

Some birthday surprises

Suppose that you are in a movie theatre with 400 other people. Then there are bound to be two patrons with exactly the same birthday. After all, there are only 366 dates available for such a happy event. So it is natural to ask how many people have to be in a gathering before there is a better than even chance that two among them will have the same birthday.

The surprising answer is that if you have a group of at least 23 people, then it is more likely than not that two of them will have the same birthday. Let me invite the readers to conduct their own experiments. Whenever you are in a group of about that many people, find out if two have the same birthday and keep track of how often this does, or does not, happen. Of course, the more people you have, the higher the chance of having matching birthdays. For thirty people, there is over a 70% chance of matching birthdays, and for fifty people, 97%. If you are a betting person, this may be a good chance to pick up some money. But perhaps I should not be counselling vice.

For there to be a better than even chance that two people in a group will have birthdays at most one day apart, you need only 14 people. And in a group of seven people, there is a better than even chance that two will have birthdays within a week of each other.

There is another striking fact about age that I would like to show you. Let us clarify that a person's age is the largest whole number of years that that person has lived, what we call the age last birthday. So we keep our age for one year, and it increases by 1 on our birthday. The age of a baby not yet twelve months old is zero.

Consider any two people. It may be yourself and a relative, for example. It turns out, assuming that both live sufficiently long, that the age of the older will be twice the age of the younger for periods of time that total exactly one year. Check it out.

To understand why, let us look at the example of two people, Primus born on April 19, 1969 and Secundus born on June 30, 1993. When Secundus is born, Primus is 24 years old, so the difference in ages between the two is 24 between June 30, 1993 and April 19, 1994. Then between April 19, 1994 and June 30, 1994, the age difference is 25. At that point, the age difference reverts to 24, and as long as both live, the age difference between the two will switch between 24 and 25.

The only way Primus can be twice the age of Secundus, is when Primus is 48 and Secundus is 24, and when Primus is 50 and Secundus is 25. This will occur during the periods June 30, 2017–April 19, 2018 and April 19, 2019–June 30, 2019. You can make a similar calculation for your own choice of two people. If it happens that both have the same birthday, then the older has twice the age of the younger for a single stretch of one year.

What happens in the case of twins? The proposition still holds, since during their first year of life, both have age 0, and twice zero is zero.