

國立政治大學 110 學年度第 1 學期 小考 (1) 考試命題紙

考試科目：統計學 (一)

開課班別：統計學整合開課

命題教授：吳漢銘

考試日期：10 月 21 日 (四) 16:10-17:00

※准帶項目打「O」，否則打「×」

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：

本試題共 2 頁，印刷份數：112 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!! (§1~§3)

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注意事項：(1) 答案卷請寫上姓名及學號。(2) 請按題號順序書寫。(3) 每一題號需置於答案卷最左邊。(4) 中英文作答皆可。(5) 可用鉛筆。(6) 需要計算過程。(7) 同時交回答案卷、題目卷、計算紙。(8) 總分共 100 分 +10 分。

1. (25%) 名詞解釋: (a) 統計 (Statistics) · (b) 敘述統計 (Descriptive Statistics) · (c) 統計推論 (Statistical Inference) · (d) Simpson's Paradox (辛普森悖論) · (e) 共變異數 (Covariance)。

2. (40%) 簡答題:

(a) 資料類型的量測的尺度 (Scales of Measurement) 有哪些類型?

(b) 對於一個類別型 (Categorical) 變數的資料，有哪些統計圖可以用來呈現其次數分佈 (Frequency Distribution)?

(c) 對於一個連續型 (Continuous) 或是屬量 (Quantitative) 變數的資料，如何定義其次數分佈?

(d) 有哪些統計圖可以用來觀察一個連續型或是屬量變數的次數分佈?

(e) 對於一個具 n 個觀察值的連續型變數樣本資料，記做 $x = (x_1, x_2, \dots, x_n)$ ，有哪些量測指標可以用來了解此資料的中心區勢 (Measure of Location)? (請同時寫出計算公式)

3. (15%) Western University has only one women's softball scholarship remaining for the coming year. The final two players that Western is considering are Allison Fealey and Emily Janson. The coaching staff has concluded that the speed and defensive skills are virtually identical for the two players, and that the final decision will be based on which player has the best batting average. Crosstabulations of each player's batting performance in their junior and senior years of high school are as follows:

Outcome	Allison Fealey		Outcome	Emily Janson	
	Junior	Senior		Junior	Senior
Hit	15	75	Hit	70	35
No Hit	25	175	No Hit	130	85
Total At-Bats	40	250	Total At-Bats	200	120

A player's batting average is computed by dividing the number of hits a player has by the total number of at-bats. Batting averages are represented as a decimal number with three places after the decimal.

(a) Calculate the batting average for each player in her junior year. Then calculate the batting average of each player in her senior year. Using this analysis, which player should be awarded the scholarship? Explain.

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(b) Combine or aggregate the data for the junior and senior years into one crosstabulation as follows:

Outcome	Player	
	Fealey	Janson
Hit		
No Hit		
Total At-Bats		

Calculate each player's batting average for the combined two years. Using this analysis, which player should be awarded the scholarship? Explain.

(c) Are the recommendations you made in parts (a) and (b) consistent? Explain any apparent inconsistencies.

4. (20%) The results of a national survey showed that on average, adults sleep 6.9 hours per night. Suppose that the standard deviation is 1.2 hours.

(a) Use Chebyshev's theorem to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours.

(b) Assume that the number of hours of sleep follows a bell-shaped distribution. Use the empirical rule to calculate the percentage of individuals who sleep between 4.5 and 9.3 hours per day. How does this result compare to the value that you obtained using Chebyshev's theorem in part (a)?

5. (10%) 加分題：證明皮爾森相關係數 (Pearson's Correlation Coefficient) 之值的範圍介於 -1 及 1 之間。

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。