Activity 2.1: Shashank Mondrati

Exercises 4.1-4.4

1. **4.1** Passwords must be 8 or more characters long.
    a. Password must contain characters from two of the following four categories:
    b. Uppercase characters A-Z (English alphabet)
    c. Lowercase characters a-z (English alphabet)
    d. Digits 0-9
    e. Special characters (!, $, #, %, etc.)

    To store passwords in the browser, they are stored in the passwords section, and to store in local machines, they are stored in an Active directory.
2. **4.2 Ten Digits, and 26 alphabets make it 36.**
    a. There are 10 * 36^(n-1) passwords begin with a digits, with n=4,6,8 characters long, and end with the same number of permutations that end with a digit. It is possible to count them directly, but the counting is more complicated. For each of the 6 positions in the password there are $10 \cdot 36^{(n-1)}$ passwords having a digit in that position, so to a first approximation there are $6 \cdot 10 \cdot 36^{(n-1)}$ acceptable passwords. However, as noted in the first paragraph, this counts some passwords more than once. For each pair of positions in the password there are $10^2 \cdot 36^{(n-1)}$ passwords having digits in both of those positions, and all of these passwords have been counted twice. Either way there are over **1,867,866,560** password combinations with no distinction between upper and lower case.
    b. If we allow both capital and lower case letters with the n=4,6,8 password long, there can be **52^(n)** password combinations
3. **4.3**. One tenth of a second, and a micro-second?
    a. For one-tenth of a second. There are 62 alpha-numerical characters, so altogether 626 = 56, 800, 235, 584 passwords. There are 365 × 24 × 60 × 60 × 10 = 315, 360, 000 tenths of a seconds in a year. Dividing we get in the worst case 180 years. On average it can take over 90 years.
    b. There are 62*6 = 56, 800, 235, 584 passwords. There are 60×60×106 = 3,600,000,000 microseconds in an hour. Dividing we get, 15.8 hours. On average ~ 8 hours.
4. **4.4** Assume that you are only allowed to use the 26 letters of the alphabet to construct passwords of length n. Assume further that you are using the same password in two systems where one accepts case-sensitive passwords but the other does not
    a. How many attempts are required to guess a password of system which is case sensitive.. There are 52 characters so 52^n passwords: 52^n is the worst case number of attempts

b. How many attempts are required to guess a password of a system that are not case sensitive There are 26 characters so 26^n passwords: 26^n is the worst case number of attempts
c. Suppose a hacker managed to get into a system that is not case sensitive, hence there are 2^n attempts given that characters are either upper or lowercase. That gives 2^n attempts.