國立臺灣師範大學101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，否則依規定扣分。

1. Suppose that a survey has been undertaken to determine if there is a relationship between place of residence and ownership of a foreign-made automobile. A random sample of 200 car owners from large cities, 150 from rural areas was selected with the following results.

	Type of Area			
Car Ownership	Large City	Suburb	Rural	Total
Own foreign car	110	60	30	200
Do not own foreign car	90	90	120	300
Total	200	150	150	500

(a) If a car owner is selected at random, what is the probability that he or she

(1) owns a foreign car? 2 points

(2) lives in a suburb? 2 points

(3) owns a foreign car or lives in a large city? 2 points

(4) lives in a large city or a suburb? 2 points

(5) lives in a large city and owns a foreign car? 2 points

(6) lives in a rural area or does not own a foreign car? 2 points

(b) Assume that we know that the person selected lives in a suburb. What is the probability that he or she owns a foreign car? 3 points

(c) Is area of residence statistically independent of whether the person owns a foreign car? Explain. 10 points (Hint. $\chi^2_{0.95,2} = 5.99, \chi^2_{0.95,6} = 12.59, \chi^2_{0.975,2} = 7.38, \chi^2_{0.975,6} = 14.45$.)

2. A political pollster is conducting an analysis of sample results in order to make predictions on election night. Assuming a two-candidate election, if a specific candidate receives at least 55% of the vote in the sample, then that candidate will be forecast as the winner of the election.

(a) If a random sample of 100 votes is selected, what is the probability that a candidate will be forecast as the winner when

(1) the true percentage of his vote is 51%? 5 points

(2) the true percentage of his vote is 60%? 5 points

(3) the true percentage of his vote is 49.5%? 5 points

(b) Determine the probability of Type II Error, ß, given the true percentage of a candidate's vote is 49.5%, a random sample of 100 votes is selected, and a equals to 0.05. 10 points

3. One marketing specialist processes an experiment about two new video games (named as gameA and gameB). The goal of the experiment is to examine whether there are significant differences across gender and age group on the magnitude of preference on gameA and gameB. For gender variable, female was coded as 0 and male was coded as 1. For age group, the subject who's younger than 25 was coded as 0 (young group), otherwise coded as 1 (adult group). After a short experience with

playing the two new video games, every subject evaluates their preference toward the gameA and gameB using an interval scale of 0 to 50. Please answer the following questions:

(a) In order to examine the differences of subjects' preference on gameA and gameB, the marketing specialist uses the ANOVA (analysis of variance) to analyze the data. Please explain what would be the dependent variable(s), independent variable(s), and the experiment design in the ANOVA? Furthermore, if there is any technique other than univariate ANOVA could be used to analyze the data? Please explain. 10 points

(b) Results of ANOVA indicated that the SS_{total}=100, SS_{gender}=5, $SS_{age\ group}$=15, and SS_{within}=60. Please prepare a summary table of ANOVA along with the appropriate test statistics for the significance of main effects and interaction effects. Explain your conclusions. 10 points (Hint. $F_{.95(1,30)}$=4.17)

(c) If the marketing specialist computed the correlation coefficients among the four variables of subjects' gender, real age, preferences of gameA and gameB, the results were listed in the below table. Please indicate what would be the significant coefficients related to the measures of preference. Furthermore, using the information listed in the table to indicate the computing formula of the correlation coefficient (.605) between preference of gameA and gameB. 10 points

	Mean	SD	1.	2.	3.	4.
1. Gender	0.41	0.5	1.00			
2. Real Age	34.29	2.7	.335	1.00		
3. Preference of gameA	33.49	10.0	.420*	.589**	1.00	
4. Preference of gameB	28.46	9.6	.369	.688**	.605**	1.00

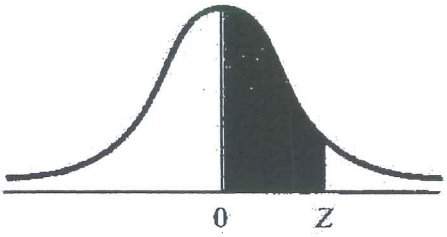
* p<.05 ** p<.01

(d) If the marketing specialist took the two variables of subjects' gender and real age to predict their preferences on gameA and gameB using multiple regression. The regression equations were listed below. Please explain the meaning of the values in these two equations and answer if the two equations can be compare to each other. Furthermore, compute the predicted preference of gameA and gameB for one 20 year-old female, and indicate that which video game she might prefer to. 10 points

$$\hat{Y}_{gameA} = 5.02Gender + 1.88Age + 4.58 \qquad \hat{Y}_{gameB} = 2.99Gender + 2.26Age - 15.07$$

(e) If the R^2 of the regression analysis listed above is .40 and .50, respectively. What does the value mean? Furthermore, what is the difference between R^2 and adjusted R^2? Should we pay attention to the adjusted R^2 in this example? Explain. 10 points

Table E.2a *The Standardized Normal Distribution*



Entry represents area under the standardized normal distribution from the mean to Z

Z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
0.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
0.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
0.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
0.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
0.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
0.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2518	.2549
0.7	.2580	.2612	.2642	.2673	.2704	.2734	.2764	.2794	.2823	.2852
0.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
0.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.49865	.49869	.49874	.49878	.49882	.49886	.49889	.49893	.49897	.49900
3.1	.49903	.49906	.49910	.49913	.49916	.49918	.49921	.49924	.49926	.49929
3.2	.49931	.49934	.49936	.49938	.49940	.49942	.49944	.49946	.49948	.49950
3.3	.49952	.49953	.49955	.49957	.49958	.49960	.49961	.49962	.49964	.49965
3.4	.49966	.49968	.49969	.49970	.49971	.49972	.49973	.49974	.49975	.49976
3.5	.49977	.49978	.49978	.49979	.49980	.49981	.49981	.49982	.49983	.49983
3.6	.49984	.49985	.49985	.49986	.49986	.49987	.49987	.49988	.49988	.49989
3.7	.49989	.49990	.49990	.49990	.49991	.49991	.49992	.49992	.49992	.49992
3.8	.49993	.49993	.49993	.49994	.49994	.49994	.49994	.49995	.49995	.49995
3.9	.49995	.49995	.49996	.49996	.49996	.49996	.49996	.49996	.49997	.49997