Exam I for CS 3332 機率統計

3:20 ~ 5:10 p.m., October 8, 2004

1. (25%) In each of the following random experiments, describe the sample space S and determine the probability of the event A:
   (a) (5%) Tossing a pair of fair coins where the event A is one head and one tail.
   (b) (5%) Casting a pair of honest dies where the event A is an even sum of points cast.
   (c) (5%) Drawing a card from a deck of playing cards where the event A indicates the card is a queen.
   (d) (5%) Choosing a number on the interval zero to two where the event A occurs if the number is less than 1.2.
   (e) (5%) Choosing two balls without replacement from the urn having w white balls and b black balls where the event A represents the second ball is white.

2. (40%) Suppose the final scores of 39 & 57 CS3332 students, respectively in last two years, are shown in the following:

First year: 61 72 77 58 70 76 70 83 58 49 74 55 90 80 61 82 90 51 48 84 76 61 76 70 70 50 77 43 71 99 63 63 52 54 67 29 83 60 61
Second year: 79 92 80 60 78 58 17 83 71 69 90 88 80 84 81 83 84 89 87 81 67 67 78 77 64 64 91 88 63 69 78 60 69 75 60 79 85 86 63 88 92 85 74 44 87 67 70 82 88 91 71 82 73 89 57 79 42

   (a) (10%) Find the sample mean $\bar{x}$ and the sample variance s^2 for the **second** year.
   (b) (10%) Construct the relative frequency histogram using 7 classes of equal length for the **second** year. [Each cut-point and class mark should be clearly illustrated.]
   (c) (5%) Construct a two-sided **ordered** stem-and-leaf display to compare both sets of the test scores.
   (d) (5%) Use box-and-whisker diagrams to compare these two sets of the test scores.
   (e) (10%) Construct a q-q plot to assess the score distribution in two years. [Hint: using 39 order statistics in the first year to pair with 39 ones derived (interpolated) from 57 scores in the second year.]

3. (15%) Tossing a fair coin as many times as necessary to turn up one head leads to the sample space S={H, TH, TTH, TTTH, …}. Let A denote the event = {TH, TTH}, B = {TTH, TTTH}, and C = {H}.
   (a) (5%) Are A, B and C mutually independent?
   (b) (5%) Compute P(A∩B) and P(B' ∪ C').
   (c) (5%) If the coin is biased with P(H) = 2·P(T), repeat (b).

4. (10%) Three integers are chosen at random without replacement from {1, 1, 1, 2, 2, 3}. Compute the probability that: (a) their sum is even; (b) their product is even.

5. (10%) Suppose a new medical procedure is invented for the early detection of an illness. The probability that the test correctly identifies someone with the illness as positive is 0.94, and the probability that the test correctly identifies someone without the illness as negative is 0.98. The incidence of the illness in the general population is 0.02. You take the test, and the result is positive. What is the probability that you have the illness?