RWTH Aachen **WS 2025**
Theoretical Computer Science Exercise 7
Rossmanith–Gehnen 11.12.2025

Exercise for Analysis of Algorithms

Exercise 24

Let $r \in \mathbf{R}$, $r \notin \{, 2, 3, \ldots\}$ and $n \in \mathbf{N}$. Find a closed formula for the binomial coefficient

$$\binom{r}{n} = \frac{r^{\underline{n}}}{n!}$$

as a function of n that is correct *up to a constant factor* if r is a fixed constant.

Exercise 25

Find a bivariate generating function and a closed-form expression for the number of bitstrings of length n that contain exactly m ones and do not contain the substring 11.

Exercise 26

Solve this recurrence:

$$f_n = f_{n-1} + 2f_{n-2} + 3f_{n-3} + \cdots + nf_0 \text{ for } n > 0 \text{ and } f_0 = 1.$$