1. (30%) On each of four days next week (Monday through Thursday), Yvonne will shoot six free throws. Assume that Yvonne's shots satisfy the assumptions of Bernoulli trials with p = 0.4.

   (a) Compute the probability that on any particular day Yvonne obtains exactly two successes.

   For future reference, if Yvonne obtains exactly two successes on any particular day, then we say that the event "Amaze" has occurred.

   (b) Refer to part (a). Compute the probability that: next week Amaze will occur on Monday and Thursday and will not occur on Tuesday and Wednesday.

   (Note: You are being asked to calculate to the fourth decimal place)

2. (20%) David is six years old and he is interested in one special toy box with a colored ball. Six different colored balls are randomly assigned to this kind of box by the manufacturer. David wants to collect the six different colored balls. From the viewpoint of expected value, how many boxes does he need to buy? (Note: You are being asked to calculate to the first decimal place)

3. 某公司想評估一款即將上市飲料的口味與甜度對消費者偏好程度的影響。假設該公司人員進行二因子的實驗設計：口味—(1)蘋果、(2)葡萄、(3)奇異果；甜度—(1)高、(2)中、(3)低，藉由隨機指派受測者到各個因子的水準組合，並依據蒐集的資料進行二因子變異數分析(two-way ANOVA)。檢定結果顯示口味與甜度有顯著的交互作用(interaction effect)，請問：(1)<口味與甜度有顯著交互作用>的意義是什麼？(10%) (2)後續應該進行什麼檢定?請簡單說明進行的過程。(10%)

4. 建立多元迴歸模式(multiple regression model)分析資料需要評估共線性(collinearity)的問題。假設建立的線性迴歸模式為： $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i$，$\beta_0$、$\beta_1$、$\beta_2$ 分別是截距項與解釋變數(X_1, X_2)的係數，ε_i是隨機誤差項，$i = 1,2,...,n$，n 為樣本大小，ε_i 滿足基本假設。就此模式而言，請問：(1)共線性問題指的是什麼？ (10%) (2)藉由變異數膨脹因子(variance inflation factor，VIF)評估這個問題該如何進行(符號可自訂)？(10%) (3)假設 X_1 的 VIF 值為 4，這個數值的意義為何？ (5%) 對 β_1 的估計檢定有何影響? (5%)

試題隨卷繳交