



DEAR Dr Maths, as a primary school teacher I was surprised when three children all came to see me for their birthday sticker on the same day this week. Can you believe that they all had the same

birth date? It reminded me of reading once that you only need 23 people in a room to have more than a 50-50 chance of someone having the same birthday. Can you explain why this is true?

Joanne,
Sunderland

MATHEMATICALLY most random chance events can be explained by probability and common sense. Let's start by considering a random group of people in a room and look at the chance of them having different birth months. For two people to have a different birth month, one could have a birthday in any of the 12 months, but the second person would have to have their birthday in one of the remaining 11 months. When you look at three people the third only has 10 possible months left and so on.

As you can see from the table, below, the chance of

Two people	$\frac{12}{12} \times \frac{11}{12} = 0.92 = 92\%$
Three people	$\frac{12}{12} \times \frac{11}{12} \times \frac{10}{12} = 0.76 = 76\%$
Four people	$\frac{12}{12} \times \frac{11}{12} \times \frac{10}{12} \times \frac{9}{12} = 0.57 = 57\%$
Five people	$\frac{12}{12} \times \frac{11}{12} \times \frac{10}{12} \times \frac{9}{12} \times \frac{8}{12} = 0.38 = 38\%$

having a different birth month reduces greatly by the time you have five people together. There is

a 100% chance that you have either a different birth month or the same birth month. It has to be one way or the other. It's like when you flip a coin, if it's not heads it has to be tails. For five people, there is a 38% chance of them having a different birth month therefore there is a 62% chance that two of the five will have the same.

You can use the same method with 365 days to establish the probability of having the same birthday as someone else, and you get an even stranger result.

The reason is that you are not just looking at one match, you are looking at the other possible connections between everyone else's birthdays. This generates a large number of combinations and so gives a high chance of the unexpected happening.

Here is a puzzle for you to try: It's Sarah's birthday party and she takes three of her best friends out for a meal. They play a game of changing places around the table. How many different ways can they sit around the table?

The first correct answer wins a copy of John Haigh's book, *Taking Chances* published by Oxford University Press. It looks at chance and how it affects our lives, including the lottery, horse racing and card games.

Well done to Emie Spence, from Newcastle, who correctly worked out that Bob ate 12 blueberry muffins while Ann ate 18. You win the book *The 10-Day Gi Diet*, donated by Waterstones in Newcastle.

Do you have a maths question or problem? Write to Dr Maths; Evening Chronicle, Newcastle, NE1 1ED or email: DRMaths@hotmail.co.uk