


Quant Puzzles 7 - Birthday Problems

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Question 1: Birthday Problem (Easy)

If you have $N \leq 365$ people in a room, what is the likelihood that at least 2 of them have the same birthday?

Solution:

We must calculate the probability that everyone has a unique birthday and subtract it from 1. There are $P_N^{365} = \frac{365!}{(365-N)!}$ permutations for N people to have different birthdays. There are 365^N total birthday assignments for the N people.

$$1 - \frac{P_N^{365}}{365^N}$$

Question 2: Birthday Problem 2 (Easy)

If you have N people in a room, what is the likelihood that someone has the same birthday as you?

Solution:

This is similar to the last question. We first compute the probability that nobody has the same birthday as us and then subtract it from 1. For computing the probability that nobody has the same birthday as us, there are 364^{N-1} possible samples of birthdays excluding our own. There are 365^{N-1} possible ways for the other guests to have birthdays. Our answer is:

$$1 - \frac{364^{N-1}}{365^{N-1}}$$

Question 3: Function Mappings (Easy)

- $|A|$ is the number of elements in a set

How many distinct functions can you make by mapping set A to set B if $|A| = m$ and $|B| = k$


Solution:

Each element of A has k possible elements that it can be mapped to.

$$k^m$$

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