

# 中原大學 102 學年度 碩士班 入學考試

102/3/2 15:30 ~ 17:00 國際經營與貿易學系

誠實是我們珍視的美德，  
我們喜愛「拒絕作弊，堅守正直」的你！

科目：統計學

(共 4 頁第 1 頁)

■ 可使用計算機，惟僅限不具可程式及多重記憶者

□ 不可使用計算機

答案精確到小數點第 4 位，沒有計算過程不給分。

1. A retailer of electronic equipment received six VCRs from the manufacturer. Three of the VCRs were damaged in the shipment. The retailer sold two VCRs to two customers.
  - (a). What is the probability that both customers received damaged VCRs? (5%)
  - (b). What is the probability that one of the two customers received a defective VCR? (5%)
2. A manufacturing process produces items whose weights are normally distributed. It is known that 22.57% of all the items produced weigh between 100 grams up to the mean and 49.18% weigh from the mean up to 190 grams. Determine the mean and the standard deviation. (10%)
3. The following table shows the results of recent study regarding gender of individuals and their selected field of study.

Field of study	Male	Female	TOTAL
Medicine	80	40	120
Business	60	20	80
Engineering	160	40	200
TOTAL	300	100	400

Using the critical method approach at 90% confidence, test for the independence of major and gender. (10%)

4. 一汽車銷售公司欲知年廣告費用 (百萬元,  $X$ ) 與汽車年銷售量 (1000 部,  $Y$ ) 之間的關係，乃抽取了 10 年的資料，得如下的資料：

$$\Sigma X = 28, \quad \Sigma X^2 = 303.4, \quad \Sigma Y = 75, \quad \Sigma Y^2 = 598.5, \quad \Sigma XY = 237.$$

- (a). 試求迴歸直線  $\hat{Y} = b_0 + b_1 X$ 。(5%)
- (b). 檢定是否廣告費愈多，汽車的銷售量就愈高 ( $\alpha = 0.05$ ) ? (5%)
- (c). 試求  $\beta_1$  的 95% 信賴區間。(5%)
- (d). 試求判定係數。(5%)

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5. A producer of various kinds of batteries has been producing "D" size batteries with a life expectancy of 87 hours. Due to an improved production process, management believes that there has been an increase in the life expectancy of their "D" size batteries. A sample of 36 batteries showed an average life of 88.5 hours. Assume from past information that it is known that the standard deviation of the population is 9 hours.
- Give the null and the alternative hypotheses. Compute the test statistic. At 99% confidence using the critical value approach, test management's belief. (5%)
  - What is the  $p$ -value associated with the sample results? What is your conclusion based on the  $p$ -value? (5%)
  - If the true life expectancy of the batteries is 90 hours, calculate the probability of Type II error. (5%)
  - The manager wants to control the probability of making a Type I error ( $\alpha$ ) and the probability of making a Type II error ( $\beta$ ) where  $\alpha = 5\%$  and  $\beta = 10\%$ . If the true life expectancy of the batteries is 90 hours, how many batteries should be selected to test? (5%)
6. If the joint probability density of  $x$  and  $y$  is given by
- $$f(x, y) = \begin{cases} \frac{2}{3}(x+2y) & \text{for } 0 < x < 1, 0 < y < 1 \\ 0 & \text{elsewhere} \end{cases}$$
- Find  $f(x|y)$ . (10%)
  - Find the conditional mean and the conditional variance of  $x$  given  $y = \frac{1}{2}$ . (10%)
7. Find the maximum likelihood estimator of the parameter  $\lambda$  of an exponential density function,  $f(x) = \lambda e^{-\lambda x}$ . (10%)

$$x_{0.05,(2)}^2 = 5.9915, \quad x_{0.05,(3)}^2 = 7.8147, \quad x_{0.05,(4)}^2 = 9.4877$$

$$x_{0.1,(2)}^2 = 4.6052, \quad x_{0.1,(3)}^2 = 6.2514, \quad x_{0.1,(4)}^2 = 7.7794$$

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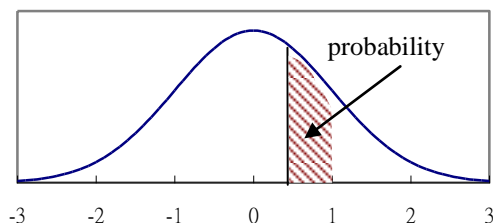
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科目：統計學

(共 4 頁第 3 頁)

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**Table 1 Standard Normal Distribution**

	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
<b>0.0</b>	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
<b>0.1</b>	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
<b>0.2</b>	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
<b>0.3</b>	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
<b>0.4</b>	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
<b>0.5</b>	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
<b>0.6</b>	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
<b>0.7</b>	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
<b>0.8</b>	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
<b>0.9</b>	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
<b>1.00</b>	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
<b>1.10</b>	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
<b>1.20</b>	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
<b>1.30</b>	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
<b>1.40</b>	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
<b>1.50</b>	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
<b>1.60</b>	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
<b>1.70</b>	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
<b>1.80</b>	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
<b>1.90</b>	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
<b>2.00</b>	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
<b>2.10</b>	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
<b>2.20</b>	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
<b>2.30</b>	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
<b>2.40</b>	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
<b>2.50</b>	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
<b>2.60</b>	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
<b>2.70</b>	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
<b>2.80</b>	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981

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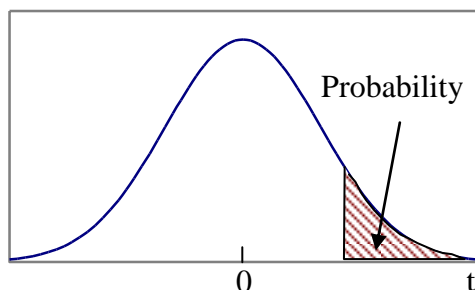


Table 2 t Distribution

df\p	0.25	0.1	0.05	0.025	0.01	0.005	0.0005
1	1.0000	3.0777	6.3138	12.7062	31.8205	63.6567	636.6192
2	0.8165	1.8856	2.9200	4.3027	6.9646	9.9248	31.5991
3	0.7649	1.6377	2.3534	3.1825	4.5407	5.8409	12.9240
4	0.7407	1.5332	2.1318	2.7765	3.7470	4.6041	8.6103
5	0.7267	1.4759	2.0150	2.5706	3.3649	4.0321	6.8688
6	0.7176	1.4398	1.9432	2.4469	3.1427	3.7074	5.9588
7	0.7111	1.4149	1.8946	2.3646	2.9980	3.4995	5.4079
8	0.7064	1.3968	1.8595	2.3060	2.8965	3.3554	5.0413
9	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498	4.7809
10	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693	4.5869
11	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058	4.4370
12	0.6955	1.3562	1.7823	2.1788	2.6810	3.0545	4.3178
13	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123	4.2208
14	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768	4.1405
15	0.6912	1.3406	1.7531	2.1315	2.6025	2.9467	4.0728
16	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208	4.0150
17	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982	3.9651
18	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784	3.9216
19	0.6876	1.3277	1.7291	2.0930	2.5395	2.8609	3.8834
20	0.6870	1.3253	1.7247	2.0860	2.5280	2.8453	3.8495
21	0.6864	1.3232	1.7207	2.0796	2.5177	2.8314	3.8193
22	0.6858	1.3212	1.7171	2.0739	2.5083	2.8188	3.7921
23	0.6853	1.3195	1.7139	2.0687	2.4999	2.8073	3.7676
24	0.6849	1.3178	1.7109	2.0639	2.4922	2.7969	3.7454
25	0.6844	1.3163	1.7081	2.0595	2.4851	2.7874	3.7251
26	0.6840	1.3150	1.7056	2.0555	2.4786	2.7787	3.7066
27	0.6837	1.3137	1.7033	2.0518	2.4727	2.7707	3.6896