**CSC175 Assignment 2 Spring 2019 Name \_\_\_\_\_\_\_\_\_\_Donald Tvedt\_\_\_\_\_\_\_\_\_\_\_\_   
Directions:** Download this file and save as lastnameAssignment2SP19. Type all solutions on this document. Use equation editor when necessary. Upload Word document to Blackboard by**Monday at 11:59 PM.  
Please show enough work so I know how you found the answer and color/highlight it.**  
Hot key for equation editor: Hold Alt and = at same time. Points in [brackets]. Total: 60 points  
  
[4] points for a professional looking document (organization, neatness, equation editor, etc.)

1. [4] How many four-digit numbers can you make from the digits {0,1,2,3,4,5,6,7,8,9}, if the first digit can’t be zero, the last digit is odd and
   1. repetition is allowed? **9\*10\*10\*5 = 4500**
   2. repetition is not allowed? **9\*9\*8\*5 = 3240**
2. [4] If you had to construct a four-digit number using only digits from the set {1, 2, 3}, how many possible outcomes exist if
   1. repetition is allowed? **3\*3\*3\*3 = 81**
   2. repetition is not allowed? **Unable to create a 4 digit number with no repetition**
3. [6] A company wants to impose a more secure password system for its employees to use on the company’s network. The current policy requires a minimum of eight characters. The system under consideration requires a minimum of nine characters. The new system will allow repetition of characters, but not doubling (e.g., the sequence 121 would be acceptable, but not 112).  
     
   For both password systems, assume the following:
   * + Only alphanumeric characters can be used in the passwords, without any spaces or symbols.
     + A lowercase letter is treated as a separate character from the uppercase equivalent.
     + Only letters on a standard American keyboard will be accepted.
     + Characters are used in a random order.

Using these guidelines, calculate the following:

1. How many different passwords are possible for the current password requirements using eight characters? **26+26+10 = 62 characters 62\*61\*61\*61\*61\*61\*61\*61 = 194,850,055,833,302**
2. How many different passwords are possible for the proposed password requirements using nine characters without any doubling? **62\*61\*61\*61\*61\*61\*61\*61\*61 = 11,885,853,405,831,422**
3. Which option has more possible passwords? How many more? State your answer in terms of millions, billions, trillions, or quadrillions. **Option B 11 quadrillions more options**

**Bonus (3 points extra credit):** The same company may impose the requirement that each password include at least one lowercase letter, at least one uppercase letter, and at least one number, but would allow doubled and repeated characters. How many different passwords are possible using 10 characters under this proposal?  
  
**26\*26\*10\*62\*62\*62\*62\*62\*62\*62 = 23,806,114,737,966,080**

1. [7] A bank wants to allow customers to use five-digit personal identification numbers (PINs) for their ATM, using hexadecimal digits instead of only decimal digits. The hexadecimal system includes 16 digits, with the decimal values 0–9 and the letters A–F.
   1. How many different PIN combinations are possible if there are no restrictions on selecting digits?

**16\*16\*16\*16\*16 = 1,048,576**

* 1. How many different PIN combinations are possible if no digit can be repeated?
  2. How many different PIN combinations are possible if no digit can be repeated, the first position needs to be a letter, and the last position needs to be a decimal value (0-9)?

1. [2] A DJ has seven requests from the audience, but only three slots to fill in her playlist. How many different combinations can she include from the seven requests if the order in which she plays the songs does not matter?
2. [2] A club needs to elect a social chair, treasurer, and a president.  If there are 14 students in the club, how many ways can these positions be filled?
3. [2] A coach must choose five starters from a team of 12 players. How many different ways can the coach choose the starters?
4. [6] Lottery officials want to make it harder for players to win. Two members of the lottery committee have suggested ways to do this.
   * 1. Use a set of six numbers as the winning combination, with each number a value between 1 and 30. Each value can be chosen at most one time, but the order in which the values are selected does not matter.
     2. Use a set of four numbers as the winning combination, but each of the four numbers is selected separately from values between 1 and 30. Repetition is allowed, but the numbers must be selected in the same order they are drawn.

**30\*30\*30\*30 = 810,000**

* + 1. Which of the following suggestions, (a) or (b), should the committee choose? Include a detailed comparison to justify your choice.

**The goal is to have fewer people win then option A is the better choice, the more numbers that have to be chosen decrease the change to win by 426 million.**

1. [6] We wish to create a partition of the Cartesian plane. Determine if the following sets are a partition and explain why or why not.
   1. The set of all circles with radius 2 and varying centers. **No, the varying centers will cause overlap which is no longer valid partition.**
   2. The set of all circles with varying radii and centered at the point (0,0) (called the origin). **Yes, this would be a partition of the cartesian plain**
2. [6] Use the binomial theorem to expand . Show all steps as shown on the class PowerPoint.
3. [3] What is the coefficient of the term of the expansion of ?
4. [5] A Geek Squad tech has 5 different laptops, 6 external drives, and 4 Bluetooth mice that she could take to a client.   
   a. How many ways could she take one of each? **5\*6\*4 = 120**  
   b. How many ways could she take two of each? **5\*5\*6\*6\*4\*4 = 14,400**
5. [3] Are the following partitions of the set {b,i,n,a,r,y}? If no, why not?  
   a. {{a,i,r},{b,y},{n,a,b}} = **No multiple b, and a**  
   b. {{r,a,n}, {b,y}, {i}} = **Yes this is a valid partition**  
   c. {{i,a},{b,n,r}} = **No missing the y**