1. We assign values to items, that being colors to houses.

a) There are $n = 3$ items and $k = 4$ values. Thus there are $k^n = 4^3 = 64$ assignments or ways to paint the houses.

b) There are $5^5 = 3125$ ways to paint the houses.

c) There are $10^2 = 100$ ways to paint the houses.

2. There are 26 lower-case letter values, 26 upper-case letter values, and 10 number values that can be assigned to the positions in the password, the items. If the password is 8 characters long, then there are $(26+26+10)^8 = 62^8$ possible passwords. If the password is 9 long, then there are 62^9, and if the password is 10 long then there are 62^{10} possible passwords. For passwords consisting of eight to ten of the allowed characters there are $62^8 + 62^9 + 62^{10}$ possible passwords.

3. Each statement can mutate n alongside at most seven other statements. Each statement has a condition that is either true or false and these are the values.

Taking one item, we have 2^1 assignments. Alongside the other seven items there are 2^7 assignments. Hence there are $2^1 \times 2^7 = 2^8 = 256$ different values `f` can return.

4. There are nine items, the squares, with three possible values, blank, containing an X, or containing an O. Thus there are 3^9 different boards.

5. There are n items, the number of positions in the string, and ten values, the digits. Hence there are 10^n different strings.

6. There are 26^n different strings that can be formed.

7.

a) $2^{13} = 2^3 \times 2^{10}$ is 8K.

b) $2^{17} = 2^7 \times 2^{10}$ is 128K.

c) $2^{24} = 2^4 \times 2^{20}$ is 16M.

d) $2^{38} = 2^8 \times 2^{30}$ is 256G.

e) $2^{45} = 2^5 \times 2^{40}$ is 32T.

f) $2^{59} = 2^9 \times 2^{50}$ is 512P.

8.

a) 2^{10} is about 10^3. Hence $10^{12} = (10^3)^4$ is about 2^{40}.

b) We know that 2^{10} is about 10^3. Hence $10^{18} = (10^3)^6$ is about 2^{60}.

c) $(10^3)^{33}$ is about $(2^{10})^{33} = 2^{330}$.