本試卷共分兩大題。第一大題為單選題、第二大題為計算單選題，考生皆應作答於答案卡上。請依照題號順序作答。

第一大題 單選題，每題 2 分，共 52 分。請作答於答案卡。

1. Coca Cola attempted to identify a most effective celebrity endorser to enhance the sales of its Gold Peak line of premium ready-to-drink (RTD) tea lattes and coffees. Four celebrity candidates had been taken into consideration in the final list. Coca Cola' s global marketing VP then initiated a test marketing (i.e., an experiment) to collect its target customers' perceptions and evaluative responses toward the potential ad endorsed by each of celebrity candidates. A sample of participants were randomly assigned to evaluate each of four ads. On a scale from 0 (very unlikely to buy) to 10 (very likely to buy), participants' average ratings of purchase intention after viewing celebrity endorsed ads were 8.60 (for ad endorsed by Alex Morgan), 8.30 (by Sanya Richards), 8.10 (by Jess Glynne), and 8.00 (by Kevin Hart), respectively. Please answer the following 25 questions accordingly.
Which of the following analysis methodologies is most relevant for Coca Cola' s global marketing VP to identify the most effective endorser?
   a. ANOVA
   b. Simple Regression
   c. T-test
   d. Paired T-test

2. Under what condition, should Kevin Hart be better selected following the conducted marketing research?
   a. Under no condition should Kevin Hart be selected.
   b. Only when Kevin Hart was as attractive as Alex Morgan should Kevin Hart be selected.
   c. When p-value was greater than .05 and the endorsement cost charged by Kevin Hart was the lowest
   d. When p-value was less than .05 and the endorsement cost charged by Kevin Hart was the lowest

3. Given the degree of freedom, the larger the F, __
   a. the smaller the eta square
   b. the smaller the R square
   c. the smaller the between (group) sum of square
   d. the smaller the p-value

4. In the above analysis, p-value less than .05 suggests that experiment participants' purchase intentions toward Coca Cola' s premium RTD product _____.
   a. are statistically identical independent of celebrity endorsers
   b. are statistically identical at least between two treatments

見背面

c. are statistically different between any pair of two treatments
d. are statistically different at least between two treatments

5. In China market, the marketing VP planned to initiate an independent marketing campaign by introducing the celebrity endorsement specifically targeting on China' s customers. Therefore, another four celebrity candidates were identified and taken into consideration for sales promotion in China. After replicating the same test marketing procedure in China, the marketing VP surprisingly found out that participants' average ratings were parallel to earlier findings as follows: 8.60 (for ad endorsed by Chi-Ling Lin), 8.30 (by Cheng-Wu Jin), 8.10 (by Jay Chou), and 8.00 (by Bing-Bing Fan), respectively. Which of the following is correct?
   a. If Kevin Hart is selected in the earlier test marketing, Bing-Bing Fan should be selected in China.
   b. If p-value in the earlier test marketing is less than .05, the p-value in China' s test marketing should be less than .05 as well.
   c. If the purchase intention is significantly different between participants viewing the ad endorsed by Alex Morgan and those viewing the ad endorsed by Sanya Richards, the significant difference in purchase intention can be also found between participants viewing the ad endorsed by Chi-Ling Lin and those viewing the ad endorsed by Chen-Wu Jin.
   d. If the purchase intension is not significantly different between participants viewing the ad endorsed by Alex Morgan and those viewing the ad endorsed by Kevin Hart, the significant difference in purchase intention can be found between participants viewing the ad endorsed by Jay Chou and those viewing the ad endorsed by Bing-Bing Fan.

6. After collecting the data, the marketing VP realized that consumers' income was likely to partially account for the purchase intention rating such that high income consumers might have higher likelihood to purchase premium RTD product than low income consumers. Income was therefore included in the earlier correspondent analysis along with the manipulation of celebrity endorser. Income is called ___ in the above analysis.
   a. treatment
   b. covariate
   c. level
   d. fixed factor

7. After incorporating Income into the analysis, which of the following is correct?
   a. p-value of celebrity endorser is likely to be greater than .05
   b. p-value of celebrity endorser is likely to be less than .05
   c. The decrease of celebrity endorser' s p-value suggests that the reduced total variation is largely accounted for by Income but not by celebrity endorser.

接次頁

d. The increase of celebrity endorser' s p-value suggests that the variation of purchase intention initially accounted for by celebrity endorser is largely shared by Income.

8. If an additional celebrity endorser is included in the test marketing (i.e., there are five endorsers in total), the sample size for examining each ad remains the same as in the early test marketing, and average preference ratings happen to be 8.6, 8.3, 8.10, 8.0, and 7.8 (for the additional celebrity), ___.
   a. the numerator degree of freedom will decrease
   b. the between group sum of square will increase
   c. the denominator degree of freedom will be the same
   d. the within group sum of square will decrease

9. To get a deeper understanding of consumers' cognitive responses, the marketing VP decided to add another manipulation variable into the test marketing: involvement. In addition to the original manipulation of four celebrity endorsers, two consumers' involvement levels, i.e., high vs. low involvement, were controlled in the test marketing. What is the most relevant multivariate methodology the market VP employs?
   a. Two-way ANOVA
   b. Multiple Regression
   c. Multiple T-test
   d. Paired T-test

10. Which of the following is NOT correct?
   a. When the interaction is significant, the p-value of main effect is greater than .05.
   b. When the interaction is significant, the main effect can be significant as well.
   c. When the main effect is significant, the interaction effect can be insignificant.
   d. When the main effect is significant, the p-value of interaction effect can be smaller than the p-value of main effect

11. The marketing VP may check the interaction effect of celebrity endorser and involvement by examining ___.
   a. Whether the difference between the mean rating of high involvement and the mean rating of low involvement is identical across different levels of celebrity endorser.
   b. Whether the mean rating of involvement is identical across different levels of celebrity endorser.
   c. Whether the difference between the mean rating of high involvement and the mean rating of Alex Morgan is identical across different combinations of involvement and celebrity endorser.
   d. Whether the mean rating of each level of celebrity endorser is identical with each other.

見背面

12. The marketing VP may check the effect of celebrity endorser by examining ____.
    a. Whether the difference between the mean rating of high involvement and the mean rating of low involvement is identical across different levels of celebrity endorser.
    b. Whether the mean rating of involvement is identical across different levels of celebrity endorser.
    c. Whether the difference between the mean rating of high involvement and the mean rating of Alex Morgan is identical across different combinations of involvement and celebrity endorser.
    d. Whether the mean rating of each level of celebrity endorser is identical with each other.

13. Which of the following regarding standardization is Not correct?
    a. Variable unit can be removed
    b. Show how a variable value is deviated from the variable mean
    c. After standardization, covariance is likely to be greater than correlation
    d. After standardizing a standardized variable, the resultant variable is equal to the standardized variable.

14. After identifying the most effective celebrity endorser, Coca Cola' s marketing VP would like to figure out how to maximize sales of RTD products. Pulling out the sales data, she noticed that sales (Sales) was significantly correlated with AD budget (AD), sales forces (Force), channel density (Channel), direct promotion (Direct), indirect promotion (Indirect), but not publicity (Publicity). Which of the following is correct?
    a. By investing more in AD budget, Coca Cola' s sales will increase
    b. By investing more in publicity, Coca Cola' s sales will decrease
    c. By investing more in AD budget, Coca Cola' s sales is likely to be unchanged
    d. By investing more in sales forces, Coca Cola' s channel density is likely to transform from a metric variable to a categorical variable.

15. Adjusted R-square is ____ R-square.
    a. always greater than
    b. always smaller than
    c. always equal to
    d. sometimes greater than, smaller than, or equal to

16. Coefficient of multiple determination considering AD, Channel, Force is ____ that of a model considering AD, Channel, and Direct, Publicity.
    a. greater than
    b. smaller than

接次頁

c. equal to
d. greater than, smaller than, or equal to

17. Coca Cola' s marketing VP would like to get the R-square where Sales serves as a dependent variable and AD serves as an independent variable in a regression. However, her assistant accidently switches the dependent variable with the independent variable, and reports the R-square where AD serves as a dependent variable and Sales serves as an independent variable. Which of the following statements is correct?
    a. R-square will not change
    b. R-square will increase since Sales can better predict AD
    c. R-square will decrease since AD can better predict Sales
    d. R-square may vary, and can be determined by offering detailed information on the collected data

The assistant anyhow runs a stepwise regression. The output of the stepwise regression is as follow. Answer the following THREE questions.

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	113.033	1	113.033	108.470	.000
	Residual	224.045	215	1.042		
	Total	337.078	216			
2	Regression	120.678	2	60.339	59.670	.000
	Residual	216.401	214	1.011		
	Total	337.078	216			

Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.720	.171		21.774	.000
	AD	.756	.073	.579	10.415	.000
2	(Constant)	4.577	.354		12.919	.000
	AD	.752	.071	.577	10.526	.000
	Direct	.266	.097	.151	-2.749	.006

見背面

Excluded Variables

Model		Beta In	t	Sig.	
1	Publicity	.022	.402	.688	.027
	Indirect	.085	1.292	.198	.088
	Channel	.124	2.251	.025	.152
	Direct	.151	2.749	.006	.185
2	Publicity	.022	.402	.688	.028
	Indirect	.079	1.230	.220	.084
	Channel	.034	.431	.667	.029

18. What variable(s) can best predict Sales of Coca Cola RTD?
    a. Direct
    b. AD, Direct
    c. Channel, Indirect, Publicity
    d. Direct, Channel, Indirect, Publicity

19. Which variable in the model is the most important in terms of explanation of Sales?
    a. Direct
    b. AD
    c. Channel
    d. Publicity

20. The assistant would like to predict the sales volume of RTD. If Direct increases one unit, what can be expected on the change of Sales?
    a. increase .266 unit
    b. increase .185 unit
    c. increase .151 unit
    d. need more information to estimate sales volume

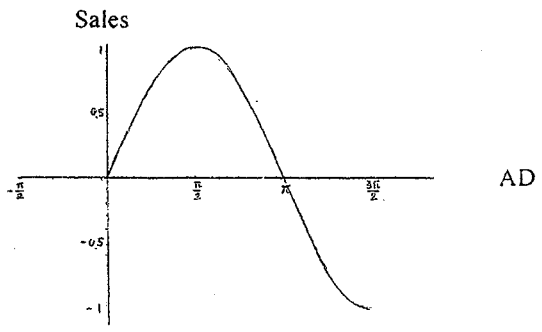
21. Assume Channel and Indirect have a linear relationship, Channel = .83 + .28*Indirect. Correlation coefficient $r_{channel, Indirect}$ is ____.
    a. 1
    b. .28
    c. -1
    d. any value between -1 and 1

22. Following the above question (Q21), $r_{channel, Force}$ is ____ $r_{Force, Indirect}$.

接次頁

a. greater than
b. identical to
c. smaller than
d. Possibly greater than, identical to, or smaller than (depending on the value of Force).

23. Assume that the relationship between Sales and AD can be depicted as follows. $r_{sales, AD}$ is ____.



a. Less than 0
b. 0
c. Greater than 0
d. Can be greater than 0 or less than 0

24. After running a simple regression with Sales the dependent variable and Indirect the independent variable, the output produces an ANOVA table showing the model F value and its *p*-value and a T-test table showing the coefficient t value and *p*-value. Which of the following is NOT correct?
a. The *p*-value in the ANOVA table is identical to the *p*-value in the T-test table.
b. The *p*-value in the ANOVA table is likely to be different from the *p*-value in the T-test table.
c. The coefficient will be indifferent from 0 statistically if *p*-value in the T-test table is greater than .05.
d. Indirect is not able to significantly account for the variance of Sales if *p*-value in the ANOVA table is greater than .05.

25. Coca Cola' s marketing VP realizes that the geographic variable might be related to RTD' s sales. Therefore, a new variable Geography is taken into account in the regression model. There are three geographic areas coded in the data: US, Asia, and Europe. She decides to employ the dummy variable in the regression analysis. Which of the following is correct?
a. Only one dummy variable should be created to represent Geography.
b. Only two dummy variables should be created to represent Geography.
c. Only three dummy variables should be created to represent Geography.
d. It is likely to create four dummy variables to represent Geography in the regression.

見背面

26. A supermarket wants to estimate the average monthly spending of customers in the grocery industry. Their marketing analysts randomly collected questionnaires from 250 customers and the 95% of confidence interval in this dataset was ($6,710, $32,311). Which of the following interpretations is correct?
    a. We are 95% confident that the mean of the sampled monthly spending falls between $6,710 and $32,311.
    b. There is a 95% probability that the average monthly spending of all consumers in the grocery industry falls in the interval from $6,710 to $32,311.
    c. 95% of the sampled monthly spending fell between $6,710 and $32,311.
    d. In the population of the grocery industry, 95% of consumers have a monthly spending that falls in the interval from $6,710 to $32,311.
    e. None of the above.

第二大題 計算單選題，每題 8 分，共 48 分。請作答於答案卡。

27. What is the sample covariance between X and Y (shown in the following table)?

X_i	Y_i
5	12
10	20
15	25

    a. -2.5
    b. 21.6
    c. 65
    d. -5
    e. 32.5

28. Please refer to question 1. What is the correlation coefficient of X and Y?
    a. 0.99
    b. -0.15
    c. -0.08
    d. 1.98
    e. 0.66

29. An online game company is interested in the amount of money players willing to pay for a new game, on average. Assuming the sample is unbiased and the sample standard deviation of spending of those sampled players in a new game is 250 regardless of the sample size, how many consumers will need to be

接次頁

sampled if the company wants this estimate within ±25 dollars and with 95% confidence?

a. 20
b. 271
c. 17
d. 385
e. None of the above

30. A financial company in Taiwan launched a survey to investigate the savings information from two groups of their customers. They got 16 and 31 respondents, respectively. The standard deviations of these two groups of sampled data are 161,000 and 112,000, respectively. Please determine whether these groups have the equal or unequal variances with $\alpha = 0.05$. ($F_{0.025, 15, 30}$=2.31; $F_{0.05, 15, 30}$=2.01; $F_{0.975, 15, 30}$=0.38; $F_{0.95, 15, 30}$=0.44)

a. $F=2.07 > F_{0.05, 15, 30}$, so we conclude that they have unequal variances.
b. $F_{0.95, 15, 30} < F=1.44 < F_{0.05, 15, 30}$, so we conclude that they have equal variances.
c. $F_{0.975, 15, 30} < F=2.07 < F_{0.025, 15, 30}$, so we conclude that they have equal variances.
d. $F_{0.975, 15, 30} < F=1.44 < F_{0.025, 15, 30}$, so we conclude that they have equal variances.
e. $F_{0.95, 15, 30} < F=1.20 < F_{0.05, 15, 30}$, so we conclude that they have equal variances.

31. A teacher wants to know whether high school students spend more than 20 hours per week on studying at home. The following information regarding 25 students was provided by a local high school:

n = 25; Average of weekly studying time = 18.5 hours; Standard Deviation = 2 hours; Stand Error = 0.4

She is going to examine her hypothesis by using a t-test at the 0.01 level of significance. What is the power of the above test if the population mean of the weekly studying time is 21 hours? Assuming the population standard deviation is 2 hours as well.

a. 0.53
b. 1
c. 0
d. 0.03
e. 0.47

32. A smartphone company intends to understand who would buy extended warranties for their products. The following table shows information about a random sample of customers who recently bought a product from one of their stores. Those customers reported whether they paid the regular price or a sale price and

見背面

whether they purchased an extended warranty. Please examine (at the 5% significant level) whether those who paid the regular price are less likely to buy an extended warranty.

	Price Type	
	Regular Price	Sale Price
Sample Size	200	300
Number who bought extended warranty	60	120

a. $Z = -1.826 < -Z_{0.05}$, so we can conclude that people who paid the regular price are less likely to buy an extended warranty.
b. $Z = -2.325 < -Z_{0.05}$, so we can conclude that people who paid the regular price are less likely to buy an extended warranty.
c. $Z = -2.282 < -Z_{0.05}$, so we can conclude that people who paid the regular price are less likely to buy an extended warranty.
d. $Z = -1.095 > -Z_{0.05}$, so we can conclude that people who paid the regular price are NOT less likely to buy an extended warranty.
e. None of the above.

接次頁

附錄一 Standard Normal Cumulative Probability Table

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

見背面

附錄二 t-distribution

df. \ α	0.1	0.05	0.025	0.01
1	3.078	6.314	12.706	31.821
2	1.886	2.920	4.303	6.965
3	1.638	2.353	3.182	4.541
4	1.533	2.132	2.776	3.747
5	1.476	2.015	2.571	3.365
6	1.440	1.943	2.447	3.143
7	1.415	1.895	2.365	2.998
8	1.397	1.860	2.306	2.896
9	1.383	1.833	2.262	2.821
10	1.372	1.812	2.228	2.764
11	1.363	1.796	2.201	2.718
12	1.356	1.782	2.179	2.681
13	1.350	1.771	2.160	2.650
14	1.345	1.761	2.145	2.624
15	1.341	1.753	2.131	2.602
16	1.337	1.746	2.120	2.583
17	1.333	1.740	2.110	2.567
18	1.330	1.734	2.101	2.552
19	1.328	1.729	2.093	2.539
20	1.325	1.725	2.086	2.528
21	1.323	1.721	2.080	2.518
22	1.321	1.717	2.074	2.508
23	1.319	1.714	2.069	2.500
24	1.318	1.711	2.064	2.492
25	1.316	1.708	2.060	2.485
26	1.315	1.706	2.056	2.479
27	1.314	1.703	2.052	2.473
28	1.313	1.701	2.048	2.467
29	1.311	1.699	2.045	2.462
30	1.310	1.697	2.042	2.457
35	1.306	1.690	2.030	2.438
40	1.303	1.684	2.021	2.423
45	1.301	1.679	2.014	2.412
50	1.299	1.676	2.009	2.403
55	1.297	1.673	2.004	2.396
60	1.296	1.671	2.000	2.390
65	1.295	1.669	1.997	2.385
70	1.294	1.667	1.994	2.381
75	1.293	1.665	1.992	2.377
80	1.292	1.664	1.990	2.374

接次頁

The F Distribution α

df2 \ df1:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	161.45	199.50	215.71	224.58	230.16	233.99	236.77	238.88	240.54	241.88	242.98	243.91	244.69	245.36	245.95
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.40	19.41	19.42	19.42	19.43
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.76	8.74	8.73	8.71	8.70
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.94	5.91	5.89	5.87	5.86
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.70	4.68	4.66	4.64	4.62
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.03	4.00	3.98	3.96	3.94
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.60	3.57	3.55	3.53	3.51
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.31	3.28	3.26	3.24	3.22
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.10	3.07	3.05	3.03	3.01
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.94	2.91	2.89	2.86	2.85
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.82	2.79	2.76	2.74	2.72
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.72	2.69	2.66	2.64	2.62
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.63	2.60	2.58	2.55	2.53
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.57	2.53	2.51	2.48	2.46
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.51	2.48	2.45	2.42	2.40

試題隨卷繳回