

考試科目	初級統計學	所別	統計研究所	考試時間	1月22日 星期	上午9:30~11:30
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Written Exam

If 5 percent of the tires purchased by a cab company last less than six months and if 20 tires are purchased, calculate the probability that at most 2 of the tires will expire(壞) in six months using

- (a) the exact distribution, (5)
- (b) the Poisson distribution approximation, (5)
- (c) the normal distribution approximation. (10)
- (d) If the mean length of life of a tire is 2 years, use the exponential distribution to calculate the probability that the life of a tire will be less than 6 months. (5)

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考試科目	初級統計學	所別	統計研究所	考試時間	星期
				()月()日	()
				下午 9:30 ~ 11:30	

Consider a random sample (X_1, X_2, \dots, X_n) from a normal distribution with mean μ and variance σ^2 .

1. Give an estimator $(\hat{\mu})$ of μ , and give reasons. (4分)
2. Give an estimator $(\hat{\sigma}^2)$ of σ^2 , and give reasons. (4分)
3. What is the distribution of $\hat{\mu}$? (3分)
4. What is the distribution of $\hat{\sigma}^2$? (3分)
5. How do you use the estimator $(\hat{\mu})$ to estimate the 95% confidence interval of μ . (3分)
6. How do you use the estimator $(\hat{\sigma}^2)$ to estimate the 95% confidence interval of σ^2 . (3分)
7. Give examples (include numerical numbers) to show that you may apply these estimators to estimate the confidence interval of μ and σ^2 , respectively. (5分)

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考試科目	初級統計學	所別	統計研究所	考試時間	一月二十二日 星期一下午 9:30 ~ 11:30
備	考	試題隨卷繳交			

(a) To determine if a single die is balanced, or fair, the die was rolled 600 times. The observed frequencies with which each of the six sides of the die turned up are recorded in the following table. Is there sufficient evidence to conclude, at the 5% level of significance, that the die is not fair? State the hypothesis, test statistic, rejection region and conclusion. (Note: $\chi^2_{0.025, 6} = 14.4494$, $\chi^2_{0.05, 5} = 12.8325$
 $\chi^2_{0.05, 6} = 12.5916$, $\chi^2_{0.05, 5} = 11.0705$)

(b) Given the following information for a completely randomized design, construct the ANOVA table and conduct the F-test with $\alpha = 0.05$

(10)

$$SS(\text{Total}) = 1052.0$$

$$SST = 581.6$$

$$SSE = 470.4$$

$$k = 3$$

$$n_1 = n_2 = n_3 = 10$$

(Note: $F_{.05, 3, 30} = 4.51$ $F_{.05, 3, 27} = 4.60$
 $F_{.05, 2, 30} = 5.39$ $F_{.05, 2, 27} = 5.49$)

國立政治大學八十五學年度碩士班甄試入學考試--命題紙

考試科目	初級統計學	所別	統計研究所	考試時間	1月22日 下午 9:30~11:30
				星期	二

85/1/22

- ($\frac{1}{2}$ 分) 1. An investigator measuring various characteristics of a large group of athletes found that the correlation between the weight of an athlete and the amount of weight that athlete could lift was 0.60. True or false? Explain briefly.
- (a) If an athlete gains 10 pounds, he can expect to be able to lift an additional 6 pounds.
 - (b) The more an athlete weighs, on the average the more he can lift.
 - (c) The more an athlete can lift, on the average the more he weighs.
 - (d) 60% of an athlete's lifting ability can be attributed to his weight alone.

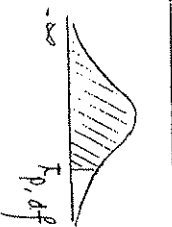
- ($\frac{1}{2}$ 分) 2. True or false? Explain briefly.
- (a) If the correlation coefficient is -0.8 , then below-average values of one variable tend to be associated with below-average values of the other variable.
 - (b) If one variable is usually less than the other variable, the correlation coefficient will be negative.
 - (c) If the correlation coefficient is 0.9, then 90% of the data points are highly correlated.
 - (d) The correlation coefficient between height and weight for male students in a college is about 0.60. For female students, it was about the same. Then the correlation coefficient between height and weight for all the students in the college will be higher than 0.60.

- ($\frac{3}{10}$ 分) 3. The yield per plot in bushels of corn was observed on 10 plots that had been fertilized in varying degrees. The data are tabulated as followed:

Yield, y_i (in bushels)	12	13	13	14	15	15	14	16	17	18
Fertilizer, x_i (in pounds per plot)	2	2	3	3	4	4	5	5	6	6

(Note: $\sum x = 40, \sum y = 147, \sum x^2 = 180, \sum y^2 = 2193, \sum xy = 611$)

- (a) Suppose the simple linear regression model is of the form $y = \alpha + \beta x + \epsilon$, where $\epsilon \sim N(0, \sigma^2)$. Find the sample regression function. Interpret $\hat{\alpha}$ and $\hat{\beta}$.
- (b) Without knowing the value of the x variable, can you provide an estimate for the yield per plot in the population? Give the estimate if your answer is yes.
- (c) If 10 pounds of fertilizer is applied to a plot, what is its predicted yield?
- (d) Can you conclude at the 5% significance level that on the average an increase of one pound per plot will result in an increase of more than one bushel of corn?
- (e) Find an estimate of σ^2 .
- (f) Define the coefficients of correlation and determination. What is the relationship between the two? Find the corresponding values and provide interpretations for the values.



df	.90	.95	.975
b	1.440	1.943	2.447
7	1.415	1.895	2.365
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228

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