

【第一部分：問答及演算題】

1. (Stratified Random Sampling) This problem is to estimate the sales for the coming year for a pharmaceutical company. The forecast is based on asking hospitals how much they are planning to order next year. To use the research budget efficiently, the hospitals are stratified by the size of their orders during the past year. The following is some relevant information based on the past year:

Strata Hospital Size	Proportion	Standard Deviation (of orders)	Interview Cost (\$)
Large	10%	40	100
Medium	20%	3	100
Small	70%	2	100

Note: Number of hospitals: 5000

- (a) Assume that a total of 300 interviews are to be conducted. How would you allocate those interviews among the three strata? (10%) (Hint: pay attention to the standard deviation of orders)
- (b) If a simple random sample of size 300 were obtained from the population, about 10% or 30 interviews, would be from the Large Hospital stratum. Why did you recommend in part (a) that more than 30 interviews be conducted from this stratum? (5%)
- (c) The survey was conducted, and the average value (in thousands) for each stratum were as follows:
 $\bar{X}_1 = 100$ $\bar{X}_2 = 8$ $\bar{X}_3 = 5$
 What would your estimate be of the population mean, the average sales that will received from all hospitals next year? (5%)
- (d) Given the context of part (c), what would be the variance of your estimate of the population mean? Do you think that this variance would be large or small than if you had taken a simple random sample of size 300 from the total population? Why? (5%)
2. The members of a health spa pay annual membership dues of \$10,000 plus a charge of \$100 for each visit to the spa. Let Y denote the total dollar cost for the year for a member and X the number of visits by the member during the year. Express the relation between X and Y mathematically. Is it a functional or a statistical relation (10%)
3. A speaker state: "In developing third-order or higher-order polynomial regression models in social science and managerial applications, inferences on the β 's usually take the form of direct tests. There is relatively little interest in estimating the β 's to assess effects of the individual polynomial terms." Why might this be so? (10%)
4. A continuous random variable X has the exponential distribution with parameter $\theta > 0$ and it has a pdf of the form
 $f(x; \theta) = \frac{1}{\theta} e^{-x/\theta}$ $x > 0$ and zero otherwise. Please prove that $P[X > a+t | X > a] = P[X > t]$ (10%)
5. A Poisson random variable, $X \sim \text{POI}(\mu)$, was defined as a discrete random variable with pdf, $f(x; \mu) = \frac{e^{-\mu} \mu^x}{x!}$, $x = 0, 1, 2, \dots$; $\mu > 0$. Please show that
 $f(x-1; \mu) < f(x; \mu)$ for $x < \mu$ (10%)
 and
 $f(x-1; \mu) > f(x; \mu)$ for $x > \mu$ (10%)

見背面

【第二部分：選擇題，每題 5 分】注意：請於試卷內之「選擇題作答區」依序作答。

6. 根據最近的調查顯示，台灣地區 20 歲以下青少年平均每天看手機的時間為 4 小時，標準差為 1.5 小時。隨機選取一組樣本大小為 36 的隨機樣本，請問此組樣本平均每天看手機的時間至多 4.5 小時的機率為何？
- (A) 0.5342
(B) 0.6693
(C) 0.8350
(D) 0.9772
7. 以下有關假說檢定的論述，何者錯誤？
- (A) 研究假說是針對母體特徵（如參數、分配）做一種推論性的描述
(B) 假說檢定之目的是宣稱虛無假說成立
(C) 檢定統計量之抽樣分配乃根據虛無假說推導而得
(D) 虛無假說（null hypothesis）的論述必須要有等號
8. 滿意度調查中使用李克特量表（Likert scale）所蒐集的資料，例如：
非常滿意 滿意 普通 不滿意 非常不滿意
此項尺度最不可能屬於下列哪一種測量尺度？
- (A) 名目尺度（nominal scale）
(B) 順序尺度（ordinal scale）
(C) 區間尺度（interval scale）
(D) 比率尺度（ratio scale）
9. 一般提到大數據都會提到 4 個 V，請問下列何者為非：
- (A) 描述資料大小的「量」（volume）
(B) 資料傳輸速度的「速」（velocity）
(C) 形容資料多元性的「多變」（variety）
(D) 資料的「垂直整合性」（Vertical）
10. 欲探討不同類型促銷方案對於產品銷售的影響，是否因顧客性別而異，則可使用何種統計方法？
- (A) 均值差異的 t 檢定
(B) 卡方分析
(C) 雙因子變異數分析
(D) 單因子變異數分析

試題隨卷繳回