Sample Problems For Exam 3
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This collection of questions is intended to give you an idea of different types of question that might be asked on the exam. There may be questions on the exam that are not found on this handout.

These questions cover Chapter 7 and section 8.1-8.4 in the Applied Finite Mathematics, 10th edition by S. T. Tan.

<u>Video solutions can be found at this link:</u>   http://www.math.tamu.edu/ ∼kahlig/141WIRpage.html

1. Explain the difference between mutually exclusive and independent.

2. Roll a 10 sided die and an 8 sided die. What is the probability that

    (a) A sum of 3 or a sum of 6 is rolled?

    (b) A sum of 6 or one of the die(at least one die) has a 2 on it.

    (c) A sum of 8 is rolled if the ten sided die has an even number on it.

    (d) A sum of 12 is rolled provided a six is cast (at least one six is rolled).

    (e) A sum of 8 and a 6 is rolled on one of the die.

3. Jim has a drawer containing eight blue, five black, and six white socks. If he pulls out two socks at random, what is the probability that Jim will draw a matching pair of socks?

4. A box contains four red, five white, and eight yellow marbles. Two marbles are drawn without replacement.

    (a) What is the probability that the first marble is red?

    (b) Assuming that the first marble is red, what is the probability that the second marble drawn is red?

    (c) What is the probability that a red marble is not drawn in neither the first nor second draw?

5. A student takes a 10 question multiple choice exam in which each question has 4 answers. Being unprepared for the exam, the student randomly guesses at each of the question.

    (a) What is the probability of getting exactly 6 of the questions correct?

    (b) What is the probability of passing the exam? (Grades below 70 don't pass.)

    (c) What is the probability that the student get the first three correct and the last 7 wrong?

    (d) How many questions should the student expect to get correct?

6. The weather forecaster at station WIBV is correct 82% of the time; the forecaster at neighboring station WILA, 65% of the time. If the forecasters make their weather predictions independently of each other, what is the probability that on a given occasion, one of the two (or both) will be correct?

7. A manufacturer of automobiles receives 500 car radios from each of three different suppliers. Unknown to the manufacturer, there are five defective radios from supplier A, seven from supplier B, and only two from supplier C. As a means of quality control, one radio is selected at random from each of the shipments. What is the probability that

    (a) All the radios selected are in working order?

    (b) At least one of the selected radios is defective?

    (c) exactly one of the selected radios is defective?

8. A new test for Alzheimer's Disease will detect the disease 95% of the time in a person who has Alzheimer's and will fail to detect it 5% of the time. In addition, the test will give a false positive 15% of the time. If the test is give to a person selected at random from a group of subjects, 90 of whom are healthy and 10 of whom have Alzheimer's, what is the probability that

   (a) Alzheimer's will not be detected if the person has the disease?

   (b) the person has Alzheimer's if the test detects the disease?

   (c) If the person takes the test twice, what is the probability that the person has the disease if both test are positive.

9. A chef's school is 60% male. Seventy percent of the males and 90% of the females like eating crab legs for dinner. A student of the school is selected at random.

   (a) What is the probability that the student is male or likes eating crab legs for dinner?

   (b) If the student likes eating crab legs for dinner, what is the probability that the student is female?

   (c) What percentage of the students like eating crab legs for dinner?

10. Let E and F be two events and $P(E) = .35$, $P(F) = .55$, and $P(E \cap F^C) = .15$. Answer the following questions.

   (a) $P(E \cap F) =$

   (b) Compute the probability of exactly one of these events occurring.

   (c) Are E and F mutually exclusive?

   (d) Are E and F independent?

   (e) $P(F|E) =$

   (f) $P(E \cup F) =$

   (g) $P(E^C|F) =$

11. Classify the following random variables as finite discrete, infinite discrete, or continuous.

   (a) X = The number of times a die is cast until a 5 is rolled.

   (b) X = How long it takes you use an ATM machine.

   (c) X = The number of cadets in a class of 100 students.

   (d) X = The temperature of the human body.

12. Fifteen people are selected at random. What is the probability that at least 2 of the people in this group

   (a) were born on the same day?

   (b) were born in the same month? Assume that months are equally likely.

13. The accompanying data were obtained in a study conducted by the manage of the Sav-More Supermarket. In this study the number of customers waiting in line at the express checkout at the beginning of each 3-minute interval between 9 a.m. and 12 noon on Saturday was observed.

Number of Customers	0	1	2	3	4	5	6	7	8	9	10
Frequency	1	4	2	7	14	8	10	6	3	4	1

   (a) Find the probability distribution for the random variable X, where X denotes the number of customers observed waiting in line.

   (b) Draw a probability histogram. Be sure to label the picture.

   (c) $P(2 \leq X \leq 6) =$

   (d) $P(X \leq 8) =$

   (e) Find the number of people that we would expect to be in line at any given time on Saturday.

   (f) Compute the mean, median, mode, variance, and standard deviation for the frequency chart. Be sure to label the answers.

14. Find the odds of drawing an ace, from a standard deck of cards, on the second draw if we know that the first card drawn was a king and cards are not replaced after they are drawn.

15. The odds against an event E occurring are 3 to 19. What is the probability of E occurring?

16. Fred wants to purchase a 10-year term life insurance policy that will pay the beneficiary $100,000 in the event that Fred doesn't survive the next ten years. Using life insurance tables, he determines that the probability that he will live another ten years is .97. What is the minimum amount that he can expect to pay for his premium?

17. Suppose you roll two fair six sided dice and sum the numbers that show. You win twice what you paid if a 7 or 11 shows up. You lose what you paid if a 2,3, or 12 shows up. For anything else that shows up, you win $5. The game costs $10 to play. Let X be the net winnings.

   (a) What is the expected net winnings?

   (b) How much should be charged to make this a fair game?

18. As part of its quality-control program, the video cartridges produced by the Starr Communications Company are subjected to a final inspection before shipment. A sample of six cartridges is selected at random from each lot of cartridges produced and the lot is rejected if the sample contains one or more defective cartridges. If 1.5% of the cartridges produced by Starr is defective, find the probability that a shipment will be accepted.

19. A drug company has developed a new drug that it believes is 90% effective. It test the drug on 500 people. Find the probability that at least 89% of the people respond favorably to the drug.

20. An insurance company estimates that 8% of automobile owners do not carry liability insurance. If 60 cars are stopped at random,

   (a) What is the probability that less than 10% of them have no liability insurance?

   (b) Of the 60 cars stopped, how many would we expect to have no liability insurance?

   (c) What is the standard deviation for this problem?

   (d) What is the variance?

21. A random variable, X, has a mean of 125 and a standard deviation of 10. Estimate $P(111 \leq X \leq 139)$.

22. The random variable X has a mean of 53 and a standard deviation of 8. Use Chebyshev's inequality to find the probability that X is greater than 63 or X is less than 43.