994
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.335

科目名稱：統計學
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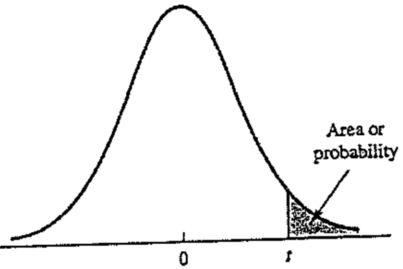
TABLE 2 *t* Distribution



Entries in the table give *t* values for an area or probability in the upper tail of the *t* distribution. For example, with 10 degrees of freedom and a .05 area in the upper tail, $t_{.05} = 1.812$.

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
1	1.376	3.078	6.314	12.706	31.821	63.656
2	1.061	1.886	2.920	4.303	6.965	9.925
3	.978	1.638	2.353	3.182	4.541	5.841
4	.941	1.533	2.132	2.776	3.747	4.604
5	.920	1.476	2.015	2.571	3.365	4.032
6	.906	1.440	1.943	2.447	3.143	3.707
7	.896	1.415	1.895	2.365	2.998	3.499
8	.889	1.397	1.860	2.306	2.896	3.355
9	.883	1.383	1.833	2.262	2.821	3.250
10	.879	1.372	1.812	2.228	2.764	3.169
11	.876	1.363	1.796	2.201	2.718	3.106
12	.873	1.356	1.782	2.179	2.681	3.055
13	.870	1.350	1.771	2.160	2.650	3.012
14	.868	1.345	1.761	2.145	2.624	2.977
15	.866	1.341	1.753	2.131	2.602	2.947
16	.865	1.337	1.746	2.120	2.583	2.921
17	.863	1.333	1.740	2.110	2.567	2.898
18	.862	1.330	1.734	2.101	2.552	2.878
19	.861	1.328	1.729	2.093	2.539	2.861
20	.860	1.325	1.725	2.086	2.528	2.845
21	.859	1.323	1.721	2.080	2.518	2.831
22	.858	1.321	1.717	2.074	2.508	2.819
23	.858	1.319	1.714	2.069	2.500	2.807
24	.857	1.318	1.711	2.064	2.492	2.797
25	.856	1.316	1.708	2.060	2.485	2.787
26	.856	1.315	1.706	2.056	2.479	2.779
27	.855	1.314	1.703	2.052	2.473	2.771
28	.855	1.313	1.701	2.048	2.467	2.763
29	.854	1.311	1.699	2.045	2.462	2.756
30	.854	1.310	1.697	2.042	2.457	2.750
31	.853	1.309	1.696	2.040	2.453	2.744
32	.853	1.309	1.694	2.037	2.449	2.738
33	.853	1.308	1.692	2.035	2.445	2.733
34	.852	1.307	1.691	2.032	2.441	2.728

TABLE 2 *t* Distribution (*Continued*)

Degrees of Freedom	Area in Upper Tail					
	.20	.10	.05	.025	.01	.005
35	.852	1.306	1.690	2.030	2.438	2.724
36	.852	1.306	1.688	2.028	2.434	2.719
37	.851	1.305	1.687	2.026	2.431	2.715
38	.851	1.304	1.686	2.024	2.429	2.712
39	.851	1.304	1.685	2.023	2.426	2.708
40	.851	1.303	1.684	2.021	2.423	2.704
41	.850	1.303	1.683	2.020	2.421	2.701
42	.850	1.302	1.682	2.018	2.418	2.698
43	.850	1.302	1.681	2.017	2.416	2.695
44	.850	1.301	1.680	2.015	2.414	2.692
45	.850	1.301	1.679	2.014	2.412	2.690
46	.850	1.300	1.679	2.013	2.410	2.687
47	.849	1.300	1.678	2.012	2.408	2.685
48	.849	1.299	1.677	2.011	2.407	2.682
49	.849	1.299	1.677	2.010	2.405	2.680
50	.849	1.299	1.676	2.009	2.403	2.678
51	.849	1.298	1.675	2.008	2.402	2.676
52	.849	1.298	1.675	2.007	2.400	2.674
53	.848	1.298	1.674	2.006	2.399	2.672
54	.848	1.297	1.674	2.005	2.397	2.670
55	.848	1.297	1.673	2.004	2.396	2.668
56	.848	1.297	1.673	2.003	2.395	2.667
57	.848	1.297	1.672	2.002	2.394	2.665
58	.848	1.296	1.672	2.002	2.392	2.663
59	.848	1.296	1.671	2.001	2.391	2.662
60	.848	1.296	1.671	2.000	2.390	2.660
61	.848	1.296	1.670	2.000	2.389	2.659
62	.847	1.295	1.670	1.999	2.388	2.657
63	.847	1.295	1.669	1.998	2.387	2.656
64	.847	1.295	1.669	1.998	2.386	2.655
65	.847	1.295	1.669	1.997	2.385	2.654
66	.847	1.295	1.668	1.997	2.384	2.652
67	.847	1.294	1.668	1.996	2.383	2.651
68	.847	1.294	1.668	1.995	2.382	2.650
69	.847	1.294	1.667	1.995	2.382	2.649
70	.847	1.294	1.667	1.994	2.381	2.648
71	.847	1.294	1.667	1.994	2.380	2.647
72	.847	1.293	1.666	1.993	2.379	2.646
73	.847	1.293	1.666	1.993	2.379	2.645
74	.847	1.293	1.666	1.993	2.378	2.644
75	.846	1.293	1.665	1.992	2.377	2.643
76	.846	1.293	1.665	1.992	2.376	2.642
77	.846	1.293	1.665	1.991	2.376	2.641
78	.846	1.292	1.665	1.991	2.375	2.640
79	.846	1.292	1.664	1.990	2.374	2.639

TABLE 2 *t* Distribution (*Continued*)

Degrees of Freedom	Area In Upper Tail					
	.20	.10	.05	.025	.01	.005
80	.846	1.292	1.664	1.990	2.374	2.639
81	.846	1.292	1.664	1.990	2.373	2.638
82	.846	1.292	1.664	1.989	2.373	2.637
83	.846	1.292	1.663	1.989	2.372	2.636
84	.846	1.292	1.663	1.989	2.372	2.636
85	.846	1.292	1.663	1.988	2.371	2.635
86	.846	1.291	1.663	1.988	2.370	2.634
87	.846	1.291	1.663	1.988	2.370	2.634
88	.846	1.291	1.662	1.987	2.369	2.633
89	.846	1.291	1.662	1.987	2.369	2.632
90	.846	1.291	1.662	1.987	2.368	2.632
91	.846	1.291	1.662	1.986	2.368	2.631
92	.846	1.291	1.662	1.986	2.368	2.630
93	.846	1.291	1.661	1.986	2.367	2.630
94	.845	1.291	1.661	1.986	2.367	2.629
95	.845	1.291	1.661	1.985	2.366	2.629
96	.845	1.290	1.661	1.985	2.366	2.628
97	.845	1.290	1.661	1.985	2.365	2.627
98	.845	1.290	1.661	1.984	2.365	2.627
99	.845	1.290	1.660	1.984	2.364	2.626
100	.845	1.290	1.660	1.984	2.364	2.626
∞	.842	1.282	1.645	1.960	2.326	2.576