

※ 考生請注意：本試題不可使用計算機

請勿在本試題紙上作答，否則不予計分

I. True or False (20 points, 2 pts each)

Notes:

- (1) Answer questions using "T" or "F".
- (2) Write down your answers along with associated questions.
- (3) Label questions in numerical order.

1. For an arbitrary distribution, there would be half of observations around the either side of the arithmetic mean.
2. Ginger not only received a score corresponding to a standardized z-score of 0.87 while participating a reading test but also obtained a score corresponding to a standardized z-score of 1 while joining a singing contest. Therefore, Ginger is much better at singing than at reading in terms of original scores in the reading test and the signing contest.
3. y_1, y_2, y_3 , and y_4 are random variables drawn from the same distribution with mean μ_y . Therefore, $\bar{y} = 0.7y_1 - 0.3y_2 + 0.5y_3 + 0.1y_4$ is an unbiased estimator of the mean.
4. If we reject a null hypothesis, then it is still possible that the null hypothesis is correct.
5. Sam calculates two confidence intervals of [LCL, UCL]=[0.235, 0.765] and [LCL, UCL]= [0.349, 0.851] from a random sample. Given these two confidence intervals, Sam might have some problems in calculation of these two confidence intervals. (LCL: lower confidence limit; UCL: upper confidence limit)
6. If R-squared of a regression line is 1, then the error sum of squares would be zero.
7. You cannot recover the probability function from any discrete distribution given the cumulative distribution function since the probability function might not exit for a single value.
8. Once you multiply each data point in a data set by 100, the new mean will be 100 times original mean and the new variance will be 10,000 times original variance.
9. Investigators would like to exam whether there is a high correlation between trainees before and after experiencing training sessions. Therefore, Investigators better employ Pearson's correlation coefficient instead of the Spearman rank correlation coefficient.
10. The more appropriate measure of the center for a data set is median when data are skewed.

(背面仍有題目,請繼續作答)

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II. Choose the BEST answer (45 points, 3 pts each)

Notes:

- (1) Answer questions using "A", "B", "C", or "D".
- (2) Write down your answers along with associated questions.
- (3) Label questions in numerical order.

1. Let $x = 1.5y + 2.32$. y has a standard normal distribution. Therefore, what is the probability for $x < 2.32$?
- (A) 0.50
(B) 0.60
(C) 0.70
(D) Not enough information

Use the following information to answer Questions 2 and 4.

Two 95% confidence intervals were constructed for the proportion of the approval voting on a new deal by a union of workers. These two confidence intervals are (1) [LCL, UCL]=[0.6116, 0.6884] and (2) [LCL, UCL]= [0.6141, 0.6859]. (Note: Do not consider the small sample correction in confidence interval construction; LCL: lower confidence limit; UCL: upper confidence limit)

2. What is the proportion of the workers in this vote who approved this new deal?
- (A) 0.85
(B) 0.75
(C) 0.65
(D) 0.55
3. If the critical values employed in these confidence intervals are ± 1.96 and the null hypothesis for the first confidence interval, [0.6116, 0.6884], is $H_0: p = 0.60$, what is the number of workers who voted in this new deal?
- (A) 100
(B) 225
(C) 400
(D) 625

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4. What is the value of the p_0 in the null hypothesis: $H_0: p = p_0$ for the second confidence interval of [0.6141, 0.6859]?
- (A) 0.9
(B) 0.7
(C) 0.5
(D) 0.3

Use the following information to answer Questions 5 to 8.

The following frequency table was compiled by a survey regarding smartphone purchase behavior of males and females:

Unit: number of people

Gender	Smartphone Platform			Total
	Android	Apple IOS	Windows	
Male	35	25	15	75
Female	20	45	10	75
Total	55	70	25	150

5. What is the expected frequency for the number of users who purchased Android and were males?
- (A) 12.83
(B) 17.50
(C) 27.50
(D) 35.00
6. What is the Pearson's Chi-square statistic for the test that the gender does not affect the smartphone purchase behavior?
- (A) 8.76
(B) 9.45
(C) 10.81
(D) 11.42
7. What is the degree of freedom for the Pearson's Chi-square test?
- (A) 2
(B) 3
(C) 4
(D) 6

(背面仍有題目,請繼續作答)

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8. Is there any significant relationship between gender and smartphone purchase behavior for the Pearson's Chi-square test at 1% level? (Chi-square values are provided as follows, $\chi_{0.01,2}^2 = 9.2103$, $\chi_{0.01,3}^2 = 11.3449$, $\chi_{0.01,4}^2 = 13.2767$, and $\chi_{0.01,6}^2 = 16.8119$)
- (A) Significant
(B) Insignificant
(C) Indeterminate
(D) Not enough information

Use the following information to answer Questions 9 to 12.

A survey was taken by asking N auto workers regarding their weekly working hours ($x_i, i = 1, 2, \dots, N$). The following information is obtained: $\sum_{i=1}^N x_i^2 = 20439$, the sample mean (\bar{x}) = 30.45, and the sample variance (s_x^2) is 99.7342.

9. What was the approximate number of workers (N) inquired in this survey?
- (A) 19
(B) 20
(C) 21
(D) 22
10. If the lower confidence limit (LCL) of the population variance of weekly working hours is 62.8643, what is the critical chi-square value employed in this LCL?
- (A) 30.1435
(B) 31.4104
(C) 32.6705
(D) 33.9244
11. The value of the test statistic for a null hypothesis, $H_0: \sigma^2 = \theta$, is 12.9167 less than the critical chi-square value in the above question 10. What is the value of θ ?
- (A) 80
(B) 90
(C) 100
(D) 110
12. If we would like to test a null hypothesis that the population variance of weekly working hours is 100 vs. the alternative that the population variance of weekly working hours is less than 100, what is your conclusion using the critical value of 10.117?
- (A) Reject the null hypothesis.
(B) Do not reject the null hypothesis.
(C) Either rejecting or accepting the null hypothesis is correct.
(D) Not enough information.

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Use the following information to answer Questions 13 to 15.

Stock	2000 (base period)		2011 (current period)	
	Price	Quantity(lots)	Price	Quantity (lots)
A	\$12	2,000	\$21	2,500
B	\$10	3,000	\$9	2,200
C	\$14	1,500	\$5	3,000
D	\$11	2,400	\$15	2,000

one lot=100 shares

13. What is the Laspeyres index of year 2011?
- (A) 140.24
(B) 130.15
(C) 120.23
(D) 110.95
14. What is the Paasche price index of year 2011?
- (A) 101.12
(B) 102.23
(C) 103.45
(D) 104.35
15. What is the Fisher ideal index of year 2011?
- (A) 103.45
(B) 104.75
(C) 105.92
(D) 1096.24

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III. Partial Credit Questions and Fill in the Blanks (35 points, 5 pts each)

Notes:

(1) Write down your answers and solution steps along with associated blanks.

(2) Label blanks in alphabetical order.

1. Below are sales data of a retail store for four years:

Unit: millions		
Year	Quarter	Sales
2008	Spring	5.34
	Summer	8.24
	Fall	11.35
	Winter	12.35
2009	Spring	5.75
	Summer	7.25
	Fall	10.54
	Winter	11.35
2010	Spring	6.32
	Summer	9.35
	Fall	12.24
	Winter	14.12
2011	Spring	6.12
	Summer	9.11
	Fall	11.25
	Winter	12.87

The seasonal indices for the sales are:

Spring	Summer	Fall	Winter
0.612	0.823	1.254	1.625

A time trend equation is set up as follows:

$$\text{Deseasonalized quarterly Sales}_t = \alpha + \beta \times \text{time} + u_t,$$

where α and β are parameters and u_t are residuals. (set $\text{time} = 1$ for the spring of year 2008)

- (a) What is the average deseasonalized quarterly sales for year 2010? (a)
- (b) What are the least squares estimates of α and β ? $\alpha =$ (b); $\beta =$ (c)
- (c) What is the expected sales (in unit of millions) for the winter of year 2012? (d).

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2. Consider a financial market condition (up or down) which is highly correlated with the state of economy (good or bad). Suppose you are aware of the following situation.

The state of economy also depends on the monetary policy (expansionary or contractionary) of the monetary authority. When the state of economy is good and the monetary authority adopts an expansionary policy, there is a sixty-five percent chance that the financial market goes up while there is a fifty-five percent chance that the financial market goes up when the state of economy is good and the monetary authority adopts a contractionary policy. On the other hand, when the state of economy is bad and the monetary authority adopts an expansionary policy, there is a seventy percent chance that the financial market goes up while there is a twenty percent chance that the financial market goes up when the state of economy is bad and the monetary authority adopts a contractionary policy. Additionally, we know that there is a 80 percent chance that the authority implements an expansionary policy when the state of economy is good while there is a 50% chance that the authority implements an expansionary policy when the state of economy is bad.

- (a) What is the probability that the financial market is up under the good economy? (e)
- (b) What is the probability that the financial market is down under the bad economy? (f)
- (c) What is the probability that the financial market is up if there is a sixty-five percent chance that the state of economy is good? (g)