

## Part I. 選擇題 (單選題，每題 3 分，不需計算過程)

- Suppose that  $E_1$ ,  $E_2$ , and  $A$  are events where  $E_1$  and  $E_2$  are mutually exclusive events.  $P(E_1) = 0.8$ ;  $P(E_2) = 0.2$ ;  $P(A | E_1) = 0.2$ ;  $P(A | E_2) = 0.4$ . Find  $P(A)$ .  
A) 0.16 B) 0.24 C) 0.32 D) None of these.
- The joint distribution of random variables  $X$  and  $Y$  is  $f(x, y) = k \cdot x \cdot y$ ,  $x = 1, 2, 3$ ,  $y = 1, 2, 3$ . Find  $P(X + Y = 3)$ .  
A) 1/9 B) 1/4 C) 1/36 D) None of these.
- Toss a fair coin three times and observe the number of heads ( $X =$  number of heads). Compute the variance of  $X$ .  
A) 0.50 B) 0.75 C) 1.25 D) 1.50
- Toss a fair coin one hundred times and observe the number of heads ( $X =$  number of heads). Find the probability  $P(X \geq 50)$  using the normal approximation.  
A)  $0.2 < p < 0.3$  B)  $0.3 < p < 0.4$  C)  $0.4 < p < 0.5$  D)  $0.5 < p < 0.6$
- $X$  is a Poisson random variable.  $3P(X=1) = 2P(X=2)$ . Find the probability  $P(X=3)$ .  
A)  $0 < p < 0.1$  B)  $0.1 < p < 0.2$  C)  $0.2 < p < 0.3$  D)  $0.3 < p < 0.4$
- A product manager knows that the number of boxes of supplies received per month is normally distributed with a mean of 200 and a standard deviation of 20. Find the probability that the number of boxes received per month is greater than 210 or less than 180.  
A)  $0.3 < p < 0.4$  B)  $0.4 < p < 0.5$  C)  $0.5 < p < 0.6$  D)  $0.6 < p < 0.7$
- According to an apple juice producer, historical records over the past 3 years have shown that 20 percent of consumers are dissatisfied with his apple juice. A survey based on 400 consumers has just been conducted. Find the probability that fewer than 64 consumers will not be satisfied with his apple juice.  
A)  $0 < p < 0.1$  B)  $0.1 < p < 0.2$  C)  $0.2 < p < 0.3$  D)  $0.3 < p < 0.4$
- The university investigates the cost of off-campus housing. A sample of 16 one-bedroom apartments resulted in a sample mean of \$3,000 per month and a sample standard deviation of \$580. Assume the sampled population to be normally distributed. Find the 95 percent confidence interval of the mean rent per month.  
A)  $3,000 \pm 284$  B)  $3,000 \pm 384$  C)  $3,000 \pm 309$  D)  $3,000 \pm 359$
- Consider a population  $\Pi = \{1, 2, 3, 4, 6\}$ . There are ten possible samples of size 2 (sampling without replacement). Using the ten sample mean values, compute the expected mean and the variance of the sample mean.  
A) 3.2 and 1.11 B) 2.5 and 1.11 C) 3.2 and 1.62 D) 2.5 and 1.62.
- Consider the hypothesis test:  $H_0: \mu \geq 10$  v.s.  $H_a: \mu < 10$ . The sample size is 120 and the population standard deviation is assumed to be 5. Find the probability of making a Type II error if the actual population mean is 8 at  $\alpha = 0.05$ .  
A) 0.0011 B) 0.0021 C) 0.0031 D) 0.0041.
- A mathematics teacher wants to see if there is any difference in the abilities of students enrolled in mathematics this year and those enrolled last year. A sample of final examination scores from students enrolled this year and from students enrolled last year was taken. You are given the following information.

	This Year	Last Year
$\bar{x}$	82	88
$\sigma^2$	112.5	54
$n$	45	36

The 95% confidence interval for the difference between the two population means is  
A) -15.62 to 3.62 B) -9.92 to -2.08 C) -8.64 to -3.46 D) -18.12 to 6.12
- Suppose employees at a company can use two different methods to perform a production task. A random sample of five workers is used. The following information was obtained from matched samples.

Worker	Completion Time for Method 1	Completion Time for Method 2
1	7	5
2	5	9
3	6	8
4	7	7
5	5	6

The 95% confidence interval for the difference between the two population means of completion time is

- A) -2.776 to 0.776    B) -3.776 to 1.776    C) -1.776 to -0.224    D) -4.776 to 2.776

13. The results of a recent poll on the preference of teenagers regarding the types of music they listen to are shown below.

Music Type	Teenagers Surveyed	Teenagers Favoring This Type
Pop	800	384
Rap	900	450

The 95% confidence interval for the difference between the two proportions is

- A) -0.068 to 0.028    B) -0.48 to 0.44    C) -0.028 to -0.012    D) -0.148 to 0.108

14. The manager of the service department of a local car dealership has noted that the service times of a sample of 30 new automobiles has a standard deviation of 6 minutes. A 95% confidence interval estimate for the standard deviation of the service times for all their new automobiles is

- A) 4.778 to 8.066    B) 2.564 to 4.044    C) 2.635 to 6.321    D) 22.547 to 66.108

15. Which of the following has a chi-square distribution?

- A)  $(n-1)\sigma/S$     B)  $(n-1)\sigma^2/S^2$     C)  $(n-1)S/\sigma$     D)  $(n-1)S^2/\sigma^2$

16. We are interested in determining whether or not the variances of the sales at two music stores (A and B) are equal. A sample of 26 days of sales at store A has a sample standard deviation of 30 while a sample of 16 days of sales from store B has a sample standard deviation of 20. The  $p$ -value for this test is

- A) between 0.02 and 0.05    B) between 0.05 and 0.1    C) between 0.1 and 0.2    D) between 0.3 and 0.4

17. 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
Total	150

The calculated value for the test statistic equals

- A) 4.72    B) 1.21    C) 0.18    D) 2.89

18. The following information regarding a dependent variable (Y) and an independent variable (X) is provided.

Y	X
4	2
3	1
4	4
6	3
8	5

The coefficient of determination is

- A) 0.375 B) 0.452 C) 0.625 D) 0.801

19. The following information regarding a dependent variable Y and an independent variable X is provided.

$$\begin{aligned} \Sigma X &= 90 & \Sigma (Y - \bar{Y})(X - \bar{X}) &= -156 \\ \Sigma Y &= 340 & \Sigma (X - \bar{X})^2 &= 234 \\ n &= 4 & \Sigma (Y - \bar{Y})^2 &= 1974 \\ SSR &= 104 \end{aligned}$$

The intercept of the regression equation is

- A) -100 B) 100 C) 1.667 D) -1.667

20. A regression model involved 18 independent variables and 200 observations. The critical value of t for testing the significance of each of the independent variable's coefficients will have

- A) 18 degrees of freedom B) 199 degrees of freedom C) 181 degrees of freedom D) 200 degrees of freedom

**Part II. 計算題 (需詳列計算過程)**

1. (10 points) The joint distribution of random variables X and Y is  $f(x, y) = c$ ,  $0 \leq x \leq y \leq 1$ , where c is a constant.

Find c, E(XY), E(X), E(Y), and Cov(X, Y).

2. (5 points) You are given the following random sample taken from a population that has a normal distribution.

10 14 20 16

Construct the 90% confidence interval for the population mean.

3. (5 points) Consider the hypothesis test:  $H_0: \mu \leq 25$  v.s.  $H_a: \mu > 25$ . A sample of size 40 provided a sample mean of 26.4. The population standard deviation is 6. Compute the value of test statistic and determine the result (reject or not reject  $H_0$ ) at  $\alpha = 0.01$

4. (10 points) In order to examine if the average monthly income of marketing managers in Kaohsiung is significantly different from Taipei, the following information was gathered.

Kaohsiung	Taipei
$n_1 = 40$	$n_2 = 45$
$\bar{x}_1 = 72$ (in \$1,000)	$\bar{x}_2 = 78$ (in \$1,000)
$s_1 = 6$ (in \$1,000)	$s_2 = 8$ (in \$1,000)

A) At 5% significance level, test the hypothesis.

B) At 95% confidence, develop an interval estimate for the difference between the average monthly incomes of the marketing managers in Kaohsiung and Taipei.

5. (5 points) Shoppers were asked where they do their regular grocery shopping. The table below shows the responses of the sampled shoppers. We are interested in determining if the proportions of females in the three categories are equal.

Gender	Grocery chain	Discount store	Membership warehouse	Total
Female	230	80	100	410
Male	80	50	60	190
Total	310	130	160	600

At 5% significance level, what is the conclusion of the test?

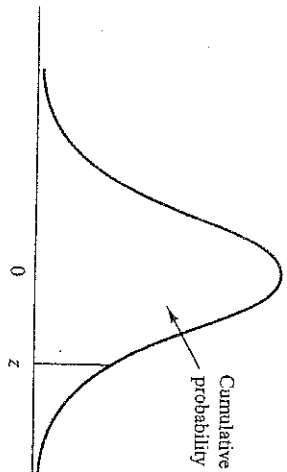
6. (5 points) Park, Inc. has three stores located in three different areas. Random samples of the sales of the three stores (in \$1,000) are shown below.

Store 1	Store 2	Store 3
88	76	85
84	78	67
88	60	58
82	62	
93		

Fill out the following ANOVA table

Source of Variation	SS	df	MS	F
Between Groups				
Within Groups				
Total				

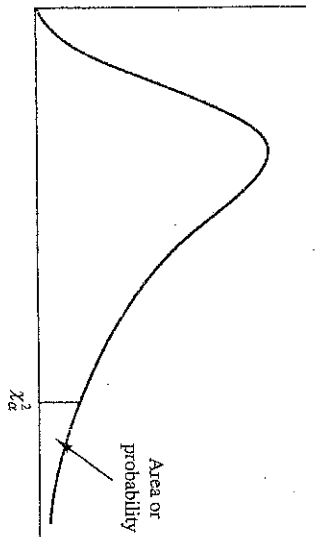
TABLE 1 CUMULATIVE PROBABILITIES FOR THE STANDARD NORMAL DISTRIBUTION (Continued)



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.

Table with 10 columns (z values from .00 to .09) and 20 rows (z values from 0.00 to 3.0). It lists cumulative probabilities for the standard normal distribution.

TABLE 3 CHI-SQUARE DISTRIBUTION



Entries in the table give  $\chi^2_{\alpha}$  values, where  $\alpha$  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,  $\chi^2_{.01} = 23.209$ .

Table with columns for Degrees of Freedom (1-100) and Area in Upper Tail (0.95 to 0.005). It lists chi-square values for various degrees of freedom and tail areas.

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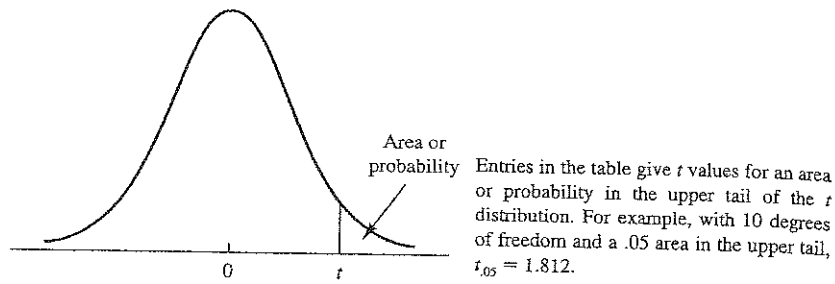
系所別：財務金融學系

科目：統計學

## 第 2 節

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TABLE 2 *t* DISTRIBUTION



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

