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CS-225:Discrete Structures for CS
Homework 7 Part 1
Exercise Set 9.2, Problem# 11.c, 14.c, 14.e, 17.a-d; Set 9.3, Problem# 5.a, 24.a, 24.c, 33.e, 33.f

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11.c

Bit string has 8 bits that can be 0 or 1. The first and last bit must be 1, and the ones in between have two possibilities, so the total possible combinations is 1*2*2*2*2*2*2*1 = 2^6 = 64

14.c

License plate has 4 letters followed by 3 numbers. Total possibilities that begin with TGIF is 1(for the letters) multiplied by 10*10*10 = 1000

14.e

License plate that begins with AB and has the remaining letters/numbers distinct. Since AB is set, that counts as 1. The remaining 2 letters have 24 and 23 possibilities if the letters are to remain distinct. The possibilities of the numbers are 10*9*8 if they are to remain distinct. So, putting it all together, 1*24*23*10*9*8 = 397,440

17

a) Since we are counting from 1000 to 9999, the first digit cannot be 0, so there are 9 possibilities for the first digit. The remaining 3 digits each have 10 possibilities. So, the number of integers from 1000 to 9999 is 9*10*10*10 = 9000

b) Building off part a, the only thing that changes is the possibilities of the units digit. Since we are counting odd numbers, it must be a 1, 3, 5, 7, or 9, so 5 possibilities. Then, 9*10*10*5 = 4500

c) Building off part a again, the first digit still remains 9, but each succession has one less possibility than before to remain distinct. So, 9*9*8*7 = 4536

d) Building off part a and b, the units digit still has 5 possibilities to remain odd. Since the units digit is counted for, the first digit has one less possibility than before, so it has 8. The next digit has 2 less than before and the third digit has 3 less than before. So, 8*8*7*5 = 2240

5.a

In this problem we are looking at integers between 10000 and 99999. To be divisible by 5, we know that the units digit must be a 0 or 5. Also, since we start counting at 10000, the first digit cannot be 0, so it only has 9 possibilities. Then, the number of integers between 10000 and 99999 that are divisible by 5 is 9*10*10*10*2 = 18000

24.a

We are counting from 1 to 1000, so we know the total number of digits is 1000. To be multiples of 2, then we know it can be written as 2m for some integer m. So, 2m = 1000 ==> m = 1000/2 = 500. To be a multiple of 9, we know it can be written as 9n for some integer n. Then 9n = 1000 ==> n = 1000/9 = 111.11, so if we take the floor value, 111 possibilities. We need to find out how many numbers are both multiples of 2 and multiples of 9 so we don't double count numbers. To be a multiple of both, the number can be written as 2*9x, or 18x for some integer x. Then, 18x = 1000 ==> 1000/18 = 55.556, so we take the floor value, 55. Total number of integers between 1 and 1000 that are multiples of 2 or 9 is 500+111-55 = 556

24.c

To find the number of integers between 1 and 1000 that are neither multiples of 2 nor multiples of 9, we subtract the number of integers that are these multiples from the number of total possibilities. So, 1000 – 556 = 444

33.e

To get the number of students that checked 2 and 3, but not 1

3 checked 2 and 3, but some of those also checked 1, so we need to subtract the students who checked all three. (#2 and #3) – (#1 and #2 and #3)

So 3-2 = 1 student

33.f

The get the number that checked 2 but neither of the other ones:

(#2) -(#1 and #2) - (#2 and #3) + (#1 and #2 and #3)

26-8-3+2 = 17 students