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Assignment06: Theory Information

1). Different between sum and product rule:

Sum rule: If a task can be done in n_1 ways and a second task in n_2 ways and if these two tasks cannot be done at the same time, then are $n_1 + n_2$ ways to do either task.

Product rules: suppose that a procedure can be broken down into two successive tasks. If there are tasks and n_1 ways to do the first task and n_2 ways to do the second task after task has done, then there $n_1 n_2$ ways to do the procedure.

2). The difference of student IDS that contain 8 digits (from 0 to 9) are 100 000 000.

- Because from 0 to 9 we have 10 number. And the ID contain 8 digits number so every digits can possible have one number from 0 to 9 so we can write that $10^8 = 100,000,000$.

3). The difference of 6 character passwords (take into account the A to Z, a to z or 0 to 9) are 618,831,552.

- Because A to Z and a to z these both characters have the same 26 characters and 0 to 9 have 10 characters. And our passwords have 6 characters so we can write that $26^6 \times 26^6 \times 10^6 = 618,831,552$.

4). The bit strings of length 7 either start with a 1 or end with 0 is equal to 96.

- Task1 : start with 1:
 - 1, (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1). So product rules : task1 can be done in $1 \times 2^6 = 64$
- Task2: end with 0:
 - (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , 0. So product rules task2 can be done in $1 \times 2^6 = 64$.
- Task3 : start with 1 or end with 0:
 - 1, (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , 0. So product rules task3 can be done in $1 \times 2^5 = 32$.
 - Since task1 we have 64 and task2 64 too. And in 32 of these cases tasks 1 and 2 are completed at the same time. Therefore $64 + 64 - 32 = 96$.

5). The bit strings of length 9 either start with 10 or end with 10 is equal to 224.

➤ Task1 : start with 10 :

- 1 , 0 , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1). So product rules task1 can be done in $1 \times 2^7 = 128$.

➤ Task2 : end with 10:

- (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , 0 , 1. So product rules task2 can be done in $1 \times 2^7 = 128$.

➤ Task3 : start with 10 or end with 10 :

- 1 , 0 , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , (0 or 1) , 0 , 1. So product rules task3 can be done in $1 \times 2^5 = 32$.

Since task1 and task2 we have the same amount equal to 128. And in 32 case of these cases task1 and 2 are completed at the same time. Therefore $128 + 128 - 32 = 224$.

6). If we have 5 sets (A,B,C,D,E), what is answer of $(A \cup B \cup C \cup D \cup E)$?

The answers of $(A \cup B \cup C \cup D \cup E)$ is

$$|(A \cup B \cup C \cup D \cup E)| = |A| + |B| + |C| + |D| + |E| - |A \cap B| - |A \cap C| - |A \cap D| - |A \cap E| + |A \cap B \cap C \cap D \cap E|$$