



DECEMBER 2023 BRAIN TEASER & SOLUTION

Happy Birthday Sharing

It is your birthday and you attend a conference. As you arrive to the registration desk, your long-time friend organizer greets you enthusiastically. You compliment your friend on his excellent organization and turnout. Looking through the doors into the main conference room you are impressed by the people, activity and buzz. Out of curiosity, you ask your friend how many people have attended? Your friend organizer has the exact registration count, but having gone to math school together with you, he decides to give you a math challenge.

"Excellent question my friend! The registered attendance in the conference is such that if all birthdays are distributed at random, excluding Feb. 29 birthdays for yourself and the attendees, your chance of having one person or more with your exact birthday is 90%".

How many people are in registered attendance in the conference?

The answer to the December 2023 Brain Teaser

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You have asked how many people are in the conference room. To answer that question you have been told that the birthdays (no Feb. 29s) are random and there is 90% chance of at least one person having your birthday. "At least one person" is the complement of "no person". Think of it as 1 minus the chance that nobody has your birthday. You are essentially in a binomial tree and the only way for nobody to have your birthday is to continue on the bottom branch, assuming you place the yes branches $1/365$ on top, and the bottom branches $364/365$ on the bottom.

For 1 person the chance of having your birthday is $1 - 364/365 = 0.27\%$

For 2 people the chance of at least 1 having your birthday is $1 - (364/365)^2 = 0.55\%$

For N people the chance of at least 1 having your birthday is $1 - (364/365)^N = 90\%$.

By trial and error you can substitute N in this equation until you reach at least 90%, or you can solve for $N = \frac{\ln(1-90\%)}{\ln(364/365)}$.

To reach exactly 90% you need 839.3 folks. So 839 falls slightly short of 90% and the answer is 840 folks are in the room.

Probability concepts and probability intuition are important to decision professionals. Hence the interesting thing about this challenge is that most folks would have thought intuitively that the chance of at least one person having your birthday would have been huge (like 90%) with 365 folks in the room, but it's only 63%. To get to 90% it takes 840 folks, more than twice the general intuition