國立臺灣師範大學113學年度碩士班招生考試試題

科目：**統計學**　　適用系所：**管理研究所**

注意：1.本試題共4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。(可以使用電子計算機)

1. According to a survey, 68% of the consumers in Japan were buying fewer products than before the currency devaluation, 24% were buying the same as number of products, and 8% were buying more products. Furthermore, in a trend toward purchasing less-expensive brands, 88%indicated that they had changed the brands they purchased. Suppose the following complete set of results were reported.

	Number of products purchased			
Brands purchased	Fewer	Same	More	Total
Same	10	14	24	48
Changed	262	82	8	352
Total	272	96	32	400

What is the probability that a consumer selected at random:

(a) purchase fewer products than before? ***(3 points)***

(b) purchase same or more products than before? ***(3 points)***

(c) purchase the same number of products and the same brands? ***(3 points)***

Given that a consumer changed the brands they purchased, what then is the probability that the consumer:

(d) purchase fewer products than before? ***(3 points)***

(e) purchase the same or more products than before? ***(3 points)***

2. Suppose the President wants an estimate of the proportion of the population who support his current policy toward gun control. The President wants the estimate to be within 4% of the true proportion. Assume a 95% level of confidence. The President's political advisors estimated the proportion supporting the current policy to be 60%.

(a) How large a sample is required? ***(7 points)***

(b) How large a sample would be necessary if no estimate were available for the proportion that support current policy? ***(8 points)***

Note: $Z_{0.005}=2.576$, $Z_{0.025}=1.96$, $Z_{0.05}=1.645$

3. ABC Auto Insurance company classifies drivers as good, medium, or poor risks. Drivers who apply to them for insurance fall into these three groups in the proportions: 30 percent, 50 percent, and 20 percent, respectively. The probability a "good" driver will have an accident is 0.01, the probability a "medium" risk driver will have an accident is 0.03, and the probability a "poor" drive will have an accident is 0.10. The company sells Mr. Lin an insurance policy and he has an accident. What is the probability Mr. Lin is:
   (a) A "good" driver? ***(5 points)***
   (b) A "medium" risk driver? ***(5 points)***
   (c) A "poor" driver? ***(5 points)***

4. There are four radio stations in Chung-Li. The stations have different formats (hard rock, country/western, and easy listening), but each is concerned with the number of minutes of music played per hour. From a sample of 10 hours from each station, the following sample means were offered.

$$\bar{X}_1 = 51.32, \bar{X}_2 = 44.64, \bar{X}_3 = 47.2, \bar{X}_4 = 50.85$$
$$\bar{\bar{X}} = (51.32 \times 10 + 44.64 \times 10 + 47.2 \times 10 + 50.85 \times 10) \div 10 = 48.5025$$
$$SS\ total = 650.75$$

   (a) Complete the ANOVA table below. ***(7 points)***

ANOVA

Source of Variation	SS	*df*	MS	F
Between stations				
Within stations				*n.a.*
Total	650.75		*n.a.*	*n.a.*

   (b) At the 0.05 significance level, is there a difference in the treat means? ***(4 points)***
   (c) At the 0.05 significance level, is there a difference in the mean amount of music time between station 1 and station 4? ***(4 points)***

Note: $F_{3,36,0.05}$=2.8663, $F_{36,3,0.05}$=8.6018, $t_{0.025,36}$=2.028, $t_{0.05,36}$=1.688

5. A study regarding the relationship between age and the amount of pressure sales person feel in relation to their jobs revealed the following sample information. At the 0.01 significance level, we'd like to conclude the relationship between job pressure and age. Please the following questions.

	Degree of Job Pressure		
Age (years)	Low	Medium	High
Less than 25	20	18	22
25 up to 40	50	46	44
40 up to 60	58	63	59
60 and older	34	43	43

(a) Write out the null and alternate hypotheses. ***(6 points)***

(b) What hypothesis test statistics should we use? And what is its value based on the sample information? ***(8 points)***

(c) What is your conclusion regarding the null hypothesis? ***(6 points)***

Note: $t_{2,0.01}=2.718$, $\chi^2_{6,0.01} = 16.812$, $Z_{0.01}=2.326$

6. The district manager of a convenient store chain is investigating why certain stores in his region are performing better than others. He believes that three factors are related to total sale: the number of competitors in the region, the population in the surrounding area, and the amount spent on advertising. From his district, consisting of several hundred stores, he selects a random sample of 30 stores. For each store she gathered the following information:

Y: total sales last year (in $ thousands)
X_1: number of competitors in the region
X_2: population of the region (in millions)
X_3: advertising expense (in $ thousands)

The sample data were run on a Statistics software, with the following results.

Analysis of Variance			
SOURCE	DF	SS	MS
Regression	3	3050.00	1016.67
Error	26	2200.00	84.62
Total	29	5250.00	
Predictor	Coef	St Dev	t-ratio
Constant	14.00	7.00	2.00
X_1	-1.00	0.70	-1.43
X_2	30.00	5.20	5.77
X_3	0.20	0.08	2.50

(a) What are the estimated sales of the TP Store, which has four competitors, a regional population of 0.4 million, and advertising expense of 30 thousand? ***(5 points)***

(b) Compute the R^2 value. ***(5 points)***

(c) Compute the multiple standard error of estimate. ***(5 points)***

(d) Conduct a global test of hypothesis to determine whether any of the regression coefficients are not equal to zero. Use the 0.05 level of significance. (Please specify the null and the alternative hypotheses.) ***(5 points)***

Note: $t_{26,0.025}=2.056$, $F_{3,26,0.95} = 2.975$, $Z_{0.01}=1.96$