Abdelwahid Benslimane
wahid.benlimane@gmail.com

Let’s do some fun probabilities. Do you know that when you gather 23 people in a room, you have more than a 50/50 chance that at least 2 of them have the same birthday. Let’s verify that…

This probability is calculated by subtracting from 1 the probability that none of the people have the same birthday because these events are the opposite of each other:

P(“at least 2 people have the same birthday”) = 1 - P(“none of the people have the same birthday”).

The probability that none of the people were born on the same day of the year is the result of this fraction: $\frac{number\ of favorable\ cases}{number\ of possible\ cases}$.

Let's simplify things a little and consider that we always have 365 days in a year.

So, in the general case, if you take 23 people you have 365^{23} possible birthday arrangements/possible cases, as the first person taken at random could be born on any of the 365 days, and the same goes for the second, third and so on...

If none of the people have the same birthday, it means that the first person taken at random can be born on any of the 365 days of the year, but the second person taken at random has only 364 options, the third 363 options, and so on, until the 23rd person that has only 343 options for his or her birthday. The number of favorable cases is then the result of the following product: $365 \times 364 \times \cdots \times 643$.

The probability that no one was born on the same day is therefore the result of the fraction $\frac{365 \times 364 \times \cdots \times 343}{365^{23}}$ which can be rewritten as follows: $\frac{365!}{342! \times 365^{23}}$ (as a reminder $n! = n \times (n-1) \times (n-2) \times \cdots \times 1$). The result is approximately equal to 0.493.

Therefore, the probability that at least 2 of the 23 persons have the same birthday is 1 – 0.493 = 50.7%.