Spring 2002 **M118 Finite Mathmatics** **Name** _____

Test # 3

1) A survey of 325 residents in a certain town indicates 170 own a dehumidifier, 130 own a snow blower, and 80 do not own either.
   a) How many own a dehumidifier or a snow blower? _____
   b) How many own a snow blower but not a dehumidifier? _____
   c) How many own both a snow blower and a dehumidifier? _____

2) How many 4–person subcommittees are possible from a group of 9 people if:
   a) There are no restrictions? _____
   b) Both Jim and Mary must be on the committee? _____
   c) Either Jim or Mary (but not both) must be on the committee? _____

3) A software development department consists of 6 women and 4 men.
   A) How many ways can they select a chief programmer, a backup programmer, and a programmer librarian?
   _____
   B) If the positions in part A are selected randomly, what is the probability that women are selected for all 3 positions? _____
   C) How many ways can they select a team of 3 programmers to work on a project?
   _____
   D) If the selections in part C are made randomly, what is the probability that a majority of the team mebers are women? _____

4) Eight cards are drawn from a standard deck of cards.
   a) What is the probability that there are 5 face cards and 3 non–face cards? _____
   b) What is the probability that all are the same suit? _____
   c) What is the probability that at least 1 face card will appear? _____

5) Suppose that three white balls and one black ball are placed in a box. Balls are drawn without replacement until the black ball is drawn, and then the game is over. You win if the black ball is drawn on the fourth draw.
   a) What is the probability that you win? _____
   b) What are the odds that you win? _____
   c) What are the odds that you make only one draw? _____

6) A shipment of 28 compact disc players contains 4 that are defective. If 7 players from this shipment are selected at random and tested, what is the probability that at least one defective player will be found?

7) If a single card is chosen from a standard 52–card deck,
   a) What is the probability that it is red $P(R)$? _____

   b) What is the probability that it is a king $P(K)$? _____

   c) What is the probability of choosing a king if it is red $P(K \mid R)$? _____

   d) Are the two events R and K dependent or independent? _____ Mathematically explain your answer.

8) Due to the continuous growth in the number of cases of measles reported from several different locations around the country, a drug company developed a new simple test to detect antibodies in the blood which indicate an immunity to measles. If the test shows a person lacking these antibodies, a vaccine can be administered to provide protection against the measles virus. In order to determine the effectiveness of this new test, it is administered to 500 people chosen at random. An older, more elaborate test reveals that 455 of the people have the measles antibodies. The new test was positive when administered to 97% of those who have the antibodies, and it also gave positive results in 2% of those who do not have them. Based on these results,

a) What is the probability that a randomly chosen person has measles antibodies in his/her blood if the new test indicates their presence? _____

b) If the new test indicates that a person does not have the measles antibody, what is the probability that the person does have the measles antibody? _____

9) Volunteers for a charity raffle sold 1,000 tickets at $15 each. Tickets are to be drawn at random and monetary prizes are awarded as follows: one prize of $800; two prizes of $500; five prizes of $300; and ten prizes of $100.

a) What is the expected value of this raffle to you if you buy one ticket? _____

b) Is the game fair? Why or why not? _____

10) A quality control engineer selects a random sample of 3 disk drives, from a group of 33 coming off an assembly line, to test for defects. There are 3 defective disk drives in the group of 33. Let X be the random variable associated with the number of defects in the sample.

a) Find the probability distribution of X.

b) Find the expected value of the random variable X. _____

Answer Key
Testname: M118–TEST3–SPRING2002.TST

1) Answer: a) 245 b) 75 c) 55

2) Answer: a) ${}_9C_4$ b) ${}_7C_2$ c) $2 \cdot {}_7C_3$

3) Answer: a)720 b) 1/6 c) 120 d) 2/3

4) Answer: a) .010 b) 6.8×10^{-6} c) .90

5) Answer: a) 1/4 b) 1:3 c)

6) Answer: P (at least one defective) = .71

7) Answer: a) $\frac{1}{2}$; b) $\frac{1}{13}$; c) $\frac{1}{13}$; d) R and K are independent events because

$$\frac{1}{26} = P(R) \cdot P(K \mid R) = P(R \cap K) = P(R) \cdot P(K)$$

8) Answer: P(measles antibodies | positive test) = .998

9) Answer: a) –$10.70 b) no the game is not fair because the expected value is not 0

10) Answer: $E(X)$ = .27