Fall 2017 COT 3100 Section 1 Homework 7

Please Consult WebCourses for the due date/time

Note: Please ***justify*** your answers and why you use each formula.

1) Consider an ant that is walking on a Cartesian grid, starting at (0,0) and ending at (15, 18). The ant always chooses to walk exactly one unit either up or to the right (towards his destination) whenever he arrives at a Lattice point. (A Lattice point is a point with integer coordinates.) Thus, from (0,0) he either walks to (1, 0) or (0, 1). If the ant is not allowed to go to the points (6, 8) and (11, 15), how many different paths can he take on his walk?

2) This question considered permutations of “RONALDMCDONALD”.

> a) How many permutations are there total?
>
> b) How many permutations start and end with vowels?
>
> c) How many permutations do NOT have consecutive vowels in them?
>
> d) How many permutations contain the vowels in order (all As before all Os)?
>
> e) How many permutations contain the substring “OLAND”? (Note: This one is hard!)

3) A class contains 18 girls and 14 boys. For all parts of this question, each boy and girl are distinguishable from one another. Answer the following questions:

> a) In how many ways can a committee of one boy and one girl be chosen?
>
> b) In how many ways can a committee of five students be chosen?
>
> c) In how many ways can a committee of four girls and three boys be chosen?
>
> d) In how many ways can a committee of six students be chosen such that all the students on the committee are the same sex?
>
> e) In how many ways can the girls and boys form a line where no two boys are standing next to one another?
>
> f) How many committees of seven students contain at least two girls?

4) How many solutions does the equation $a + b + c + d + e + f = 30$ have if each variable must be a non-negative integer and $a \leq 3$, $b \leq 7$ and $d \geq 8$?

5) How many solutions does the equation $a + b + c + d + e + f + g + h \leq 40$ have if each variable must be a non-negative integer?

6) A class has 2n students who must be split up into pairs. We consider two sets of pairs S and T different if at least one pair in the set S isn't a pair in the set T. A pair is unordered, so we consider the pair (1, 2) and (2, 1) to be the same pair. How many different sets of pairs can the class be split up into, in terms of n? (For example, with $n = 2$, the answer is 3. Sets are {(1, 2), (3, 4)}, {(1, 3), (2, 4)} and {(1, 4), (2, 3)}.)

7) How many integers in between 1 and 10^7 are divisible by 15, 35, or 77?

8) Give a summary of the life and mathematical contributions of Emmy Noether. Please aim for a length of roughly 200 - 400 words. ***<u>Your summary must be typed.</u>*** Please state the sources you used in writing your summary.