

## 1 Gambling in the lottery

In the lottery, six numbered balls are drawn randomly from a sample of 49 balls carrying the numbers 1 to 49. The balls are drawn sequentially and are not placed back in the sample, so that each number can only occur at most once. In every drawing step, each of the remaining balls is chosen with equal probability. To win the lottery, you have to guess the six random numbers, where the order of the numbers is irrelevant.

### 1.1 Calculate the number of possible sequences of 6 out of 49

$$N = 49 \cdot 48 \cdot 47 \cdot 46 \cdot 45 \cdot 44 = 10068347520 \quad (1)$$

### 1.2 Calculate the probability that you guess all six numbers correctly

$$P = \frac{1}{N} \quad (2)$$

### 1.3 Calculate the probability that you guess exactly four numbers correctly

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## 2 Birthdays

Assuming that the birthdays of a population are distributed equally over the 365 days of a year, how large is the probability that in a lecture attended by 150 students at least two of the students have their birthday on the same day of the year? How many people would have to attend the lecture so that the probability for them having their birthday on the same day is 0.5?

## 3 Bayes and a-posteriori probabilities

Bayes theorem can be used to improve/revise our guesses on probabilities.