

國立政治大學 113 學年度第 1 學期 Final Exam 考試命題紙

Subject: 統計學 (一)

開課班別: 統計學整合開課

Teacher: Han-Ming Wu

Date: 09 Jan. (Thur) 13:10-14:50

*Allowed: 「O」· Prohibited: 「×」

1. 需加發計算紙或答案紙請在試題內封袋備註。
2. 為環保節能減碳· 試題一律採雙面印刷· 如有特殊印製需求· 請註記:

Pages: 3 · Copies: 50

Calculator

Textbook

Class notes

3C product

Scope: §ch5-8

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Notes:

- (1) Fill in the student ID number and name on the answer sheet °
- (2) Answer all questions in English (ignore the grammar and spelling) °
- (3) Answer each question in the order it appears ° The total score is 120.
- (4) It is recommended to use a dark ballpoint pen ° (pencil is allowed)
- (5) The calculation process (for parts **IV** and **V**) is required (calculate to 4 decimal places) °
- (6) Return both the answer sheet and the question sheet.

(-) Declaration (0%): Please transcribe the following oath onto the first page of the answer sheet in either Chinese or English. (複寫下列宣誓詞至答案卷的第一頁上) ° (10 points will be deducted if not written.) (不寫扣 10 分)

0. ”本人姓名 恪遵各項考試規則· 若如違反· 願受校方最嚴厲處罰· 謹誓。”

”I (your name here) will strictly adhere to all examination rules. If I break this oath, I am willing to accept the most severe punishment imposed by the school. Solemnly sworn.”

(I) Multiple choice (20%, 5% each); select one correct answer.

1. The closer the sample mean is to the population mean, (A). the larger the sampling error. (B). the smaller the sampling error. (C). the sampling error equals 1. (D). none of these alternatives is correct.
2. The purpose of statistical inference is to provide information about the (A). population based upon information contained in the sample. (B). sample based upon information contained in the population. (C). population based upon information contained in the population. (D). mean of the sample based upon the mean of the population.
3. If we change a 95% confidence interval estimate to a 99% confidence interval estimate, we can expect the (A). width of the confidence interval to increase. (B). width of the confidence interval to decrease. (C). width of the confidence interval to remain the same. (D). sample size to increase.
4. For a given confidence level and when σ is known, the margin of error in a confidence interval estimate (A). is independent of sample size. (B). varies from sample to sample of the same size. (C). increases as the sample size increases. (D). is the same for all samples of the same size.

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本試題共3頁· 印刷份數: 50 份

計算機

課本

筆記

字典

手機平板筆電

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備註：注意事項要看!! (Scope: §ch5-8)

O

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(II) Fill-in-the-blank (Correct spelling should be used if possible.) (20%, 5% each)

5. A random variable, often denoted by X (or some other capital letter), is a _____ that maps outcomes to numbers on the real line.
6. What is the normal probability density function (let μ denotes the population mean, and σ the population standard deviation): _____.
7. A sample characteristic, such as a sample mean \bar{X} , a sample standard deviation s , a sample proportion \bar{p} , and so on, is called the _____.
8. The t distribution is a family of similar probability distributions, with a specific t distribution depending on a parameter known as the _____.

(III) Short answer (20%, 10% each)(write down the statement (or definition), formula if any, interpretation)

9. What is the so-called "sampling distribution"?
10. How to interpret a 95% confidence interval for a population parameter θ ?

(IV) Calculation (40%, 20% each)

11. **Employee Ages.** To estimate the mean age for a population of 4000 employees, a simple random sample of 40 employees is selected.
 - (a) If the population standard deviation is $\sigma = 8.2$ years, compute the standard error both with and without the finite population correction factor. What is the rationale for ignoring the finite population correction factor whenever $n/N \leq 0.05$?
 - (b) What is the probability that the sample mean age of the employees will be within ± 2 years of the population mean age?

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備註：注意事項要看!! (Scope: §ch5-8)

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12. **Meal Cost in Hong Kong.** The mean cost of a meal for two in a midrange restaurant in Tokyo is \$40 (Numbeo.com website). How do prices for comparable meals in Hong Kong compare? (The data file HongKongMeals contains the costs for a sample of 42 recent meals for two in Hong Kong midrange restaurants (the sample mean is \$32.66, and the sample variance is 46.60793)).

- (a) What is the 95% confidence interval estimate of the population mean in Hong Kong?
- (b) How do prices for meals for two in midrange restaurants in Hong Kong compare to prices for comparable meals in Tokyo restaurants? (Hint: Whether the mean cost for a mid-range meal for two in Tokyo is in or not in the 95% confidence interval for comparable meals in Hong Kong? if yes, what does that mean? Or if not, what does that mean?)

(V) Bonus (20%)

13. Let X_1, X_2, \dots, X_n be i.i.d. random sample from a Normal population with a unknown mean μ and a known standard deviation σ . Derive the formula of the 95% confidence interval for μ .

機率表

Lower tail probability of a standard normal distribution: $Z \sim N(0, 1), P(Z \leq z) = p$.

z	-1.29	-0.26	-0.19	0.86	0.95	1.54	1.78
p	0.0985	0.3974	0.4247	0.8051	0.8289	0.9382	0.9625

Lower tail probability of a t distribution: $T \sim t_{(df)}, P(T \leq t) = p$.

df	41	41	41	42	42	42	43	43	43
t	-2.4208	-2.0195	-1.6829	-2.4185	-2.0181	-1.6819	-2.4163	-2.0166	-1.6811
p	0.01	0.025	0.05	0.01	0.025	0.05	0.01	0.025	0.05

<The blank pages at the back can be used as scratch paper. (後面空白頁可當計算紙)>

注意：1、考試求公平及公正，請同學務必自律，維護學校與學生之榮譽。

2、考試時不得有交談、窺視、夾帶、抄襲、傳遞、代考或其它作弊等舞弊行為，考畢務必交卷，不得攜卷出場，違者依考場規則議處。