

第一部份 選擇題 (每題 2.5 分；共 30 分) ※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. Peter Pan is conducting a simple linear regression analysis. Which predictors are providing significant information regarding the response according to the null hypothesis of the ANOVA F-test?
a) Most of them b) None of them c) all of them d) Some of them
2. PocketMon is conducting a simple linear regression analysis, suppose a 99% confidence interval for β_1 is calculated as $(-2.51, -1.12)$. What should be his conclusion when the hypotheses of interest are $H_0: \beta_1 = 0$ vs. $H_a: \beta_1 \neq 0$?
a) Reject H_0 when $\alpha = 0.10$ but not with $\alpha = 0.05$ and $\alpha = 0.01$.
b) Reject H_0 at the 0.10, 0.05, 0.01 confidence levels
c) Fail to reject H_0 when $\alpha = 0.10$ but not with $\alpha = 0.05$ and $\alpha = 0.01$.
d) Fail to reject H_0 at the 0.10, 0.05, 0.01 confidence levels
3. Zebret adopts a regression model, $Z = \gamma + \omega X + \varepsilon$. If X increases by 0.5 unit, the change in Z
a) Will be equal to $1/2 \times \varepsilon$ b) Will be equal to 2γ
c) Will be equal to $1/2 \times \omega$ d) Will be equal to $1/2 \times (\gamma + \omega X + \varepsilon)$,
4. Professor Yeh explores the relation between productivity of auto plant workers and three independent variables including number of years of experience, salaries and gender. Data from a random sample of 7,893 workers was used to fit the multiple regression model. According to the assumptions, what has to have a Normal distribution and constant variance?
a) The auto plant workers b) Productivity
c) Years d) All variables
5. Skyboy conducted a χ^2 test of independence the p-value is 0.001. What should be his conclusion about the association between the two variables?
a) The observed data indicate that the response and the predictor are positively associated.
b) The observed data indicate that the response and the predictor are associated.
c) The observed data indicate that there is no association between the response and the predictor.
d) The observed data indicate none of the above.
6. In a multiple regression model, $Z = \gamma + \omega_1 X_1 + \omega_2 X_2 + \dots + \omega_n X_n + \varepsilon$, Noisemaker has $H_0: \omega_1 = \omega_2 = \dots = \omega_p = 0$ against H_a : at least one of ω 's $\neq 0$, and the p-value is less than any reasonable α . Then he should conclude that
a) All the explanatory variables have significant effect on Z .
b) None of the explanatory variables has significant effect on Z .

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- c) At least one explanatory variable has significant effect on Z.
- d) None of the above

Use the following for questions 7 – 12: Silverpot's regression study of the effect of the total cost of Producing Noisypet (COST) on the number of output units (OUTPUT) resulted in the following output:

$$COST = 15,670 + 2,418(OUTPUT).$$

$$P\text{-value} = 0.001 \quad R^2 = 0.797$$

7. The predictor variable in this case is equal to:
 - a) OUTPUT b) R^2 c) COST d) $COST = 15,670 + 2,418(OUTPUT)$.
8. The proportion of variability in COST explained by the OUTPUT is equal to:
 - a) 55.64 % b) 79.7 % c) 89.27% d) None of these
9. The proportion of variability in output explained by the total costs is equal to:
 - a) 55.64 % b) 79.7 % c) 89.27 % d) None of these
10. How do we interpret the slope of the prediction equation in this case?
 - a) As the output increases by 1 unit, the total costs decreases on average by 2,418 units
 - b) As the total costs increases by 1 unit, the output decreases by 2,418 units
 - c) As the output increase by 1 unit, the total costs increase on average by 2,418 units
 - d) As the output increase by 1 unit, the total costs increase on average by 15,670 units
11. How do we interpret the intercept in the prediction equation in this case?
 - a) When the output is zero, total costs is 15,670 units
 - b) When total costs is zero, output is 2,418 units
 - c) We do not interpret the intercept since zero output is not meaningful.
 - d) None of the above.
12. The correlation coefficient between total costs and output is equal to:
 - a) 0.797 b) -0.893 c) -8.93 d) 0.893

第貳部份 計算與觀念模型題

1. (5分) 安步理計教授想要瞭解本系學生報考公務人員意願與其是否愛看少年 Yi 電影間的關係。他得到以下初步結果，

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對於少年 Yi 電影看法	報考公務人員意願	
	有興趣	沒有興趣
喜歡	120	150
不喜歡	60	30

下表是安步哩計本研究虛無假說 (null hypothesis) 下的期望頻率表(expected frequencies table)格式，試求算空格中的期望頻率(expected frequencies)值各是多少？

對於少年 Yi 電影看法	報考公務人員意願	
	沒有興趣	有興趣
喜歡		
不喜歡		

2. (10 分) 陶德教授研究學生「解剖學」成績(變數 Y)與「易老莊學說」成績(變數 X)間關係，他得到：

$$\bar{X} = 240 \quad \bar{Y} = 250 \quad S_x = 40 \quad S_y = 60 \quad r = 0.3$$

他利用上列結果，估計迴歸式關係為 $\hat{y} = 370 + 0.2x$ 。您同意嗎？如果不同意，試求正確的估計迴歸式

3. (5 分) 豐楷先生認為變數 Z 與變數 X 間關係為微笑曲線(smile curve)關係，除了 $Z = \gamma + \omega_1 X + \omega_2 X^2 + \epsilon$ 迴歸模型，試為他列出另兩種迴歸模型。

4. Consider the given discrete probability distribution.

x	1	2	3	4	5
p(x)	.1	.1	.2	.3	.3

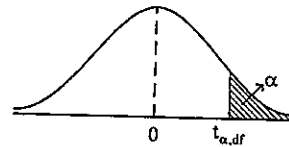
- (1) Find the mean for the discrete probability distribution, μ . (2 points)
 - (2) Find the standard deviation for the discrete probability distribution, σ . (3 points)
 - (3) Find the probability that the value of x falls within one standard deviation of the mean. (3 points) Compare this result to the Empirical Rule and explain the reason for the difference. (5 points)
5. A small brewery has two bottling machines. Machine A produces 75% of the bottles, and machine B produces 25%. 1 out of every 20 bottles filled by A is rejected for some reason, while 1 out of every 30 bottles from B is rejected. What is the probability that a randomly selected bottle comes from machine A, given that it is accepted? (10 points)

6. A recent survey found that 72% of all adults over 50 wear glasses for driving. In a random sample of 100 adults over 50,
- (1) what is the mean (2 points) and standard deviation (3 points) of the number who wear glasses?
 - (2) find the probability that more than two of the 100 sampled wear glasses for driving. (5 points)
7. How many tissues should a package of tissues contain? Researchers have determined that a person uses an average of 100 tissues during a cold. Suppose a random sample of 100 people yielded the following data on the number of tissues used during a cold: mean = 109, standard deviation = 5.
- (1) Identify the null and alternative hypothesis for a test to determine if the mean number of tissues used during a cold is greater than 100. (3 points)
 - (2) Using the z-statistic to test the hypothesis at the $\alpha = 0.05$ level of significance.
 - A. What is the decision rule? (5 points)
 - B. What would be your conclusion? (4 points)
 - C. Interpret the result. (5 points)

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t 分配臨界值表

$P(t_{df} > t_{\alpha, df}) = \alpha$



df	α											
	0.25	0.20	0.15	0.10	0.05	0.025	0.02	0.01	0.005	0.0025	0.001	0.0005
1	1.000	1.376	1.963	3.078	6.314	12.710	15.890	31.820	63.660	127.30	318.30	636.60
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.090	22.330	31.600
3	0.765	0.978	1.250	1.638	2.353	3.182	3.482	4.541	5.841	7.453	10.210	12.920
4	0.741	0.941	1.190	1.533	2.132	2.776	2.999	3.747	4.604	5.598	7.173	8.610
5	0.727	0.920	1.156	1.476	2.015	2.571	2.757	3.365	4.032	4.773	5.893	6.869
6	0.718	0.906	1.134	1.440	1.943	2.447	2.612	3.143	3.707	4.317	5.208	5.959
7	0.711	0.896	1.119	1.415	1.895	2.365	2.517	2.998	3.499	4.029	4.785	5.408
8	0.706	0.889	1.108	1.397	1.860	2.306	2.449	2.896	3.355	3.833	4.501	5.041
9	0.703	0.883	1.100	1.383	1.833	2.262	2.398	2.821	3.250	3.690	4.297	4.781
10	0.700	0.879	1.093	1.372	1.812	2.228	2.359	2.764	3.169	3.581	4.144	4.587
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328	2.718	3.106	3.497	4.025	4.437
12	0.695	0.873	1.083	1.356	1.782	2.179	2.303	2.681	3.055	3.428	3.930	4.318
13	0.694	0.870	1.079	1.350	1.771	2.160	2.282	2.650	3.012	3.372	3.852	4.221
14	0.692	0.868	1.076	1.345	1.761	2.145	2.264	2.624	2.977	3.326	3.787	4.140
15	0.691	0.866	1.074	1.341	1.753	2.131	2.249	2.602	2.947	3.286	3.733	4.073
16	0.690	0.865	1.071	1.337	1.746	2.120	2.235	2.583	2.921	3.252	3.686	4.015
17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567	2.898	3.222	3.646	3.965
18	0.688	0.862	1.067	1.330	1.734	2.101	2.214	2.552	2.878	3.197	3.611	3.922
19	0.688	0.861	1.066	1.328	1.729	2.093	2.205	2.539	2.861	3.174	3.579	3.883
20	0.687	0.860	1.064	1.325	1.725	2.086	2.197	2.528	2.845	3.153	3.552	3.850
21	0.686	0.859	1.063	1.323	1.721	2.080	2.189	2.518	2.831	3.135	3.527	3.819
22	0.686	0.858	1.061	1.321	1.717	2.074	2.183	2.508	2.819	3.119	3.505	3.792
23	0.685	0.858	1.060	1.319	1.714	2.069	2.177	2.500	2.807	3.104	3.485	3.768
24	0.685	0.857	1.059	1.318	1.711	2.064	2.172	2.492	2.797	3.091	3.467	3.745
25	0.684	0.856	1.058	1.316	1.708	2.060	2.167	2.485	2.787	3.078	3.450	3.725
26	0.684	0.856	1.058	1.315	1.706	2.056	2.162	2.479	2.779	3.067	3.435	3.707
27	0.684	0.855	1.057	1.314	1.703	2.052	2.158	2.473	2.771	3.057	3.421	3.690
28	0.683	0.855	1.056	1.313	1.701	2.048	2.154	2.467	2.763	3.047	3.408	3.674
29	0.683	0.854	1.055	1.311	1.699	2.045	2.150	2.462	2.756	3.038	3.396	3.659
30	0.683	0.854	1.055	1.310	1.697	2.042	2.147	2.457	2.750	3.030	3.385	3.646
40	0.681	0.851	1.050	1.303	1.684	2.021	2.123	2.423	2.704	2.971	3.307	3.551
50	0.679	0.849	1.047	1.299	1.676	2.009	2.109	2.403	2.678	2.937	3.261	3.496
60	0.679	0.848	1.045	1.296	1.671	2.000	2.099	2.390	2.660	2.915	3.232	3.460
80	0.678	0.846	1.043	1.292	1.664	1.990	2.088	2.374	2.639	2.887	3.195	3.416
100	0.677	0.845	1.042	1.290	1.660	1.984	2.081	2.364	2.626	2.871	3.174	3.390
1000	0.675	0.842	1.037	1.282	1.646	1.962	2.056	2.330	2.581	2.813	3.098	3.300
∞	0.674	0.841	1.036	1.282	1.645	1.960	2.054	2.326	2.576	2.807	3.091	3.291

試題隨卷繳回