Exam. 1, Stat 126, Fall 2002

Name:

This exam consists of 8 questions. **To receive partial credit you must show all work.**

1. (**5 points.**) Four Americans, 3 Frenchmen and 3 Englishmen are seated in a row. What is the probability that the people of the same nationality are seated next to each other?

2. Let A and B be two events. Probability that neither A nor B occurs is 0.4. Probability that B occurs but A does not is 0.2. Also, the probability that B occurs is 0.3.

(a) (**4 points.**) Find the probability that exactly one out of A and B occurs.

(b) (**4 points.**) Are A and B independent? Give reasons.

3. (**5 points.**)A and B alternate rolling a pair of dice, stopping either when A rolls the sum 9 or when B rolls the sum 6. Assuming that A rolls first, find the probability that the final roll is made by A.

4. Suppose that a machine is made up of 3 components: A, B and C. The machine works if at least one of the components work. It is known that the probability that A works is 0.45, probability that B works is 0.6 and probability C works is 0.45. Also probability that both A and B work is 0.2, probability that A and C work is 0.25 and probability that B and C work is 0.3. Finally the probability that all three of them work is 0.1.

(a) (**4 points.**)Find the probability that the machine works.

(b) (**4 points.**)Suppose that we know that the machine is working properly. What is the probability that component A is in working order?

5. (**5 points.**) A tennis tournament has 20 contestants. In the first round the players are partitioned into 10 pairs and each pair plays a game. John and Paul are two of the contestants. Find the probability that John and Paul don't play against each other in the first round.

6. (**5 points.**) Urn A contains 4 white and 5 black balls, whereas urn B has 3 white and 7 black balls. A ball is drawn at random from urn A and placed in urn B. A ball is then drawn from urn B. This last ball happens to be white. What is the probability that the ball transferred was black?

7. You ask your neighbor to water a plant while you are on vacation. Without water the plant will die with probability 0.8. With water the plant will die with probability 0.15. You are 90 % sure that the neighbor will remember to water the plant.

(a) (**5 points.**) What is the probability that the plant will be alive when you return?

(b) (**4 points.**) If it is dead, what is the probability that the neighbor forgot to water it?

8. (**5 points.**) A fair coin is tossed 4 times. Let X represent the number of heads minus the number of tails obtained. For example if the outcome is HTTT then $X = -2$. Write the probability distribution of X.