

系所組別：國際企業研究所乙組

考試科目：統計學

考試日期：0219 · 節次：3

※ 考生請注意：本試題 可 不可 使用計算機

Please show all your work.

Notes:

You may find the following critical values useful in answering questions.

Right-tailed probabilities:  $Z_{0.05} = 1.645$ ;  $Z_{0.025} = 1.96$ ;  $Z_{0.01} = 2.33$ ;  $t_{0.05, 26} = 1.706$ ;  $t_{0.05, 28} = 1.701$ ;  $t_{0.025, 28} = 2.048$ ;  $t_{0.025, 26} = 2.056$ ;  $t_{0.005, 24} = 2.797$ ;  $t_{0.005, 25} = 2.787$ ;  $\chi^2_{0.05, 1} = 3.84$ ;  $\chi^2_{0.05, 4} = 9.49$ ;  $\chi^2_{0.995, 24} = 9.89$ ;  $\chi^2_{0.005, 24} = 45.56$

1. (10%) Please show your understanding of a *Chi-square* distribution with  $n$  degree of freedom.
2. (10%) Suppose a firm has a plan to expand its size. Two options are currently available. The first option is to double the size of its existing plant. The second option is to build a replica of the existing plant at another location. Assume that the value of each individual plant would be NT\$ 100 million and the value of one plant if it were doubled in size is NT\$ 200 million. Further suppose that both locations are exposed to losses from earthquakes. The probability of an earthquake at each location is 0.05. Earthquakes at different locations are independent. A complete loss would occur if an earthquake at either location happens. (1) (5%) What are the expected direct losses under the two options, respectively? (2) (5%) We now assume that an indirect loss equal to NT\$ 50 million only occurs if a NT\$ 200 million direct loss occurs. What are the expected indirect losses under the two options, respectively?
3. (10%) Suppose fire insurance costs are uniformly distributed in Taiwan with a range of from NT\$200 to NT\$1,182. What is the probability that a person's annual cost for fire insurance in Taiwan is between NT\$410 and NT\$825?
4. (10%) Assume that 18 big technology firms operate in Taiwan and that 12 are located in Tainan. If three technology firms are randomly selected from the entire list, what is the probability that one or more of the selected companies are located in Tainan?

(背面仍有題目,請繼續作答)

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5. (10%) A margin of error is defined as how close the sample proportion is to the population proportion. A prior study shows that 44% of 10,000 sampled undergraduate students spend more than 3 hours a day surfing on the net. Suppose you would like to estimate the proportion of undergraduate students who spend more than 3 hours a day surfing on the net. How large a random sample would you need to estimate it to within a margin of error of 0.05 with 95% confidence, if you use the abovementioned study as a guideline?
6. (10%) The following table shows a contingency table that crosstabulates student gender (male/female) against exam result (pass/fail). (1) (5%) Calculate the *Phi* coefficient to test the strength of the relationship between student gender and exam result. (2) (5%) Is the Pearson product-moment correlation coefficient applicable in this case? Explain.

	Pass	Fail	Total
Male	33	17	50
Female	11	39	50
Total	44	56	100

7. (10%) A researcher wishes to estimate the difference in the average daily milk consumption of whole milk drinkers and low-fat milk drinkers. He randomly selects 13 whole milk and 15 low-fat milk drinkers, and asks how many cups of milk per day they drink. The average for the whole milk drinkers is 4.35 cups, with a standard deviation of 1.20 cups, while the average for the low-fat milk drinkers is 6.84 cups, with a standard deviation of 1.42 cups. Assume that the daily consumption for the populations of whole and low-fat drinkers is normally distributed. What is the 95% confidence interval of the difference in the average daily milk consumption of the whole and low-fat milk populations?

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8. (10%) Use data in the following table to find (1) (5%) the best-fitting linear relationship between the explanatory variable  $X$  and the dependent variable  $Y$ , and (2) (5%) the coefficient of determination for this regression.

$X$	30	73	40	47	25	82	60	56	43	50	11	19	41
$Y$	5	10	6	11	5	14	30	11	17	3	9	11	4
$X$	59	4	22	33	20	32	36	69	47	22	67	43	
$Y$	9	3	8	8	5	5	7	4	3	7	11	9	

9. (10%) Suppose we wish to estimate the concentration ( $\mu\text{g}/\text{mL}$ ) of a specific dose of ampicillin in the urine after various periods of time. Twenty-five volunteers are recruited. We find that they have a mean concentration of  $7.0 \mu\text{g}/\text{mL}$  with a standard deviation of  $2.0 \mu\text{g}/\text{mL}$ . Assume that the underlying population distribution of concentrations is normally distributed. Find a 99% confidence interval for the population variance of the concentrations?
10. (10%) A study concludes that treating people appropriately for high blood pressure reduced their overall mortality by 20%. Treating people adequately for hypertension has been difficult, since it is estimated that 50% of hypertensives do not know they have high blood pressure; 50% of those that do know are inadequately treated by their physicians; and 50% that are appropriately treated fail to comply with this treatment by taking the appropriate number of pills. What is the probability that among 10 true hypertensives at least 50% are being treated appropriately and are complying with this treatment?