

(100)輔仁大學碩士班招生考試試題 考試日期：100年3月18日第3節

本試題共：7頁(本頁為第1頁)

科目：基礎統計 系所組：餐旅管理研究所 乙組

答案須寫在彌封的答案卷內。

Part I. Multiple Choice Questions(50%)

Choose the best answer out of the five options. From Q1.) to Q10.), each question counts for 4 points; Q11.) and Q12.) count for 5 points each. (-1 point for each wrong answer, 0 if left empty)

Q1.) A vending machine is selling 12 kinds of soft drinks which cost either NT\$ 25 or NT\$ 20 per can. Let it be the case that the daily selling of each drink is independent, and daily cost of maintaining the machine is NT\$ 250. What is the expected value and variance of daily profit ( $Y$ ) from the machine, if the average numbers of the NT\$ 25 drinks ( $x_1$ ) and the NT\$ 20 drinks ( $x_2$ ) sold per day are the same and equal to 50, and if  $\text{var}[x_1]=1,000$  and  $\text{var}[x_2]=2,000$ ?

- A)  $E[Y]=\text{NT\$ }2,250$  and  $\text{var}[Y]=\text{NT\$ }312,500$
- B)  $E[Y]=\text{NT\$ }2,000$  and  $\text{var}[Y]=\text{NT\$ }312,500$
- C)  $E[Y]=\text{NT\$ }2,250$  and  $\text{var}[Y]=\text{NT\$ }320,000$
- D)  $E[Y]=\text{NT\$ }2,000$  and  $\text{var}[Y]=\text{NT\$ }320,000$
- E)  $E[Y]=\text{NT\$ }2,000$  and  $\text{var}[Y]=\text{NT\$ }632,500$

Q2.) Consider a ten question statistics multiple choice tests, with four options per question. If a student “guesses” the answers randomly and if six or more correct answers are needed to pass, what’s the probability that the student would pass the test?

- A) 2%
- B) 1%
- C) It cannot be determined.
- D) 0.5%
- E) 0.125%

Q3.) Consider the experiment of tossing a fair dice and let

$A=\{\text{Observe an even number}\}$

$B=\{\text{Observe a number less than or equal to }4\}$

Which of the following statement is INCORRECT?

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科目：基礎統計 系所組：餐旅管理研究所 乙組

- A) Events A and B are independent.
- B)  $P(A)=1/2$  and  $P(B)=2/3$
- C)  $P(A \cap B)=1/3$
- D)  $P(A | B)=1/2$
- E)  $P(B \cup A)=3/4$

Q4.) Professors routinely hire graduate students as research assistants. Suppose a professor randomly selects three assistants from a total of ten applicants, six male and four female students. Let  $x$  be the number of females who are hired. Find the probabilities that no females are hired and all hired are females.

- A) The mean of  $x$  is 1.2
- B) The standard deviation of  $x$  is 0.56
- C) The probability that no female students are hired by the professor is  $1/6$
- D) The probability that all hired students are females is  $1/30$
- E) The probability that exactly one of the hired is female is  $1/2$

Q5.) Which of the following statements is INCORRECT about the sampling distribution of the sample mean:

- A) The sampling distribution shows how the sample was distributed around the sample mean
- B) The standard error of the sample mean will decrease as the sample size increases.
- C) The standard error of the sample mean is a measure of the variability of the sample mean among repeated samples.
- D) The sample mean is unbiased for the true (despite unknown) population mean.
- E) The sampling distribution shows how the sample mean will vary among repeated samples.

Q6.) The Central Limit Theorem is important in Statistics because it allows us to use the normal distribution to make inferences concerning the population mean:

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科目：基礎統計 系所組：餐旅管理研究所 乙組

- A) provided that the population is normally distributed and the sample size is reasonably large.
- B) provided that the population is normally distributed (for any sample size).
- C) provided that the sample size is reasonably large (for any population).
- D) provided that the population is normally distributed and the population variance is known (for any sample size).
- E) provided that the population size is reasonably large (whether the population distribution is known or not).
- Q7.) Suppose the scores,  $x$ , on a college entrance examination are normally distributed with a mean of 550 and a standard deviation of 100. A certain prestigious university will consider for admission only those applicants whose scores exceed the 90th percentile of the distribution. Find the minimum score an applicant must achieve in order to receive consideration for admission to the university. (Hint: Use the closest approximation from the standard normal table attached at the end.)
- A) 650
- B) 678
- C) 667
- D) 611.11
- E) 636.23
- Q8.) Many institutes conduct surveys to determine the current consumer sentiment concerning the state of the economy. A recent survey by a commercial bank randomly samples 484 consumers and finds that 257 are optimistic about the state of the economy. Which of the following is INCORRECT? (Hint: A standard normal table is attached at the end.)
- A) The point estimate of the proportion of the population who are optimistic about the economy is 0.531.
- B) The standard deviation of the point estimate of the proportion of the population who are optimistic about the economy is 0.023.

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- C) The sample size is sufficiently large that the normal distribution provides a reasonable approximation for the sampling distribution of the proportion of the population who are optimistic about the economy.
- D) A 95% confidence interval of the proportion of the population who are optimistic about the state of the economy is (0.487, 0.575).
- E) Using a 90% confidence interval, one can conclude that the proportion of the population who are optimistic about the economy exceeds 50%.

Q9.) Which of the following descriptions about hypothesis testing is INCORRECT?

- A) If the test statistic does not fall into the rejection region, one should accept the null hypothesis.
- B) Type I error refers the probability of rejecting the null hypothesis when the true state of nature is the one characterizes by the null hypothesis.
- C) The level of significance of a test is the probability of Type I error.
- D) Type II error refers the probability of accepting the null hypothesis when the true state of nature is the one characterizes by the alternative hypothesis.
- E) One minus the probability of Type II error is referred to as the power of the test.

Q10.) Recently intensive campaigns have been conducted by both the government and private agencies to discourage using eat-and-toss disposable wooden chopsticks and to promote carrying the more environmental friendly reusable chopsticks. Suppose the Environmental Protection Agency randomly sampled 1,500 adults in 2008 and then sampled 1,750 adults in 2010 to determine whether there was evidence that the percentage of adults who use disposable wooden chopsticks had decreased. The results of the two sample surveys are shown in the table below, where  $x_1$  and  $x_2$  represent the numbers of sampled adults who use disposable wooden chopsticks. Denote  $p_1$  and  $p_2$  as the true proportions of adult population who use disposable wooden chopsticks in 2008 and 2010.

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本試題共：7頁(本頁為第5頁)

科目：基礎統計 系所組：餐旅管理研究所 乙組

Results of the Surveys	
2008	2010
$n_1 = 1,500$	$n_2 = 1,750$
$x_1 = 555$	$x_2 = 578$

Using a significance level of .05, consider the following test (a standard normal table is attached at the end):

$$H_0 : p_1 - p_2 = 0$$

$$H_0 : p_1 - p_2 > 0$$

A test statistics can be

- A)  $z=2.37$
- B)  $z=2.02$
- C)  $z=1.96$
- D)  $z=3.77$
- E)  $z=3.12$

Q11.) Access the following descriptions about simple linear regressions:

- I. The slope measures the change in the dependent variable for every 1-unit increase in the independent variable.
- II. Using the method of least squares, the sum of errors of prediction is zero.
- III. The coefficient of determination measures the strength of the linear relationship between the independent and dependent variables.
- IV. The correlation coefficient gives the proportion of the sample variable in the dependent variable that can be explained by the straight-line model.
- V. A very low correlation between the variables indicates that the two variables are unrelated.

Which of the above are CORRECT?

- A) I and II only.
- B) I, II, III, and IV only.
- C) I, II, III, and V only.
- D) I, II, IV, and V only.
- E) All of them.

Q12.) Access the following descriptions about multiple regressions:

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科目：基礎統計 系所組：餐旅管理研究所 乙組

- I. Multicollinearity occurs when two or more of the independent variables in the model are correlated.
- II. One may find residuals that are greater than three times the standard deviation estimate to detect a misspecified model.
- III. One may graph residuals in a histogram and look for strong departures from normality to detect outliers.
- IV. One may plot residuals against each quantitative independent variable in the model and look for trends to detect non-normal error.
- V. One may plot residuals against the independent variable and look for patterns to detect a nonconstant error variance.

Which of the above are CORRECT?

- A) I, II, and III only.
- B) I, III, and IV only.
- C) I, II, and V only.
- D) I and V only.
- E) All of them.

**Part II. 問答與計算題(50%)**

1. 估計母群比例時樣本人數是非常重要的，假設有家國際觀光旅館想了解顧客對於「女性擔任 doorman(bell lady)」是否合適的看法，並且希望對於適任與不適任意見的反應誤差不超過 5%，請問在 95%的信賴水準下，最少應抽取多少顧客才行？(10%)
2. 試比較說明列聯表的獨立性檢定與齊一性檢定之異同。請從母體、抽樣方法、分析方法及實例說明。(10%)
3. 迴歸模型中  $Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \epsilon_i$  ,  $i=1,2,3,\dots,50$  (10%)  
(1)請完成下表，將( )區填入數字(7%，1格1分)

ANOVA Table

變異來源	平方和	自由度	均方和	F值
迴歸	300	(b)	(e)	(g)
誤差	(a)	(c)	(f)	
總變異	1000	(d)		

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(2)請寫出上述檢定的虛無假設及對立假設。(3%)

4.變異數分析的檢定前的假設，須符合那三個前提假定？(10%)

5.某家連鎖餐廳想瞭解午晚餐來客數的比較，分別抽取10家的連鎖餐廳，記錄同一天的來客數，在顯著水準0.05時，是比較其來客數是否有差異？(10%)

(單位：十人)

店家	1	2	3	4	5	6	7	8	9	10
午餐	5	8	7	10	6	8	9	6	5	2
晚餐	6	7	8	8	5	6	8	7	5	4

附件：機率表

	機率值	機率值	機率值
$t_{(19,0.05)}$	1.729	$t_{(19,0.025)}$	2.093
$t_{(18,0.05)}$	1.734	$t_{(18,0.025)}$	2.101
$t_{(9,0.05)}$	1.833	$t_{(9,0.025)}$	2.262

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