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ECS 020 A03

Homework 8

Exercise 1: .

How many strings are there of four lower case letters that have the letter x in them?

Number of strings of length $4 = 26^4$

Number of strings of length 4 other than $x = 25^4$

Thus, the answer is $26^4 - 25^4 = 66351$ strings.

Exercise 2: .

How many strings of four decimal digits

a)do not contains the same digit twice?

$$10 * 9 * 8 * 7 = 5040$$

b)End with an even digit?

$$10^3 * 5 = 5000$$

c)Have exactly three digits that are 9s?

$$9 * 4 = 36$$

Exercise 3: .

How many license plates can be made using either three digits followed by three letters, or three letters followed by three digits?

$$9^3 * 26^3 + 26^3 * 9^3 = 2(26^3 * 9^3) = 25625808$$

Exercise 4: .

How many subsets of a set with 100 elements have more than one element?

All of the subset $= 2^{100}$

The sub set has less than one element $= 100 + 1$

Thus, the answer is $2^{100} - 100 - 1$.

Exercise 5: .

How many bit strings of length 10 contain either five consecutive 0s or five consecutive 1s?

let's consider 5 consecutive 1s first:

if it start at position 1, remaining digits can be both 1 and 0: $2^5 = 32$

if it start at position $k = 2, 3, 4, 5, 6$, the number at position $k - 1$ must be o, or it will be in previous cases: $5 * 2^4$

So the total number is $2^5 + 5 * 2^4 = 112$

5 consecutive 0s is similar as 5 consecutive 1s, so we get another 112.

because we count 0000011111 and 1111100000 twice, we should subtract 2 from the answer.

Thus the final answer is $112 * 2 - 2 = 222$

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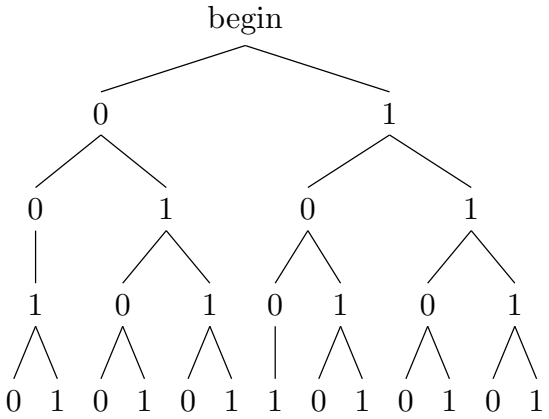
Exercise 6: .

Use a tree diagram to find the number of bit strings of length four with no three consecutive 0s.



So there are 13 strings of length four with no three consecutive 0s.

Exercise 7: .

Form a group of 13 men, 8 women, 2 boys and 4 girls.

(a)How many ways can a man, a woman, a boy and a girl be selected?

$$13 * 8 * 2 * 4 = 832$$

(b)How many ways can a male and a female be selected?

$$(13 + 2) * (8 + 4) = 180$$

(c)How many ways can a person be selected?

$$13 + 8 + 2 + 4 = 27$$

Exercise 8: Extra Credit

How many numbers in the range 100-999 have no repeated digits? (For example, 110 and 211 have repeated 1, while 101 is OK)

$$9 * 9 * 9 = 729$$

Now how many of them are even? (be careful!).

if the first digit is even, the second is odd

$$4 * 5 * 5 = 100$$

if the first digit is even, the second is even

$$4 * 4 * 4 = 64$$

if the first digit is odd, the second is odd

$$5 * 4 * 5 = 100$$

if the first digit is odd, the second is even

$$5 * 5 * 4 = 100$$

So the total number is $100 + 64 + 100 + 100 = 364$