

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

考試日期：0301，節次：3

**I. MULTIPLE CHOICE QUESTIONS (4% for each question)**

In the following multiple choice questions, choose the correct answer.

1. Of five letters (A, B, C, D, and E), two letters are to be selected at random. How many possible selections are there?
  - a. 20
  - b. 7
  - c. 5!
  - d. 10
2. Events that have no sample points in common are
  - a. independent events
  - b. posterior events
  - c. mutually exclusive events
  - d. complements
3. If a coin is tossed three times, the likelihood of obtaining three heads in a row is
  - a. zero
  - b. 0.500
  - c. 0.875
  - d. 0.125
4. For any continuous random variable, the probability that the random variable takes on exactly a specific value is
  - a. 1.00
  - b. 0.50
  - c. any value between 0 to 1
  - d. almost zero
5. Stratified random sampling is a method of selecting a sample in which
  - a. the sample is first divided into strata, and then random samples are taken from each stratum
  - b. various strata are selected from the sample
  - c. the population is first divided into strata, and then random samples are drawn from each stratum
  - d. None of these alternatives is correct.
6. The standard deviation of all possible  $\bar{x}$  values is called the
  - a. standard error of proportion
  - b. standard error of the mean
  - c. mean deviation
  - d. central variation

(背面仍有題目,請繼續作答)

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7. A population has a mean of 80 and a standard deviation of 7. A sample of 49 observations will be taken. The probability that the sample mean will be larger than 82 is
- 0.5228
  - 0.9772
  - 0.4772
  - 0.0228
8. For the interval estimation of  $\mu$  when  $\sigma$  is known and the sample is large, the proper distribution to use is
- the normal distribution
  - the t distribution with n degrees of freedom
  - the t distribution with n - 1 degrees of freedom
  - the t distribution with n - 2 degrees of freedom
9. Whenever the population standard deviation is unknown and the population has a normal or near-normal distribution, which distribution is used in developing an interval estimation?
- standard distribution
  - z distribution
  - beta distribution
  - t distribution
10. A random sample of 144 observations has a mean of 20, a median of 21, and a mode of 22. The population standard deviation is known to equal 4.8. The 95.44% confidence interval for the population mean is
- 15.2 to 24.8
  - 19.200 to 20.800
  - 19.216 to 20.784
  - 21.2 to 22.8

**Exhibit AA**

$$n = 36 \quad \bar{x} = 24.6 \quad S = 12 \quad H_0: \mu \leq 20$$
$$H_a: \mu > 20$$

11. Refer to Exhibit AA. The standardized test statistic equals
- 2.3
  - 0.38
  - 2.3
  - 0.38
12. For a one-tailed hypothesis test (upper tail) the p-value is computed to be 0.034. If the test is being conducted at 95% confidence, the null hypothesis
- could be rejected or not rejected depending on the sample size

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- b. could be rejected or not rejected depending on the value of the mean of the sample
- c. is not rejected
- d. is rejected

13. To construct an interval estimate for the difference between the means of two populations which are normally distributed and have equal variances, we must use a t distribution with (let  $n_1$  be the size of sample 1 and  $n_2$  the size of sample 2)
- a.  $(n_1 + n_2)$  degrees of freedom
  - b.  $(n_1 + n_2 - 1)$  degrees of freedom
  - c.  $(n_1 + n_2 - 2)$  degrees of freedom
  - d.  $n_1 - n_2 + 2$

**Exhibit BB**

The following information was obtained from matched samples.

The daily production rates for a sample of workers before and after a training program are shown below.

Worker	Before	After
1	20	22
2	25	23
3	27	27
4	23	20
5	22	25
6	20	19
7	17	18

14. Refer to Exhibit BB. The null hypothesis to be tested is  $H_0: \mu_d = 0$ . The test statistic is
- a. -1.96
  - b. 1.96
  - c. 0
  - d. 1.645
15. In an analysis of variance where the total sample size for the experiment is  $n_T$  and the number of populations is  $K$ , the mean square within treatments is
- a.  $SSE/(n_T - K)$
  - b.  $SSTR/(n_T - K)$
  - c.  $SSE/(K - 1)$
  - d.  $SSE/K$

(背面仍有題目,請繼續作答)

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**Exhibit CC**

To test whether or not there is a difference between treatments A, B, and C, a sample of 12 observations has been randomly assigned to the 3 treatments. You are given the results below.

Treatment	Observation			
A	20	30	25	33
B	22	26	20	28
C	40	30	28	22

16. Refer to Exhibit CC. The null hypothesis for this ANOVA problem is
- $\mu_1 = \mu_2$
  - $\mu_1 = \mu_2 = \mu_3$
  - $\mu_1 = \mu_2 = \mu_3 = \mu_4$
  - $\mu_1 = \mu_2 = \dots = \mu_{12}$
17. Refer to Exhibit CC. The mean square between treatments (MSTR) equals
- 1.872
  - 5.86
  - 34
  - 36
18. In a regression model involving more than one independent variable, which of the following tests must be used in order to determine if the relationship between the dependent variable and the set of independent variables is significant?
- t test
  - F test
  - Either a t test or a chi-square test can be used.
  - chi-square test
19. In a regression and correlation analysis if  $r^2 = 1$ , then
- SSE = SST
  - SSE = 1
  - SSR = SSE
  - SSR = SST
20. A graph showing the probability of accepting the lot as a function of the percent defective in the lot is
- a power curve
  - a control chart

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- c. an operating characteristic curve  
d. None of these alternatives is correct.

**Exhibit DD**

Five hundred randomly selected automobile owners were questioned on the main reason they had purchased their current automobile. The results are given below.

	Styling	Engineering	Fuel Economy	Total
Male	70	130	150	350
Female	<u>30</u>	<u>20</u>	<u>100</u>	<u>150</u>
	100	150	250	500

$H_0$ : automobile preference is independent of sex

$H_a$ : automobile preference is not independent of sex

21. According to Exhibit DD, what is chi-square test statistic?

- a. 15.891  
b. 24.056  
c. 29.890  
d. 31.746

22. Based on Exhibit DD and question number 21, what is your conclusion?

- a. do not reject the null hypothesis  
b. reject the null hypothesis  
c. can not judge  
d. none of the above

**Exhibit EE**

Below you are given a partial computer output based on a sample of 7 observations, relating an independent variable (x) and a dependent variable (y).

Predictor	Coefficient	Standard Error
Constant	24.112	8.376
x	-0.252	0.253

**Analysis of Variance**

SOURCE	SS
Regression	196.893
Error	94.822

(背面仍有題目,請繼續作答)

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23. Based on Exhibit EE, to test for the significance of the slope, what is the t test statistics?

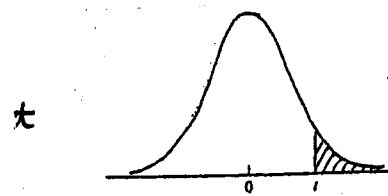
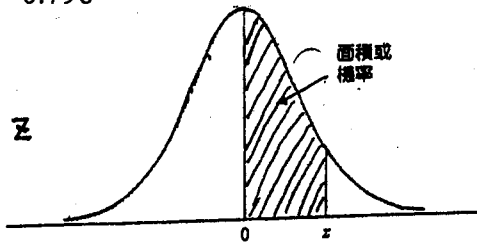
- a. 3.222
- b. 3.650
- c. 3.986
- d. 4.126

24. Based on Exhibit EE, to perform an F test, what is the F test statistic?

- a. 9.766
- b. 9.932
- c. 10.382
- d. 11.010

25. Based on Exhibit EE, what is the coefficient of determination?

- a. 0.545
- b. 0.675
- c. 0.776
- d. 0.798



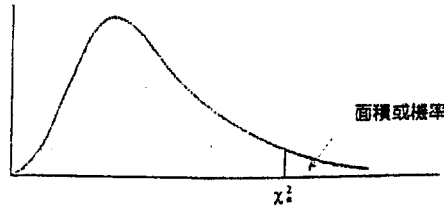
右尾面積(陰影部分)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	自由度	0.10	0.05	0.025	0.01	0.005
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359	1	3.078	6.314	12.706	31.821	63.657
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753	2	1.886	2.920	4.303	6.965	9.925
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141	3	1.638	2.353	3.182	4.541	5.841
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517	4	1.533	2.132	2.776	3.747	4.604
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879	5	1.476	2.015	2.571	3.365	4.032
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224	6	1.440	1.943	2.447	3.143	3.707
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549	7	1.415	1.895	2.365	2.998	3.499
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852	8	1.397	1.860	2.306	2.896	3.355
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133	9	1.383	1.833	2.262	2.821	3.250
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389	10	1.372	1.812	2.228	2.764	3.169
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621	11	1.363	1.796	2.201	2.718	3.106
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830	12	1.356	1.782	2.179	2.681	3.055
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015	13	1.350	1.771	2.160	2.650	3.012
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177	14	1.345	1.761	2.145	2.624	2.977
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319	15	1.341	1.753	2.131	2.602	2.947
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441	16	1.337	1.746	2.120	2.583	2.921
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545	17	1.333	1.740	2.110	2.567	2.898
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633	18	1.330	1.734	2.101	2.552	2.878
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706	19	1.328	1.729	2.093	2.539	2.861
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767	20	1.325	1.725	2.086	2.528	2.845
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817	21	1.323	1.721	2.080	2.518	2.831
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857	22	1.321	1.717	2.074	2.508	2.819
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890	23	1.321	1.717	2.074	2.508	2.819
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916	24	1.319	1.714	2.069	2.500	2.807
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936	25	1.318	1.711	2.064	2.492	2.797
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952	26	1.316	1.708	2.060	2.485	2.787
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964	27	1.315	1.706	2.056	2.479	2.779
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974	28	1.314	1.703	2.052	2.473	2.771
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981	29	1.313	1.701	2.048	2.467	2.763
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986	30	1.311	1.699	2.045	2.462	2.756
3.0	0.4986	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990	40	1.310	1.697	2.042	2.457	2.750
											60	1.303	1.684	2.021	2.423	2.704
											120	1.289	1.658	1.980	2.358	2.617
											∞	1.282	1.645	1.960	2.326	2.576

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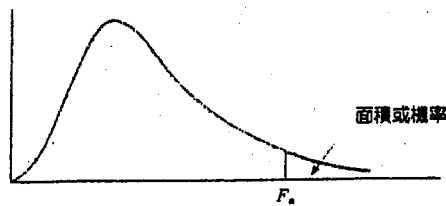
表 3 卡方分配



表中的數值是  $\chi^2_{\alpha}$ ，其中  $\alpha$  代表卡方分配右尾的面積或機率。例如，若自由度為 10 且右尾面積為 0.01，則  $\chi^2_{0.01} = 23.2093$ 。

自由度	右尾面積									
	0.995	0.99	0.975	0.95	0.90	0.10	0.05	0.025	0.01	0.005
1	$392,704 \times 10^{-10}$	$157,088 \times 10^{-9}$	$982,069 \times 10^{-9}$	$393,214 \times 10^{-8}$	0.0157908	2.70554	3.84146	5.02389	6.63490	7.87944
2	0.0100251	0.0201007	0.0506356	0.102587	0.210720	4.60517	5.99147	7.37776	9.21034	10.5966
3	0.0717212	0.114832	0.215795	0.351746	0.584375	6.25139	7.81473	9.34840	11.3449	12.8381
4	0.206990	0.297110	0.484419	0.710721	1.063623	7.77944	9.48773	11.1433	13.2767	14.8602
5	0.411740	0.554300	0.831211	1.145476	1.61031	9.23635	11.0705	12.8325	15.0863	16.7496
6	0.675727	0.872085	1.237347	1.63539	2.20413	10.6446	12.5916	14.4494	16.8119	18.5476
7	0.989265	1.239043	1.68987	2.16735	2.83311	12.0170	14.0671	16.0128	18.4753	20.2777
8	1.344419	1.646482	2.17973	2.73264	3.48954	13.3616	15.5073	17.5346	20.0902	21.9550
9	1.734926	2.087912	2.70039	3.32511	4.16816	14.6837	16.9190	19.0228	21.6660	23.5893
10	2.15585	2.55821	3.24697	3.94030	4.86518	15.9871	18.3070	20.4831	23.2093	25.1882
11	2.60321	3.05347	3.81575	4.57481	5.57779	17.2750	19.6751	21.9200	24.7250	26.7569
12	3.07382	3.57056	4.40379	5.22603	6.30380	18.5494	21.0261	23.3367	26.2170	28.2995
13	3.56503	4.10691	5.00874	5.89186	7.04150	19.8119	22.3621	24.7356	27.6883	29.8194
14	4.07468	4.66043	5.62872	6.57063	7.78953	21.0642	23.6848	26.1190	29.1413	31.3193
15	4.60094	5.22935	6.26214	7.26094	8.54675	22.3072	24.9958	27.4884	30.5779	32.8013
16	5.14224	5.81221	6.90766	7.96164	9.31223	23.5418	26.2962	28.8454	31.9999	34.2672
17	5.69724	6.40776	7.56418	8.67176	10.0852	24.7690	27.5871	30.1910	33.4087	35.7185
18	6.26481	7.01491	8.23075	9.39046	10.8649	25.9894	28.8693	31.5264	34.8053	37.1564
19	6.84398	7.63273	8.90655	10.1170	11.6509	27.2036	30.1435	32.8523	36.1908	38.5822

表 4 F 分配



表中的數值是  $F_{\alpha}$  值，其中  $\alpha$  代表 F 分配右尾之面積或機率。例如，若分子自由度為 12、分母自由度為 15 且右尾面積為 0.05，則  $F_{0.05} = 2.48$ 。

$F_{0.05}$  值之表

分母自由度	分子自由度																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	$\infty$
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.36
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13