MAT 108: Exam 2 **Name:** _____
Spring — 2024
04/01/2023
85 Minutes

Write your name on the appropriate line on the exam cover sheet. This exam contains 9 pages (including this cover page) and 8 questions. Check that you have every page of the exam. Answer the questions in the spaces provided on the question sheets. Be sure to answer every part of each question and show all your work. If you run out of room for an answer, continue on the back of the page — being sure to indicate the problem number.

Question	Points	Score
1	10	
2	15	
3	15	
4	15	
5	15	
6	10	
7	10	
8	10	
Total:	100	

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1. (10 points) Let A, B, and C be events from a probability space whose probabilities are given below.

$$P(A) = 0.55$$
$$P(B) = 0.43$$
$$P(C) = 0.30$$

   (a) Can we say that $P(A \text{ or } B) = 0.55 + 0.43 = 0.98$? Explain.

   (b) Can we say that $P(A \text{ and } B) = 0.55 \cdot 0.43 = 0.2365$? Explain.

   (c) Assume that B and C are independent. Find $P(B \text{ or } C)$.

   (d) Assume that B and C are disjoint. Find $P(B \text{ and } C)$

2. (15 points) Statisticians are examining American's satisfaction with the candidates they can vote for in an upcoming election. Each individual surveyed was asked, "I am satisfied with the options for candidates that I can vote for in the upcoming election." An individual could answer 'Strongly Disagree', 'Disagree', 'Neutral', 'Agree', or 'Strongly Agree.' The gender of each individual was recorded (male, female, or other/refused to disclose). The results are given below.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Male	15	22	9	4	16	66
Female	14	26	10	8	11	69
Other/Non-Disclosure	9	9	4	6	2	30
Total	38	57	23	18	29	165

(a) What percentage of individuals surveyed were not satisfied (strongly disagree or disagree) with the options for candidates in the election?

(b) What percentage of individuals surveyed were female?

(c) What percentage of individuals surveyed were neutral or were recorded as either 'other gender' or refused to disclose their gender?

(d) What percentage of males surveyed strongly agreed with the statement?

(e) What percentage of individuals surveyed were females that were neutral about the statement?

3. (15 points) A recent study of cholesterol levels for adults in South Korea was determined to be approximately normally distributed with mean 200 mg/dL and standard deviation 50 mg/dL. Based on the results of this survey, answer the following:

   (a) What percentage of adults in South Korea have cholesterol levels less than 136 mg/dL?

   (b) What percentage of adults in South Korea have cholesterol levels greater than 232 mg/dL?

   (c) What percentage of adults in South Korea have cholesterol levels between 136 mg/dL and 232 mg/dL?

   (d) What is the highest cholesterol level an adult in South Korea can have to be in lowest 20% of cholesterol levels?

4. (15 points) Recent TokTik surveys suggest that 15% of individuals 'have the rizz.' An independent, simple random sample of nine individuals was taken.

   (a) Explain why the count of individuals 'having the rizz' in this survey follows a binomial distribution.

   (b) What is the probability that exactly three individuals surveyed 'had the rizz'?

   (c) What is the probability that at most five but more than two individuals surveyed 'had the rizz' ?

   (d) What is the probability that at least one individual surveyed 'had the rizz.'?

5. (15 points) As part of their Clery Act obligations, a university takes a survey of their students to determine their use of illicit substances. The college recorded each student only as male or female and 64% of individuals surveyed were male. Of the males surveyed, 42% indicated they had tried an illicit substance on campus, whereas only 23% of females surveyed answered similarly.

   (a) What percentage of students surveyed indicated they had used an illicit substance?

   (b) What percentage of students surveyed were female or had not tried an illicit substance?

   (c) What percentage of students that had tried an illicit substance were male?

6. (10 points) A store gets an average of 570 potential customers each day. Past sales records indicate that 17% of potential customers entering the store each day do not make a purchase. For potential customers that do make a purchase, records indicate that 29% spend at least \$1 but less than \$100, 33% spend at least \$100 but less than \$300, and the rest spend at least \$300. What is the smallest average revenue the store should expect to make each day?

7. (10 points) An online retailer sells both PS5 and XBox One. They are examining video game console preferences to determine how many of each console to stock. They survey 120 individuals about which video game console they own. Of the 120 individuals surveyed, 54 stated they owned either a PS5 or an XBox One. Furthermore, 27 stated they only owned a PS5, while 19 stated they only owned an XBox One.

   (a) What percentage of individuals surveyed owned both a PS5 and an XBox One?

   (b) What percentage of individuals surveyed owned neither a PS5 nor an XBox One?

   (c) What percentage of individuals surveyed owned an XBox One, if they owned a PS5?

8. (10 points) Economists are studying the effects of inflation on households in the United States. In particular, they examine the change in costs for common household goods. The researchers focus on the city of Chicago. They take a simple random sample of 45 stores in the city and find an average cost of $2.79 for a gallon of milk.

   (a) Explain why the Central Limit Theorem can be used in this situation to examine the distribution of average cost of milk.

   (b) Based on the results of this survey, find an 80% confidence interval for the cost of a gallon of milk in Chicago. [Assume the standard deviation for the cost of a gallon of milk in Chicago is $0.35.]