Name: _____
MAT 121
Summer 2019
Homework 6

"Live by this credo: have a little laugh at life and look around you for happiness instead of sadness. Laughter has always brought me out of unhappy situations."
–Red Skelton

Problem 1: Let A and B denote events in a sample space with $P(A) = 0.3$, $P(B) = 0.8$, and $P(A \cap B) = 0.4$.

(a) Are the events A and B disjoint?

(b) $P(A \cup B) =$

(c) $P(\overline{B}) =$

(d) Are A and B independent? Explain.

(e) $P(A \mid B) =$

Problem 2: Given two independent events A, B with $P(A) = 0.7$ and $P(B) = 0.4$, find...

(a) $P(A$ and $B)$

(b) $P(B \mid A)$

(c) $P(A$ or $B)$

Problem 3: You are performing a study to examine the relationship between sports viewership and (STEM) employment. Based on the following sample, answer the following questions:

	Watch Sports	Does Not Watch Sports
Unemployed	34	44
STEM Job	15	51
Non-STEM Job	31	43

(a) How many total people were involved in the study?

(b) How many people did not watch sports or had a STEM job?

(c) What is the probability that person with a STEM job watches sports?

(d) What is the probability that a person watches sports or has a non-STEM job?

(e) What is the probability that a person has a STEM job?

(f) What is the probability that a person with a STEM job watches sports?

Problem 4: If the odds against something, let's say an event A, are $27:1$, what is $P(A)$? What is $P(\overline{A})$?

Problem 5: If you roll two die, what is the probability that the sum of the numbers is 6? What is the probability that the sum is 2? What about the sum being 1?

Problem 6: How many 6 digit passwords can be made from the digits 0–9? How many that start with a 4? How many that are even?

Problem 7: A bag contains four coins—three real and one trick coin. The real coins are all ordinary coins with a head and a tail. The trick coin has two heads. Suppose a person is blindfolded, reaches into the bag, and flips the coin. They then remove the blindfold and records what side of the coin faces up.

(a) What is the probability that a heads is observed?

(b) What is the probability that a tails is observed?

(c) Supposing they grabbed the trick coin, what is the probability that a heads was observed?

(d) Supposing they grabbed one of the real coins, what is the probability that a tail was observed?

(e) Given that the coin was heads up, what is the probability that the fake coin was selected?

Problem 8: Ads suggest that 64% of homes for sale in a certain area have garages, 21% have swimming pools, and 4% of homes have just a swimming pool.

(a) Find the probability that a home has a swimming pool or garage.

(b) Find the the probability that a home has neither a swimming pool nor a garage.

(c) Find the probability that a home only has a garage.

(d) Find the probability that a home has a swimming pool if it has a garage.

Problem 9: You have 5 friends that you want to take to an SU basketball game. But they do not all get along so you should keep the groups small. You get a discount if you buy 4 tickets, one for you and three for your friends. How many times can you go to the games always bringing 3 friends and never having the same 3 friends there with you? If you go that many times, how many times will one of your friends not go to the game with you and your other friends?

Problem 10: The letters of the word 'braids' are rearranged to create new 'words'. Creating all the possible words and putting them in ordinary alphabetic order, what number in the list is the word 'baidrs'? [Hint: Count them alphabetically. How many words begin with 'a'? How many with begin with 'b'? How many begin with 'ba'? So on. . .]

Problem 11: How many ways can the letters of the word ‘permutations’ be arranged so that there 4 letters between the ‘p’ and the ‘s’? [Hint: Fix ‘p’ and ‘s’. How many arrangements ‘around’ these letters? Take note of the double ‘t’. How many placements for ‘p’ and ‘s’?]

Problem 12: How many ways can the letters of the word ‘baclava’ be rearranged so that the letters ‘a’, ‘l’, and ‘a’ all appear together in some order? [Hint: Treat the letters needing to appear together as one giant letter, being careful that there is more than one way to ‘block’ them together.]

A standard deck of playing cards has 52 cards, consisting of 4 suits of cards: hearts, clubs, diamonds, and spades, each suit containing 13 cards. The suits hearts and diamonds are colored red while the suits clubs and spades are colored black. The cards types are 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, King, Ace—a total of 13 types. A typical game of poker is a card game where the player is dealt 5 cards. For this game, a full house is a hand which contains 3 of one type of cards, i.e. 2's, Jacks, etc., and 2 cards of another type. For example, a full house could consist of 2 of hears, 2 of clubs, 2 of diamonds, and an ace of hearts with an ace of diamonds. A three of a kind is where one holds 3 cards of one type in their hand.

Problem 13: What is the probability of a full house?