

Name: \_\_\_\_\_

**MAT 121**  
**Summer 2019**  
**Homework 5**

*“When I was a boy and I would see scary things in the news, my mother would say to me, ‘Look for the helpers. You will always find people who are helping.’”*

*– Fred Rogers*

**Problem 1:** How many unique ways are there of arranging the letters of the word ‘Mississippi’?

**Problem 2:** A club has 16 members. How many possible outcomes are there if it wishes to elect. . .

(a) a president, vice president, treasurer, and secretary, assuming no person can hold more than one office.

(b) a finance committee with four members.

**Problem 3:** The following table summarizes the numbers of people of various ages and genders who attended a recent movie. If one of these people is chosen at random, what is the probability that the chosen person is either male or in the 0–9 age range?

	0–9	10–19	20–29	30 and up
Female	4	6	24	36
Male	8	12	45	65

**Problem 4:** How many ways are there to select a committee of 3 members from among 10 faculty members?

**Problem 5:** A survey shows that 60% of university students own laptops. If 8 university students are selected at random, find

(a) the probability that exactly 6 of them own laptops.

(b) the probability that more than 6 of them own laptops.

**Problem 6:** A die is rolled 6 times. What is the probability that at least one 5 appeared during these rolls? [Hint: Use compliments.]

**Problem 7:** The table below classifies a group of voters according to gender and political affiliation.

	Democrat	Republican	Independent
Male	205	251	33
Female	269	182	57

- (a) What is the total number of voters in this group?
- (b) If a person is chosen at random from this group of voters, what is the probability of selecting a male or Republican voter.
- (c) What is the probability that a person is a female Democrat?
- (d) What is the probability that a male is independent?

**Problem 8:** Suppose you have events  $A, B, C$ , where  $P(A) = P(B) = P(C) = 0.6$ .

(a) Are the events  $A, B$  disjoint? Explain.

(b) If  $P(B | A) = 0.9$ , are the events  $A, B$  independent? Explain.

(c) If events  $A, C$  were independent, what is the probability that they occur at the same time?

(d) If events  $A, C$  were independent, what is the probability that at least one of them occurs?



**Problem 10:** A rare genetic disease is discovered and it is known that only 0.01% of the population has the disease. The test for the disease is positive for 99.9% of people that have the disease, while the test is positive for 0.2% of the people who do not have the disease.

(a) What is the probability that any given person tests positive for the disease?

(b) What is the probability that a person tests positive and has the disease?

(c) What is the probability that a person who has the disease tests positive?

(d) What is the probability that a person who tests positive actually has the disease?