Week in Review # 9

MATH 141 Drost-Spring 2010

7.4, 7.5, 7.6, 8.1

1. Two cards are selected at random without replacement from a well shuffled deck of 52 playing cards. Find the probability

    a) a pair is drawn.

    b) a pair is not drawn.

2. A bag contains 5 green, 4 blue, and 2 red balls. Suppose a sample of 4 balls are selected at random. What is the probability that the sample contains

    a) 2 green and 2 blue balls.

    b) all the balls are green.

    c) at least 2 red balls.

3. Assuming the probability of a boy being born is the same as the probability of a girl being born. Find the probability that a family with 3 children will have

    a) 2 girls and a boy.

    b) no girls

4. Five cards are dealt from a well shuffled deck of 52 cards. What is the probability of being dealt a full house?

5. From a bin with 100 empty, ready to fill Easter eggs, 15 are selected, filled with chocolate, and returned to the bin, and scrambled. If 10 eggs are selected at random, what is the probability

    a) that 4 contain chocolate?

    b) that at least one contains chocolate?

6. Twenty people are selected at random from class. What is the probability no two have the same birthday (day and month)? Set up the solution but do not calculate.

Conditional Probability of an Event

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

Product Rule

$$P(A \cap B) = P(A) \cdot P(B|A)$$

$$P(A \cap B \cap C) = P(A) \cdot P(B|A) \cdot P(C|A \cap B)$$

If A and B are independent events

$$P(A|B) = P(A) \text{ and } P(B|A) = P(B)$$

Test for Independence of 2 Events

$$P(A \cap B) = P(A) \cdot P(B)$$

7. Determine if the events A and B are independent when $P(A^c) = 0.3$, $P(B^c) = 0.4$ and $P(A \cap B) = 0.42$.

8. Given A and B are independent, $P(A) = 0.35$ and $P(B) = 0.7$, find

    a) $P(A \cap B)$

    b) $P(A \cup B)$

9. An experiment consists of two independent trials. The outcomes of the first trial are A and B with the probability of occurring equal to 0.35 and 0.65. There are two outcomes, C and D, in the second trial with $P(C) = 0.25$ and $P(D) = 0.75$. Draw a tree diagram and use it to find each of the following:

    a) $P(A \cap D)$

    b) $P(C)$

    c) Are events A and D independent?

10. Two cards are drawn without replacement from a well shuffled deck of 52 playing cards.

    a) What is the probability that the first card drawn is a diamond?

    b) What is the probability that the second card drawn is a diamond if the first card was not a diamond?

    c) What is the probability both cards are diamonds?

11. In a family with 3 children, what is the probability all three children are girls given that *at least* one is a girl?

12. The probabilities that three patients who are scheduled for cornea transplant surgeries at Centerville Hospital will suffer rejection are $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{10}$. Assuming the events are independent, find the probability that

    a) At least one patient will suffer rejection.

    b) Exactly two patients will suffer rejection.

Bayes' Theorem

$$P(A_i|E) = \frac{P(A_i) \cdot P(E|A_i)}{P(A_1) \cdot P(E|A_1) + \ldots + P(A_n) \cdot P(E|A_n)}$$

13. A 52" screen produced by VisionAire was found to be defective. The company has three factories where the television screens are manufactured. The percentage of the total number produced by

each factory, and the probability that a television screen manufactured by that factory is defective are shown in the table below. What is the probability that the defective television screen was manufactured in Austin?

Location	% of Total	Probability
	Production	of Defective
		Screen
Austin	30	.15
Lubbock	40	.25
College Station	30	.05

14. A study conducted by the Chamber of Commerce revealed the following information concerning the age distribution of renters within the city.

Age in yrs.	% Population	% Renters
21 – 29	45	50
30 – 59	25	12
60 – 90	30	35

a) What is the probability that someone between the ages of 21 and 90 selected at random is a renter?

b) If a renter is selected at random, what is the probability that they are in the 30 – 59 age bracket?

c) If a renter is selected at random, what is the probability that they are 30 yrs of age or older?

15. A medical test has been created to detect the presence of migraines. Among those who have a migraine, the probability that it will be detected by the test is 95%. However, the probability that the test will erroneously indicate the presence of a migraine in those who do not actually have it is 5%. Suppose 35% of those referred to this clinic for the test did in fact have a migraine. If the test administered to an individual from this group is positive, what is the probability that the person actually has a migraine?

16. Classify each of the following random variables as **finite discrete**, **infinite discrete**, or **continuous**. List all possible values the random variable may take.

a) $X =$ the number of strikeouts the pitcher throws in a game.

b) $Y =$ the number of points scored on your next exam.

c) $Z =$ the number of minutes spent working the exam.

d) You have a bag of peanut M&M's©, with an even distribution among the 20 pieces of blue, red, yellow and brown M&M's.

(i) You randomly pick 4 pieces. $X =$ the number of blue M&M's selected.

(ii) You randomly pick one piece with replacement, until you get a red M&M. $Y =$ the number of times you picked an M&M.

e) $Z =$ the number of ounces of water you drink at the gym while working out each day.

17. The probability distribution of the random variable X is shown below. X represents the student's score on a 10 question scantron quiz. Find each of the following:

a) $P(X = 80)$

b) $P(60 \leq X \leq 90)$

c) $P(X \leq 70)$

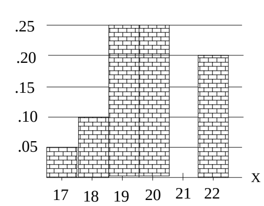
x	40	50	60	70	80	90	100
$P(X = x)$	.05	.10	.10	.15	.40	.15	.05

18. Two dice are rolled. Let the random variable X represent the number that falls uppermost on the 8-sided die. Let the random variable Y represent the number that falls uppermost on the 6-sided die. Find the probability distribution of $X + Y$.

19. The following groups of diners went to *On The Border*© for dinner to celebrate the Aggie win Saturday night, where X represents the number in their group. Complete the probability distribution below.

# in the group	1	2	3	4	5	6	8
Frequency	120	350	180	320	80	210	240
$P(X = x)$							

20. A survey was taken of the students in my 12:40pm class and the results of the students ages are shown in the histogram below. The student's ages ranged from 17 to 22. The probability distribution of the random variable X, where X represents age of a randomly chosen student, is missing one column. Fill in the histogram correctly.



What is the probability that a randomly chosen student is 20 or older?