Chapter 4 and 5 Test   Review   MAT123   Fall 2022

Name: _____   Date: 10/17/2022

1) **Poker Chips.** A bowl contains 12 poker chips—3 red, 4 white, and 5 blue. If one of these poker chips is selected at random from the bowl, what is the probability that its color is

   A. red?
   B. red or white?
   C. not white?

2) **Diabetes Prevalence.** In a report titled *Behavioral Risk Factor Surveillance System Summary Prevalence Report*, the Centers for Disease Control and Prevention discusses the prevalence of diabetes in the United States. The following table provides a diabetes-prevalence frequency distribution for the 50 U.S. states based on the question "Have you ever been told by a doctor that you have diabetes?"

Diabetes (%)	Frequency
5–under 6	1
6–under 7	5
7–under 8	13
8–under 9	10
9–under 10	9
10–under 11	8
11–under 12	2
12–under 13	1
13–under 14	1

For a randomly selected state, let

- A = event that the state has a diabetes prevalence percentage of at least 8%,
- B = event that the state has a diabetes prevalence percentage of less than 7%,
- C = event that the state has a diabetes prevalence percentage of at least 6% but less than 13%, and
- D = event that the state has a diabetes prevalence percentage of less than 9%.

Describe each of the following events in words and determine the number of outcomes (states) that constitute each event.

1. (not C)
2. (A & B)
3. (C or D)
4. (C & B)

3) **Craps.** In the game of *craps*, a player rolls two balanced dice. Thirty-six equally likely outcomes are possible. Let

A = event the sum of the dice is 7,

B = event the sum of the dice is 11,

C = event the sum of the dice is 2,

D = event the sum of the dice is 3,

E = event the sum of the dice is 12,

F = event the sum of the dice is 8, and

G = event doubles are rolled.

A. Compute the probability of each of the seven events.
B. The player wins on the first roll if the sum of the dice is 7 or 11. Find the probability of that event by using the special addition rule and your answers from part (a).
C. The player loses on the first roll if the sum of the dice is 2, 3, or 12. Determine the probability of that event by using the special addition rule and your answers from part (a).
D. Compute the probability that either the sum of the dice is 8 or doubles are rolled, without using the general addition rule.
E. Compute the probability that either the sum of the dice is 8 or doubles are rolled by using the general addition rule and compare your answer to the one you obtained in part (d).

4) **New England Patriots.** From the National Football League (NFL) Web site, in the *New England Patriots Roster*, we obtained information on the weights and years of experience for the players on that team, as of September 26, 2013. The following contingency table provides a cross-classification of those data.

Years of experience						
		Rookie	1–5	6–10	Over 10	**Total**
	Under 200	3	5	0	0	8
Weight (lb)	200–300	11	21	7	2	41
	Over 300	4	4	5	0	13
	Total	18	30	12	2	62

A. How many cells are in this contingency table?
B. How many players are on the New England Patriots roster as of September 26, 2013?
C. How many players are rookies?
D. How many players weigh between 200 and 300 lb?
E. How many players are rookies who weigh between 200 and 300 lb?

5) **Protective Orders.** In the article "Judicial Dispositions of Ex-Parte and Domestic Violence Protection Order Hearings: A Comparative Analysis of Victim Requests and Court Authorized Relief" (*Journal of Family Violence*, Vol. 20, No. 3, pp. 161–170), D. Yearwood looked at the discrepancies between what a victim of domestic violence requests and what the courts reward. The following contingency table cross-classifies, by race and gender, a sample of 407 domestic violence protective orders from the North Carolina Criminal Justice Analysis Center.

Race		White	Black	Other	Total
Gender	Male	30	26	0	56
	Female	210	121	20	351
	Total	240	147	20	407

Compute the following conditional probabilities directly; that is, do not use the conditional probability rule. One of these protective orders is selected at random. Find the probability that the order was filed by

A. a Black.
B. a white female.
C. a male, given that the filer was white.
D. a male, given that the filer was Black.

6) Coin Tossing. When a balanced dime is tossed three times, eight equally likely outcomes are possible:

HHH	HTH	THH	TTH
HHT	HTT	THT	TTT

Let

A = event the first toss is heads,

B = event the third toss is tails, and

C = event the total number of heads is 1.

 A. Compute P(A), P(B), and P(C).
 B. Compute P(B | A).
 C. Are A and B independent events? Explain your answer.
 D. Compute P(C | A).
 E. Are A and C independent events? Explain your answer.

7) **Zip Codes.** The author spoke with a representative of the U.S. Postal Service and obtained the following information about zip codes. A five-digit zip code consists of five digits, of which the first three give the sectional center and the last two the post office or delivery area. In addition to the five-digit zip code, there is a trailing *plus four zip code.* The first two digits of the plus four zip code give the sector or several blocks and the last two the segment or side of the street. For the five-digit zip code, the first four digits can be any of the digits 0–9 and the fifth any of the digits 1–8. For the plus four zip code, the first three digits can be any of the digits 0–9 and the fourth any of the digits 1–9.

    A. How many possible five-digit zip codes are there?
    B. How many possible plus four zip codes are there?
    C. How many possibilities are there in all, including both the five-digit zip code and the plus four zip code?

8) **Major Hurricanes.** The *Atlantic Hurricane Database* extends back to 1851, recording among other things the number of major hurricanes striking the U.S. Atlantic and Gulf Coast per year. A major hurricane is a hurricane measuring at least a Category 3 on the Saffir-Simpson hurricane wind scale (i.e., with winds of at least 110 mph). As published by the National Oceanic & Atmospheric Administration and the Atlantic Oceanographic & Meteorological Laboratory, the following table provides a probability distribution for the number of major hurricanes, *Y*, for a randomly selected year between 1851 and 2012.

y	
0	0.185
1	0.296
2	0.266
3	0.093
4	0.049
5	0.056
6	0.037
7	0.012
8	0.006

Use random-variable notation to represent each of the following events. The year had

  A. at least one major hurricane.
  B. exactly three major hurricanes.
  C. between 2 and 4 major hurricanes, inclusive.

Use the special addition rule and the probability distribution to determine

  D. $P(Y \geq 1)$.
  E. $P(Y = 3)$.
  F. $P(2 \leq Y \leq 4)$.

9) Archery. An archer shoots an arrow into a square target 6 feet on a side whose center we call the origin. The outcome of this random experiment is the point in the target hit by the arrow. The archer scores 10 points if she hits the bull's eye—a disk of radius 1 foot centered at the origin; she scores 5 points if she hits the ring with inner radius 1 foot and outer radius 2 feet centered at the origin; and she scores 0 points otherwise. Assume that the archer will actually hit the target and is equally likely to hit any portion of the target. For one arrow shot, let S be the score. A probability distribution for the random variable S is as follows.

s	0	5	10
	0.651	0.262	0.087

    A. On average, how many points will the archer score per arrow shot?

    B. Obtain and interpret the standard deviation of the score per arrow shot

10) Traffic Fatalities and Intoxication. The National Safety Council publishes information about automobile accidents in *Accident Facts*. According to that document, the probability is 0.40 that a traffic fatality will involve an intoxicated or alcohol-impaired driver or nonoccupant. In eight traffic fatalities, find the probability that the number, Y, that involve an intoxicated or alcohol-impaired driver or nonoccupant is

    A. exactly three; at least three; at most three.
    B. between two and four, inclusive.
    C. Find and interpret the mean of the random variable Y.
    D. Obtain the standard deviation of Y.