Birthday Paradox

How many people are there in the room right now?

How many of them were born on the same day of the year?

This is surprisingly likely to have happened

Birthday Paradox

The birthday paradox says that if there are **23 people** in the room, that it's **more likely than not** that two of them were born on the same day of the year

Not that it **will** happen. Just that the **probability** is more than **0.50**

There's a **greater than 50% chance**

Birthday Paradox

This doesn’t seem possible

But it works

It’s called a **paradox** because people think it can’t be true

But it is – there’s a **greater than 50% chance**

Birthday Paradox

Assumption: ignore leap years

Simplification in coding: I'm just using the number of the day of the year

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Birthday Paradox

How many people? 23
[33, 65, 65, 83, 109, 114, 120, 127, 185,
 207, 227, 231, 231, 253, 263, 282, 286, 291,
 297, 303, 331, 342, 345]
```

Birthday Paradox

Greater than 50% chance of a match

```
Birthday Paradox

How many people? 23
[33, 65, 65, 83, 109, 114, 120, 127, 185,
207, 227, 231, 231, 253, 263, 282, 286, 291,
297, 303, 331, 342, 345]
```

The more times you repeat the experiment the more certain you can be of the result

Birthday Paradox

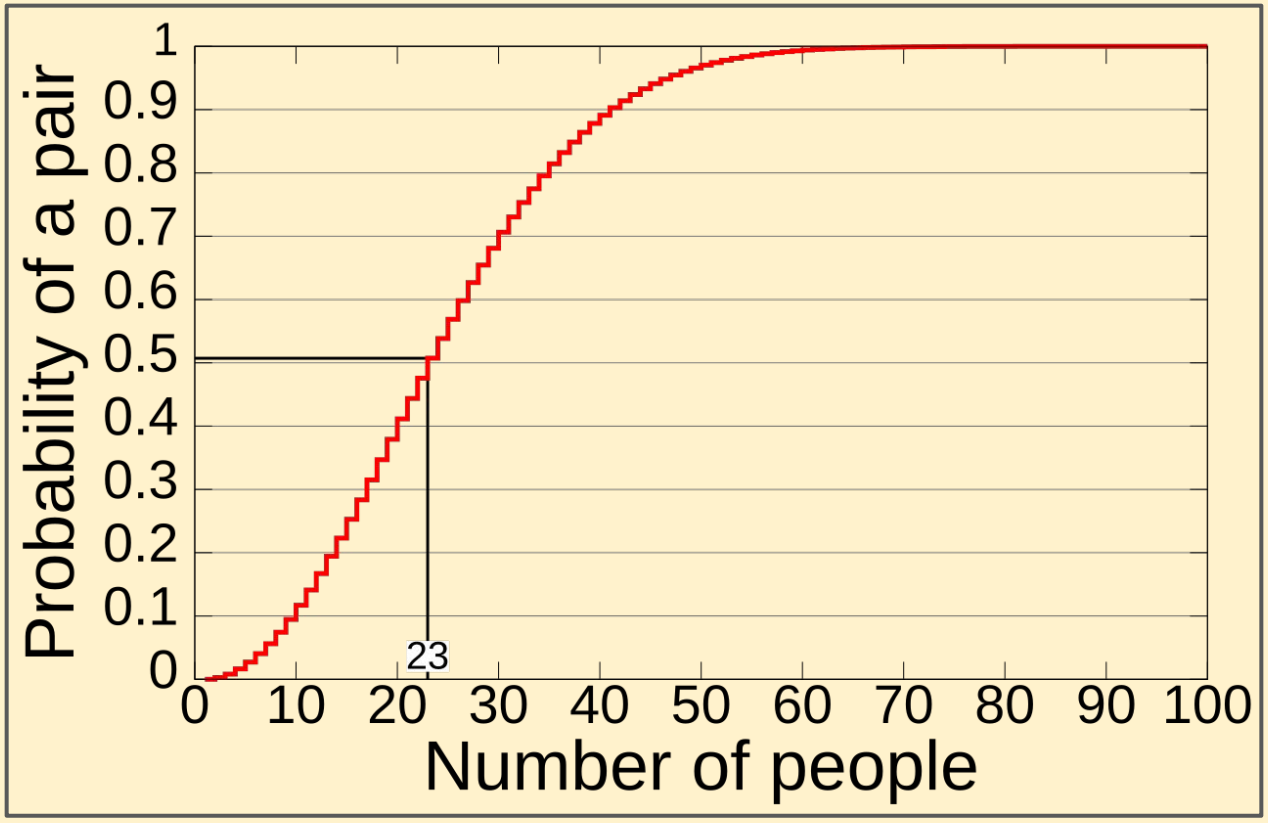
We can use Python to check if the birthday paradox is true or not

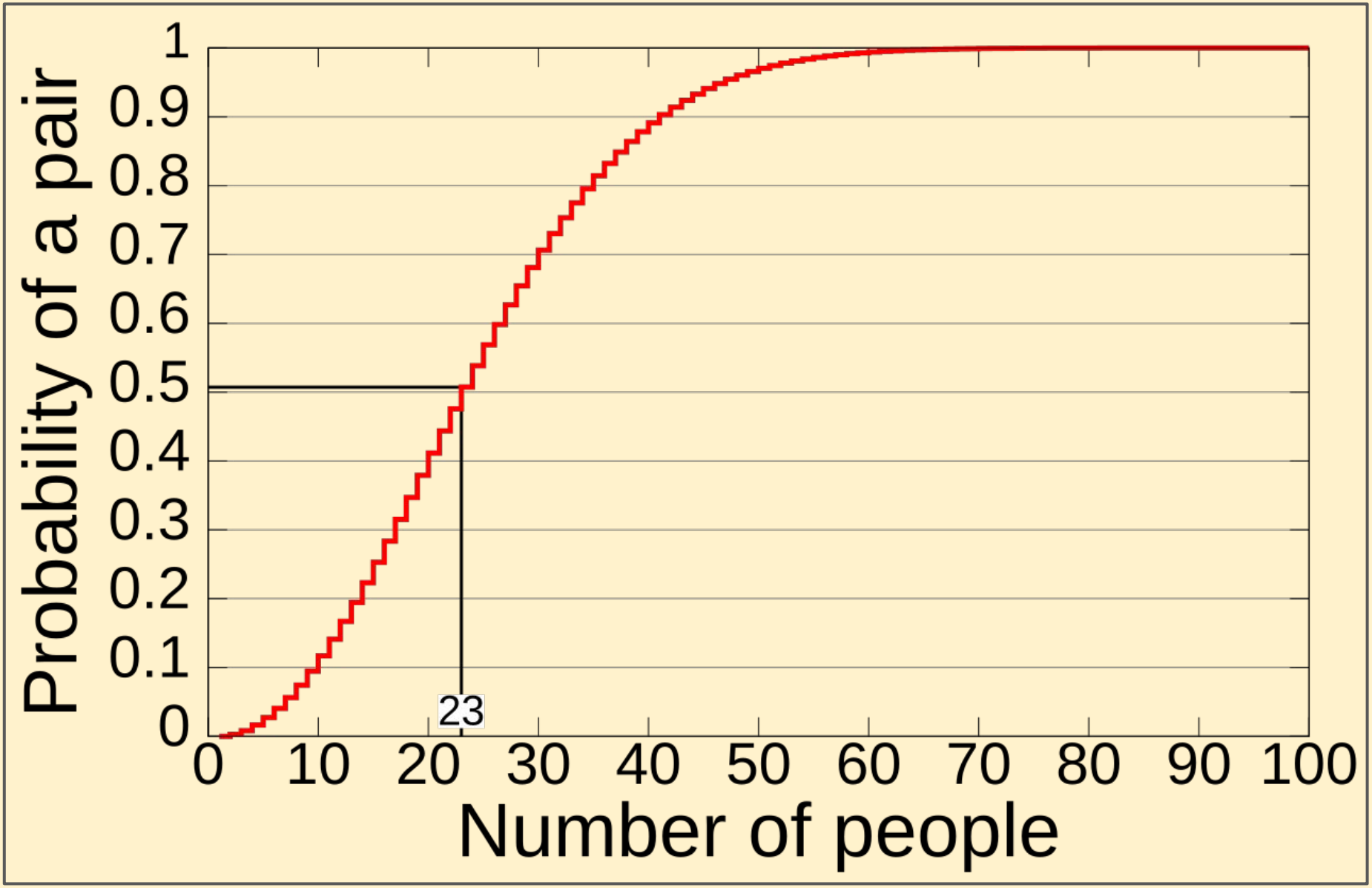
To do this, we'll create sets of 23 random numbers between 1 and 365 to act as birthdays

And then check and see if there's a match or not

Birthday Paradox

The maths behind the birthday paradox is complex, but this graph shows how it works





How many people do you need for a 75% chance?

How many for a 90% chance?

Birthday Paradox

A **paradox** is a statement that shouldn't be right, but is

The birthday paradox is an example of a **veridical paradox**

It was first discovered in the 1920s, probably by a British mathematician called Harold Davenport