

元智大學 100 學年度研究所 碩士班 招生試題卷

系(所)別： 管理學院經營管
理碩士班

組別： 國際企業碩士學
程

科目： 統計學

用紙第 1 頁共 5 頁

● 可以使用不具儲存程式功能之電子計算機

Part I

Q1 (15 points, 5 points each) In a large company, 80% of the employees favor unionization. A researcher selected 6 employees from this company. This sample follows the binominal distribution, and the density function of the distribution is listed below. Please answer the following questions.

$$P(x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{n-x}$$

- (1) Find the probability that 5 or more employees favor unionization.
- (2) Find the probability that 3 or fewer employees favor unionization.
- (3) Find the probability that exactly 2 employees among the 6 selected do NOT favor unionization.

Q2 (16 points, 4 points each) A local country club has a membership of 600 and operates facilities that include an 18-hole championship golf course and 12 tennis courts. Before deciding whether to accept new members, the club president would like to know how many members regularly use each facility. A survey of the membership indicates that 65% regularly use the golf course, 44% regularly use the tennis courts, and 8% use neither of these facilities regularly. Let T = regularly use the tennis courts, and let G = regularly use the golf course.

Please answer the following questions according to the above situation.

- (1) Use T and G to represent the 8% use neither of these facilities regularly.
- (2) What is the probability that a member regularly uses at least one of these facilities?
- (3) What is the probability that a member regularly uses both facilities?
- (4) If a member regularly uses the tennis courts, what is the probability that he/she will NOT use the golf course?

Q3 (8 points) As Internet usage proliferates, so do questions of security and confidentiality of personal information, including such things as social security and credit card numbers. NCR Corporation surveyed 1,000 U.S. adults and asked them under what circumstances they would give personal information to a company. 290 people said they would never give personal data to a company. Please establish the 90% confidence interval and use this interval to evaluate whether the proportion that people would never give personal data to a company is smaller than 35%.

Q4-Q7 Multiple Choices (單選題 8 分, 每題 2 分)

Q4 (2 points) Consider a confidence interval from a sample knowing the population standard deviation. Which of following action will widen the confidence interval if we keep other factors constant?

- a. Increase α
- b. Increase population standard deviation
- c. Increase sample size
- d. None of above

Q5 (2 points) Which of the following action will increase power when other factors are constant?

- a. Increase β
- b. Increase α
- c. Decrease sample size
- d. None of above

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Q6 (2 points) When we calculate sample size, which of the following action will increase the sample size when keeping other factors constant?

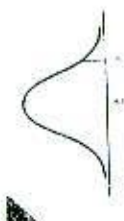
- Decrease population standard deviation
- Decrease $Z_{\alpha/2}$
- Decrease E
- None of above

Q7 (2 points) Keeping other factors constant, which of following action will increase β (Type II Error)?

- Increase sample size.
- Increase the distance between true mean and hypothesis mean.
- Decrease Type I Error.
- None of above

Q8 (3 points) Please draw a box plot according to the data below.

5 10 4 5 3 17 10 11 6 19



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5949	0.5988	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9985	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990

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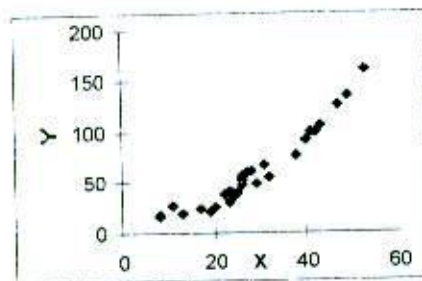
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Part II

I. Multiple Choice (單選題 20 分，每題 2 分)

- A chi-square goodness-of-fit test is to be used to determine if a distribution is normally distributed. The data will be divided into "k" categories. Both the mean and standard deviation must be estimated. The degrees of freedom would be _____. A. k-1 B. k-2 C. k-3 D. k-4
- The following scatter plot indicates _____.



- A. a log x transform may be useful B. a y^2 transform may be useful C. a x^2 transform may be useful D. no transform is needed
- A goodness of fit test is to be performed to see if consumers prefer any of three package designs (A, B, and C) more than the other two. A sample of 60 consumers are used. What is the expected frequency for category A? A. 1/3 B. 20 C. 60 D. 10
- A chi-square goodness of fit test is to be performed to see if data fit the Poisson distribution. There are 6 categories, and lambda must be estimated. How many degrees of freedom should be used? A. 6 B. 5 C. 4 D. 3
- BigShots, Inc. is a specialty e-tailer that operates 87 catalog Web sites on the Internet. Kevin Conn, Sales Director, feels that the style (color scheme, graphics, fonts, etc.) of a Web site may affect its sales. He chooses three levels of design style (neon, old world, and sophisticated) and randomly assigns six catalog Web sites to each design style. In Kevin's experiment "style" is _____. A. the dependent variable B. a treatment variable C. a concomitant variable D. a blocking variable
- The same issue as Q5, In Kevin's experiment "sales at a Web site" is _____. A. a blocking variable B. a concomitant variable C. a treatment variable D. the dependent variable
- Restaurateur Denny Valentine is evaluating two sites, Raymondville and Rosenberg, for his next restaurant. Prevailing images of the two suburbs imply that Raymondville residents (population 1) dine out less often than Rosenberg residents (population 2). Denny commissions a market survey to test this hypothesis. The market researcher used a random sample of 64 families from each suburb, and reported the following: $\bar{x}_1 = 16$ times per month, $\bar{x}_2 = 14$ times per month, $s_1 = 4$, and $s_2 = 3$. Assuming $\alpha = .01$, the appropriate decision is _____. A. reject the null hypothesis $\sigma_1 < \sigma_2$ B. accept the alternate hypothesis $\mu_1 > \mu_2$ C. reject the alternate hypothesis $n_1 = n_2 = 64$ D. do not reject the null hypothesis $\mu_1 \leq \mu_2$
- Michael Fugate, Marketing Manager at Classic Merchandise, is investigating response rates to scented and unscented direct mail catalogs. If the response rate for the scented catalog (population 1) is higher, Mike will adopt the scented version. His staff randomly selects two samples of 200 each from the

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- company's customer database. One month after the 400 test catalogs were mailed, forty-five orders (twenty-five from the scented and twenty from the unscented) were received from the test catalogs. Assuming $\alpha = .01$, Mike's null hypothesis is _____.
- A. $\sigma_1 < \sigma_2$ B. $\mu_1 = \mu_2$ C. $\mu_1 \geq \mu_2$ D. $P_1 \leq P_2$
9. Michael Fugate, Marketing Manager at Classic Merchandise, is investigating response rates to scented and unscented direct mail catalogs. If the response rate for the scented catalog (population 1) is higher, Mike will adopt the scented version. His staff randomly selects two samples of 200 each from the company's customer database. One month after the 400 test catalogs were mailed, forty-five orders (twenty-five from the scented and twenty from the unscented) were received from the test catalogs. Assuming $\alpha = .01$, the critical z value is _____.
- A. -1.645 B. 2.33 C. 1.96 D. 2.58
10. Hope Hernandez, Marketing Manager of People's Pharmacy, Inc., wants a regression model to predict sales in the greeting card department. Her data set includes two qualitative variables: the pharmacy neighborhood (urban, suburban, and rural), and lighting level in the greeting card department (soft, medium, and bright). The number of dummy variables needed for in Hope's regression model is _____.
- A. 2 B. 4 C. 6 D. 8

II. Please fill in the blanks from (1) through (10). (共 20 分) (每小格 2 分)

1. A microcomputer manufacturer has developed a regression model relating his sales (Y in \$10,000s) with three independent variables. The three independent variables are price per unit (Price in \$100s), advertising (ADV in \$1,000s) and the number of product lines (Lines). Part of the regression results is shown below.

	Coefficient	Standard Error
Constant	1.0211	22.8752
Price	-0.1524	0.1411
ADV	0.8849	0.2886
Lines	-0.1463	1.5340

Analysis of Variance

Source of Variation	Degrees of Freedom	Sum of Squares
Regression		2708.61
Error (Residuals)	14	2840.51

- a. Use the above results and write the regression equation that can be used to predict sales. _____(1)_____
- b. What has been the sample size for this analysis? _____(2)_____
- c. Compute the coefficient of determination and fully interpret its meaning _____(3)_____
- d. At $\alpha = 0.05$, test to see if there is a significant relationship between sales and the number of product lines. _____(4)_____

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e. Is the regression model significant? (Perform an F test.) ____ (5) ____

$$F_{0.05,3,11} = 7.6, F_{0.05,2,12} = 8.51, F_{0.05,1,12} = 7.23, F_{0.05,2,8} = 11.04, F_{0.05,4,8} = 8.81, F_{0.05,3,8} = 9.6$$

2. The management of a department store is interested in estimating the difference between the mean credit purchases of customers using the store's credit card versus those customers using a national major credit card. Independent samples of credit sales are shown below.

	Store's Card	Major Credit Card
Sample size	64	49
Sample mean	\$140	\$125
Sample standard deviation	\$10	\$8

- a. A point estimate for the difference between the mean purchases of the users of the two credit cards is ____ (6) ____
- b. A 95% confidence interval estimate for the difference between the average purchases of the customers using the two different credit cards is ____ (7) ____
3. In the past, 35% of the students at ABC University were in the Business College, 35% of the students were in the Liberal Arts College, and 30% of the students were in the Education College. To see whether or not the proportions have changed, a sample of 300 students was taken. Ninety of the sample students are in the Business College, 120 are in the Liberal Arts College, and 90 are in the Education College.
- a. This problem is an example of a ____ (8) ____ distribution
- b. The expected frequency for the Business College is ____ (9) ____
- c. The calculated value for the test statistic equals ____ (10) ____

III Calculation (共 10 分)

The marketing department of a company has designed three different boxes for its product. It wants to determine which box will produce the largest amount of sales. Each box will be test marketed in five different stores for a period of a month. Below you are given the information on sales.

	Store 1	Store 2	Store 3	Store 4	Store 5
Box 1	210	230	190	180	190
Box 2	195	170	200	190	193
Box 3	295	275	290	275	265

- a. State the null and alternative hypotheses. (2分)
- b. Construct an ANOVA table. (3分)
- c. What conclusion do you draw? (2分)
- d. LSD = 33.73, use Fisher's LSD procedure and determine which mean (if any) is different from the others. Let $\alpha = 0.05$. (3分)

$$F_{0.05,3,11} = 7.6, F_{0.05,2,12} = 8.51, F_{0.05,1,12} = 7.23, F_{0.05,2,8} = 11.04, F_{0.05,4,8} = 8.81, F_{0.05,3,8} = 9.6$$