Name: _____ **Section: MAT098/181C-**

MAT098/181C EXAM #2 (FORM B)

A scientific calculator is permitted. ***Cellphones may not be used as calculators and must be off or on vibrate during the exam****. Show all work on the test or on the work paper provided.*

1. **For each problem (a) – (d)**
   i. **Please circle one: marginal, conditional or joint probability.**
   ii. **Then write your answer as a fraction and as a percentage. Please round to the nearest tenth.**

	Who did Bostonian vote for in 2016?			
	Trump	**Clinton**	**Other**	**Total**
Female	**11**	**115**	**7**	**133**
Male	**26**	**97**	**9**	**132**
Total	**37**	**212**	**16**	**265**

a. What is the probability that a voter voted for Trump? *(4 pts)*
   i. Marginal Probability Conditional Probability Joint Probability
   ii. Calculate the probability.

b. If a researcher randomly selects a female voter, what is the probability that she voted for Trump? *(4 pts)*
   i. Marginal Probability Conditional Probability Joint Probability
   ii. Calculate the probability.

c. If a researcher randomly selects a Trump voter, what is the probability that the voter is female? *(4 pts)*
   i. Marginal Probability Conditional Probability Joint Probability
   ii. Calculate the probability.

d. What is the probability that a voter is a female who voted for Trump? In other words, what is the probability that a voter voted for Trump and is a female? *(4 pts)*
   i. Marginal Probability Conditional Probability Joint Probability
   ii. Calculate the probability.

2. A campaign manager was planning an advertisement. He polled the voters on their number one concern during the election. The following table represents the data that was collected. *(18 points)*

	Economy	**Social Issues**	**Does not care**	**Total**
Asian American	**32**	**21**	**3**	
African American	**18**	**42**	**2**	
Total				

a) Please fill in the missing entries in the table.

b) Find the probability that a randomly selected voter does not care.

c) Find the probability that a randomly selected voter is Asian American and concerns about the economy.

d) Find the probability that a randomly selected voter concerns about the economy OR does not care.

e) Find the probability that a randomly selected voter concerns about the social issues given they are African American.

f) Find the probability that a randomly selected student is Asian American given they concern about the economy.

g) Are African American more likely to concern about social issues than Asian American? EXPLAIN your answer by comparing probabilities.

3. The faculty at a college collected data on a multiple choice quiz over several years. Instructors gave different students the quiz. The quiz had ten questions. *(16 points)*

Below is a probability distribution. This probability distribution displays the probability of getting a certain number of questions correct.

x	$P(x)$	$xP(x)$	$x-\mu$	$(x-\mu)^2$	$(x-\mu)^2P(x)$
1	0.45				
2	0.19				
3	0.15				
4	0.15				
5	0.06				

a) Find the probability a student selected at random got exactly 4 questions correct on the quiz.

b) Find the probability a student selected at random got exactly 4 OR exactly 5 questions correct on the quiz.

c) Find the probability a student selected at random got less than 4 questions correct on the quiz.

d) Find the standard deviation using the table/formula.

4. Ahmed wants to start his business with an ice cream truck. He offers 3 flavors of ice cream: chocolate, strawberry, and vanilla. The topping choices are cookie crumbs, sprinkles, and walnuts. Use a tree diagram to show how many total possible combinations Ahmed can sell. (10 points)

5. Please use the formula & show all work. (10 points)

   (a) There are 17 soldiers in a training camp. If the drill sergeant needs to send a team of 4 soldiers for ranger training, how many different teams are possible? (10 points)

   (b) If a college basketball league has 15 teams, how many different end of the season rankings are possible for first, second, and third prizes? Assume no ties.

6. An article in a journal reports that 66% of American fathers take responsibility for child care. A researcher wants to verify this rate as the city is interested in running some parenting programs. He selects a random sample of 8 fathers in town. Find the probability that exactly 5 of the 8 fathers take responsibility for child care. (15 points)

   a) Why is this a binomial distribution?

   b) Identify the following:

   n = p = q = r =

   c) Find the probability that exactly 5 of the 8 fathers take responsibility for child care. ****Please use the formula & show all work**.

7. In a research study, 70% of students graduating from four-year colleges had student loan debt. A government agency wishes to study student loan debt for Boston. Among 12 college students randomly selected from this area, only 8 reported that they had student loan debt. (15 points) ****Please use the formula & show all work**.

   a. Identify the following:

      n = p = q =

   b. Find the probability that when 12 college students are randomly selected, 10 or more had student loan debt.

   c. Find the probability that when 12 college students are randomly selected, less than 10 had student loan debt.

(EXTRA CREDIT)

1. A test consists of 10 true/false questions. To pass the test a student must answer at least 7 questions correctly. If a student guesses on each question, what is the probability that the student will fail the test?

2. In a research study, 97% of the 3850 Facebook users are adults. Find the mean and standard deviation for this distribution.

Mean for discrete probability distribution:

$$\mu = \sum [x \cdot P(x)]$$

Standard Deviation for discrete probability distribution:

$$\sigma = \sqrt{\sum (x - \mu)^2 \cdot P(x)}$$

Factorial:

$$n! = n \cdot (n-1) \cdots 2 \cdot 1$$

Permutation:

$${}_nP_r = \frac{n!}{(n-r)!}$$

Combination:

$${}_nC_r = \frac{n!}{r! \cdot (n-r)!}$$

Binomial Probability:

$$P(r) = {}_nC_r \cdot p^r \cdot q^{(n-r)}$$

Mean & Standard Deviation for *binomial* probability distribution:

$$\mu = np$$

$$\sigma = \sqrt{npq}$$