國立臺灣師範大學 100 學年度碩士班招生考試試題

科目：**統計學**　　適用系所：**全球經營與策略研究所**

注意：1.本試題共 3 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則不予計分。

1. If a quality control manager wants to estimate the mean life of light bulbs to within ±10 hours with 95% confidence and also assumes that the population standard deviation is 40 hours, how many light bulbs need to be selected? (本題 10 分)

2. From a shipment of 20 cars being sent to a local automobile dealer, 3 are hybrid electric vehicles (HEVs). What is the probability that if 3 cars arrive at a particular dealership, (本大題請寫至小數點以下第四位)
   (a) all 3 are HEVs? (本題 10 分)
   (b) none are HEVs? (本題 5 分)
   (c) at least 1 is a HEV? (本題 5 分)

3. A bond service provider has three rating categories (A, B, and C). Suppose that in the past year, of the corporate bonds issued throughout Taiwan, 60% were rated "A", 25% were rated "B", and 15% were rated "C". Of the corporate bonds rated "A", 55% were issued by X Corporation, 40% by Y Corporation, and 5% by Z Corporation. Of the corporate bonds rated "B", 55% were issued by X Corporation, 15% by Y Corporation, and 30% by Z Corporation. Of the corporate bonds rated "C", 80% were issued by X Corporation, 10% by Y Corporation, and 10% by Z Corporation.
   (a) If a new corporate bond is to be issued by X Corporation, what is the probability that it will receive an "A" rating? (本題 10 分)
   (b) What proportion of corporation bonds are issued by Y Corporation? (本題 10 分)

4. Channex cosmetic company tested three packaging materials for moisture retention by storing the same cream product in each of them for a fixed period of time and then determining the moisture loss. Each material was used to package 10 cream items. The results are given in the accompanying table.
   (a) Construct the analysis of variance table. (本題 10 分)
   (b) Write down the null and alternative hypotheses on equality of three packaging materials for moisture retention. (本題 3 分)
   (c) Can we reject the hypothesis that the materials are equally effective? Let the level of significance be 0.5. (本題 7 分)

	Material 1	*Material 2*	*Material 3*
Number of Packages	10	10	10
Mean Loss	224	232	228
Sample Variance	30	35	40

$F_{0.95,2,27} = 3.354$, $F_{0.95,3,29} = 2.934$, $F_{0.975,2,27} = 4.242$, $F_{0.975,3,29} = 3.607$,
$t_{0.95,29} = 1.699$, $t_{0.95,28} = 1.701$, $t_{0.95,26} = 1.706$, $t_{0.975,29} = 2.045$, $t_{0.975,28} = 2.048$, $t_{0.975,26} = 2.056$.

5. A multiple regression analysis with sales (in thousands of dollars) of a product as the dependent variable Y, and advertising expenditure X_1 (in thousands of dollars) and market share X_2 as the independent variables, was done by Shilob company, with a sample of $n = 10$ retail outlets. The analysis of variance table for the multiple regression is presented in the accompanying table. The sample multiple regression equation is $\hat{Y} = 10 + 3.5X_1 + 6.4X_2$, $SSX_1 = 2.83$, $SSX_2 = .8$, and $r_{12}^2 = .6$.

   (a) Test the overall significance of the multiple regression relationship. That is, test H_0: $\beta_1 = \beta_2 = 0$ against H_a: One or more of the β_i values is not equal to zero. Let the level of significance be 0.5. (本題 8 分)

   (b) Test the hypothesis that X_2 adds no explanatory power to the multiple regression equation over and above that which is provided by X_1. That is, test H_0: $\beta_2 = 0$ against H_a: $\beta_2 \neq 0$, and let the level of significance be 0.5. (本題 8 分)

   (c) Find the predicted value for Y given that advertising expenditure is \$10,000 and market share is 60%. (本題 7 分)

(d) Find a 95% confidence interval for the mean sales given that advertising expenditure is \$10,000 and market share is 60%. Let the standard error of the predicted value of Y be 3.48. (本題 7 分)

ANOVA

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square
Regression	17	2	8.5
Error	9	7	1.29
Total	26	9	

$SSX_i = \sum (X_i - \overline{X}_i)^2$, $F_{0.975,2,7} = 6.542$, $F_{0.95,2,7} = 4.737$, $F_{0.975,2,9} = 5.715$, $F_{0.95,2,9} = 4.257$, $t_{0.95,7} = 1.895$, $t_{0.975,7} = 2.365$, $t_{0.975,9} = 2.262$, $t_{0.95,9} = 1.833$.

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常態分配表										
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	0.0199	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	0.2967	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	0.3531	0.3554	0.3577	0.3599	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
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998