

Probability and Statistics  
Fall 2006  
Test 1

Name:.....

(3+6+6+6=21 pts)

1. (a) If  $P(A) = 0.5$ ,  $P(B) = 0.6$  and  $A$  and  $B$  are **independent**, find  $P(A \cup B)$ .
- (b) If  $P(A) = 0.5$ ,  $P(B) = 0.3$  and  $A$  and  $B$  are **mutually exclusive**, find  $P(A \cap B')$  and  $P(A' \cup B')$ .
- (c) If  $P(A) = 0.5$ ,  $P(B) = 0.8$  and  $A \subset B$ , find  $P(A \cap B')$  and  $P(A' \cup B')$ .
- (d) If  $P(A) = 0.6$ ,  $P(B) = 0.5$ , and  $P(A \cap B) = 0.3$ , find the  $P(B' | A')$ .

(7+8=15 pts)

- 2 (a) If  $A$  and  $B$  are independent events, then prove that  $A$  and  $B'$  are also independent.
- (b) Suppose  $A$ ,  $B$ , and  $C$  are mutually independent events and that  $P(A) = 0.5$ ,  $P(B) = 0.8$ , and  $P(C) = 0.9$ . Find the probability that exactly two of the three events occur.

(6 pts)

- 3 A travel brochure lists 10 museums in the city of London. In how many ways can a tourist visit four museums if the order in which the museums are visited does not matter.

(6+6=12 pts)

4 Suppose that Pete Sampras and Andre Agassi are playing a tennis match in which the first player to win three sets wins the match.

- (a) In how many different ways could this match end?
- (b) If the probability that Andre will win any particular set against Pete is 0.48, what is the probability that Andre will win the match?

(4+4+7=15 pts)

5 Two cards are drawn successively and without replacement from an ordinary deck of playing cards. Compute the probability of drawing

- (a) Two clubs.
- (b) A club on the first draw and a heart on the second draw.
- (c) A heart on the first draw and a face card (king, queen, or jack) on the second draw.

(10 pts)

- 6 A box contains three cards. One card is red on both sides, one card is green on both sides, and one card is red on one side and green on the other. One card is selected from the box at random, and the color on one side is observed. If this side is green, what is the probability that the other side of the card is also green?

(8+7=15 pts)

- 7 Bean seed from supplier A have a 90% germination rate and those from supplier B have an 80% germination rate. A seed packing company purchases 45% of their bean seeds from supplier A and 55% from supplier B and mixes these seeds together.

- (a) Find the probability that a seed selected at random from the mixed seeds will germinate, say  $P(G)$ .
- (b) Given that a seed germinates, find the probability that the seed was purchased from supplier B.

(6 pts)

- 8 Suppose that 12 six-sided balanced dice are to be rolled. Find the probability that each of the six numbers will appear twice.