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ACSC/MATH 347/447 Exam #1h 100 Points Total October 17, 2005

Exam 1 Grade: Course Average:

You must show enough work, or give sufficient explanation, in each problem to clearly indicate how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

1. (12 points) Let A and B be events with $P(A) = 0.4$, $P(B) = 0.3$, and $P(B|A) = 0.2$. Find:

a. $P(\overline{B})$

b. $P(A \cap B)$

2. (18 points) Let C and D be events with $P(C) = 0.6$, $P(D) = 0.3$, and $P(C \cap D) = 0.2$. Find:

a. $P(C \cup D)$

b. $P(\overline{C} \cup \overline{D})$

c. Are events C and D independent? You must explain how you know in order to receive credit.

You must show enough work, or give sufficient explanation, to indicate clearly how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

3. (20 points) Y is a random variable with support $\{0, 1, 2, 3, 4\}$. The values of its probability function, $p(y) = P(Y = y)$, for $y = 1, 2, 3$, and 4 , are given in the table below. Find each of the following, showing how you obtain your answer in each part.

- | | | |
|---------------------------------|------------------|-------------------------|
| a. Find $p(0) = P(Y = 0)$. | c. Find $E(Y)$. | e. Find $E(\sqrt{Y})$. |
| b. Find $P(Y \text{ is odd})$. | d. Find $V(Y)$. | |

y	0	1	2	3	4	sum
$p(y)$		0.1	0.3	0.2	0.2	

You must show enough work, or give sufficient explanation, to indicate clearly how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

4. (12 points) An auto insurance company insures drivers of all ages. An actuary compiled the following statistics on the company's insured drivers:

Age of Driver	Probability of Accident During the Policy Year	Portion of Company's Insured Drivers
16-20	0.06	0.08
21-30	0.03	0.15
31-65	0.02	0.49
66-99	0.04	0.28

A driver that the company insures is selected at random from among all policyholders.

- Find the probability that the selected driver has an accident during the policy year. [*Hint*: Use the Law of Total Probability.]
- Given that a randomly selected policyholder has an accident during the policy year, calculate the probability that the driver was age 16-20.

You must show enough work, or give sufficient explanation, to indicate clearly how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

5. (14 points) A fair die is tossed ten times and the resulting sequence of ten values is observed.
- How many sequences are possible?
 - How many of these sequences have exactly three sixes?
 - What is the probability that a sequence with exactly three sixes is observed?

You must show enough work, or give sufficient explanation, to indicate clearly how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

6. (12 points) A small commuter plane has 30 seats. The probability that any particular passenger will not show up for a flight is 0.10, independent of other passengers. The airline sells 32 tickets for the flight. Let Y be the number of passengers who show up for the flight.
- What distribution does the random variable, Y have? Explain and list its parameters.
 - Calculate the probability that more passengers show up for the flight than there are seats available; i.e. that $Y > 30$. You may not use any distribution functions on your calculator.
 - Calculate the mean and the variance of Y , the number of passengers who show up for the flight.

You must show enough work, or give sufficient explanation, to indicate clearly how you obtain your answer. **No credit** will be given for a problem if there is insufficient work/explanation.

7. (12 points) The following table classifies 1456 people by their gender and by whether or not they favor a gun law. Suppose one of these people is selected at random. Let F be the event the person is a female, M the event the person is a male, A the event the person favors the gun law and B the event the person opposes the gun law. Find the indicated probabilities below *and, for each probability describe in words, using a complete English sentence, the probability that you have found.* (For example, if you were asked for $P(M)$, you should say “ $P(M)$ is the probability that a person selected at random is male.”)

	Male (M)	Female (F)	Totals
Favor (A)	392	649	1041
Oppose (B)	241	174	415
Totals	633	823	1456

a. $P(M \cap A)$

b. $P(F | B)$

c. $P(B | F)$