Part I

1. 假設線性迴歸式為：$Y = \beta_0 + \beta_1 X + \varepsilon$，$\beta_0$、$\beta_1$ 是參數，ε 是誤差，樣本大小為 n。

   依據這個模式回答兩個問題：

   (1) β_1 的估計滿足一致性（consistency）指的是什麼？（10%）

   (2) 不滿足這個特性對 β_1 的估計有何影響？（10%）

2. 北大企業行銷部門進行新產品市場測試。行銷人員想知道包裝與口味對消費意願的影響。測試因子設計包括：三款包裝（P1, P2, P3）及兩種口味（T1, T2）。藉由隨機指派 180 位受測者到這六個組合，依據蒐集的資料進行二因子變異數分析（two-way ANOVA）。統計檢定發現：包裝與口味有交互效果（interaction effect）。請問：

   (1) 這個發現對行銷人員有什麼意涵？（20%）

   (2) 如果行銷人員想要得到更具體的結果，您認為接下來該進行什麼分析？（10%）

Part II

1. A group of 6 friends are exchanging Christmas gifts. In how many ways can they exchange gifts so that no one receives their own gift？（15%）

2. Given that the lifetime of a particular device follows an exponential distribution with a mean of x hours, find the expected lifetime of the device, given that it has lasted at least Y hours.（15%）

3. A rare medical condition affects only 1 in 50,000 people in a specific population. A sophisticated diagnostic test for this condition has the following characteristics：

   • If a person has the disease, the test is 99.5% accurate in detecting it (sensitivity).

   • If a person does not have the disease, the test has a 1.5% false positive rate.

   • Two independent tests are performed on the same patient.

   What is the probability（%）that a person actually has the disease, given that they tested positive on the first test and also tested positive on the second test？（20%）

   (Note: You are asked to answer in percentages, counted to two decimal places.)

試題隨卷繳交