考　試　科　目	統計學	系所別	財政	考試時間	2月2日(五)第三節

1. Suppose a population of working couples has the bivariate distribution of income shown in the following Table: (15 points, 7.5 points/each)

Table: Joint Distribution of Husband's Income X and Wife's Income Y Annually

x \ Y	10	20	30	40	P(x)
10	0.20	0.04	0.01		0.25
20	0.10	0.36	0.09		0.55
30		0.05	0.10		0.15
40				0.05	0.05
P(y)	0.30	0.45	0.20	0.05	

Calculate the standard deviation of:

(a) Total income S=X+Y

(b) Total pension contribution W= 0.10X+0.20Y

2. I am thinking of buying a used Q-car at Honest Ed's. In order to make an informed decision, I look up the records of Q-cars in an auto magazine, and find that, unfortunately, 30% have faulty transmissions. To get more information on the particular Q-car at Honest Ed's, I hire a mechanic who can make a guess on the basis of a quick drive around the block. Of course, he is not always right; but he does have an excellent record: Of all the faulty cars he has examined in the past he correctly pronounced 90% "faulty"; in other words, he wrongly pronounced only 10% "OK." He has almost as good a record in judging good cars: He has correctly pronounced 80% "OK," while he wrongly pronounced only 20% "Faculty". (15 points, 5 points/each)

What is the chance that Q-car I am thinking of buying has a faulty transmission:

(a) Before I hire the mechanic?

(b) If the mechanic pronounced it "faulty"?

(c) If the mechanic pronounced it "OK"?

3. True or False. Explain Why. (30 Points, 6 point/each)

(a) Both θ and δ are estimator of μ. If the variance of θ is smaller than the variance of δ, then θ is a more efficient estimator than δ.

(b) The sample mean is a consistent estimator of the population mean.

(c) The probability of type I error = 1 – the probability of type II error

(d) The variance of $X = \mu^2$ – the expected value of X^2 (note: μ is population mean)

(e) θ is the estimator of μ. The sampling error = $E(\theta) - \mu$.

備　註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

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4. A large estate wants to use regression analysis to estimate fair market value of the land. The following model was fit to data collected for n=20 properties, 10 of which are located near a cove. (40 points)

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_1 X_2 + \beta_4 X_1^2 + \beta_5 X_1^2 X_2 + \varepsilon$$

where $Y =$ Sale price of property in thousands of dollars

$X_1 =$ Size of property in thousands of square feet

$X_2 =$ 1 if property located near cove, 0 if not

The partial output is shown as below:

R Square　　　　　0.970

ANOVA

	df	SS	MS	F	Signif F
Regression	___	28324	5664	___	0.0001
Residual	___	1279	91		
Total	___	29063			

	Coefficient	Standard error	t Statistic	P-value
Intercept	-32.1	35.7	___	0.3834
Size	12.2	5.9	___	0.0594
Cove	-104.3	53.5	___	0.0715
Size*Cove	17.0	8.5	___	0.0661
SizeSquare	-0.3	0.2	___	0.2204
SizeSquare*Cove	-0.3	0.3	___	0.2749

(a) Please fill blank spaces. (Numbers have to be written in the answer sheet) Explain how you find these numbers. (10 points)

(b) How will you explain estimated number of R Square shown in the table? (4 points)

(c) Is the overall model statistically adequate at a 0.05 level of significance for predicting sale price? Explain why. (5 points)

(d) Is (Are) there dummy variable(s) in this regression? Which one(s)? Is there a multicollinearity problem in the regression? If yes, what is it? (6 points)

(e) Which of explanatory variables have statistically significant effects on sale price of property at 10% significance level? Explain why. (5 points)

(f) Explain the economic meanings of estimated coefficients of all explanatory variables. (10 points)

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