

國立臺北大學 115 學年度碩士班一般入學考試試題

系（所）組別：企業管理學系甲組

科 目：統計學

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☐可 ☒不可使用計算機

1. 銷售人員想評估兩種服飾材質 (M1, M2) 及兩種設計風格 (S1, S2) 組合的市場接受度。藉由隨機指派受測者到四個組合，依據蒐集的資料進行二因子變異數分析發現：服飾材質與設計風格搭配的交互效果達顯著水準。請問：
(1) 如果想要得到更具體的結果，銷售人員接下來該選擇進行事後多重比較檢定 (post hoc multiple comparison test) 或是單純效果檢定 (simple effect test) ? (10%)
(2) 說明該檢定如何進行。(20%)
2. 研究人員進行資料分析設立了一個線性迴歸模式： $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$ ， β_0 、 β_1 、 β_2 是截距項與 X_1 、 X_2 的係數， ε 是殘差項，樣本大小 n 。該研究人員想知道不納入解釋變數 X_2 對 β_1 估計結果會產生什麼影響。請討論其影響為何？(20%)
3. An airplane has 15 seats and 15 passengers, each with an assigned seat (passenger k assigned to seat k). Passenger No.1 boards first but has lost the boarding pass and chooses a seat uniformly at random. Passengers No.2 through No.14 board in order: each takes their assigned seat if available; otherwise, they choose a remaining seat uniformly at random. Passenger No.15 boards last. What is the exact probability that Passenger No.15 sits in the assigned seat (seat No.15)? (10%)
(Note: You are asked to answer in percentages, counted to two decimal places.)
4. A prestigious art gallery is hosting an exhibition of 10 sculptures. The gallery has 10 pedestals arranged in a perfect circle. Among these sculptures are three specific pieces created by the same artist (Tom), which we will label A1, A2, and A3. The other seven sculptures are created by seven different artists.

The curator has dictated the following strict conditions for the installation:

Condition 1: The Artist's Constraint: No two of the Tom's sculptures (A1, A2, A3) can be placed on adjacent pedestals.

Condition 2: The Rotational Symmetry: Because the pedestals are in a circle and the room is perfectly uniform, two arrangements are considered identical if one can be rotated into the other.

Condition 3: The Reflectionary Constraint: Furthermore, because the room features floor-to-ceiling mirrors on all walls, we must also account for vertical symmetry. Two arrangements are considered identical if one is a reflection of the other.

Answer the following two questions.

- (1) Assuming that A1, A2, and A3 are distinct sculptures, calculate the total number of ways that the 10 sculptures can be arranged on the pedestals while satisfying all three conditions. (20%)
- (2) Assuming that A1, A2, and A3 are the same sculpture, calculate the total number of ways that the 10 sculptures can be arranged on the pedestals while satisfying all three conditions. (20%)

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