## Statistics Assignment #3

1. Box I contains 2 white balls and 2 black balls, box II contains 2 white balls and 1 black ball, and box III contains 1 white ball and 3 black balls.

a. One ball is selected from each box. Calculate the probability of getting all white balls.

- b. One box is selected at random and one ball drawn from it. Calculate the probability that it will be white.
- c. In b, calculate the probability that the first box was selected given that a white ball, is drawn.

2. A Morgan Stanley Consumer Research Survey sampled men and women and asked each whether the preferred to drink plain bottled water or a sports drink such as Gatorade or Propel Fitness water (The Atlanta Journal –Constitution, December 28, 2005). Suppose 200 men and 200 women participated in the study, and 280 reported they preferred plain bottled water. Of the group preferring a sports drink, 80 were men and 40 were women.

- Let M=the event the consumer is a man
  - W= the event the consumer is a woman
  - B=the event the consumer Preferred plain bottled water
  - S= the event the consumer Preferred sports drink.
- a. What is the probability a person in the study preferred plain bottled water?
- b. What is the probability a person in the study preferred a sports drink?
- c. What are the conditional probabilities P(M|S) and P(W|S)?
- d. What are the joint probabilities  $P(M \cap S)$  and  $P(W \cap S)$ ?
- e. Give a consumer is a man, what is the probability he will prefer a sports drink?
- f. Give a consumer is a woman, what is the probability she will prefer a sports drink?
- g. Is preference for a sports drink independent of whether the consumer is a man or woman? Explain using probability information.

3. To help select suitable employees for a particular job a personnel department administers and aptitude test to all applicants. To test the effectiveness of the test a sample of applicants who failed were also hired and given a fast trial at the job. It was found that of the 30 percent who passed the test, 80% were satisfactory, and of those who did not, only 10 percent were satisfactory

- a. What is the probability that an applicant selected at random will prove to be satisfactory at this job?
- b. If an applicant is satisfactory, what is the probability that he passed the test?

4. 研究者若善用統計技巧,將可降低受訪者心防,使調查結果更加可靠。例如某 位老師想了解班上 60 名同學中,約有多少比率在國中前談過戀愛,於是他設計了 A、B 兩份問卷(其中 A 卷 40 張, B 卷 20 張)及不記名答案卷 60 張, 隨機發給班上 同學(同學不是拿到 A 卷就是 B 卷,至於 A、B 卷接不回收,答案卷則要回收)。其 中 A 卷的題目是我曾經在國中以前談過戀愛,因此拿到 A 卷的同學若國中前曾談戀 愛,就要在答案卷上劃O,若不曾談過戀愛,則劃X;反之,B卷的題目是我不曾 在國中以前談過戀愛,因此拿到 B 卷的同學若國中前曾談戀愛,就要在答案卷上劃 X,若不曾談過戀愛,則劃O。如此設計,不論某位同學回答的結果是O或X,老 師都無法得知該生在國中前是否談過戀愛,但卻可大致了解全班的狀況。答案卷經 回收後,老師發現 60 張答案卷中有 25 張劃 O,35 張劃 X。請你求出在本班同學中, 約有多少比例的同學曾在國中前談過戀愛?

5. Alcol bank reviewed its credit card policy with the intention of recalling some if its credit cards. In the past approximately 5% of cardholders defaulted, leaving the bank unable to collect the outstanding balance. Hence, management established a prior probability of .05 that any particular cardholder will default. The bank also found that the probability of missing a monthly payment is .20 for customers who do not default. Of course, the probability of missing a monthly payment for those who default is 1.

- a. Given that a customer missed one or more monthly payments, compute the posterior probability that the customer will default.
- b. The bank would like to recall its card if the probability that a customer will default id greater than .20. Should the bank recall its card if the customer misses a monthly payment? Why or why not?

6. Your favorite team is in the final playoffs. You have assigned a probability of 60% that they will win the championship. Past records indicate that when team win the championship, the win the first game of the series 70% of the time. When they lose the series, they win the first game 25% of the time. The first game is over; your team has los t. what is the probability that they win the series?

- 7. Two independent events: A and B. Suppose P(A)=0.6, P(B)=0.2, Compute:
- (1) P(A | B) and  $P(A^{c} | B)$
- (2)  $P(A \cap B)$  and  $P(A \cap B^c)$
- (3) P(AUB) and P(AUB<sup>e</sup>)
- 請參考講義第五頁,若兩天訂購一次貨,且兩天的需求是獨立,則需要訂多少 8. 貨才能满足90%的顧客需求?

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## 兩天demand 兩天# of days

- 0 2 1 6 2 26 3 50 4 60
- 5 58
- 6 54 7
  - 34
- 8 10