RWTH Aachen **SS 2012**
Lehrgebiet Theoretische Informatik Problem Set 5
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Analysis of Algorithms — Tutorial

Problem 5-1

Given an array a of length n, an algorithm compares all pairs $(a[i], a[j])$ for all $i < j \leq n$, and then calls itself recursively on all proper prefixes of a.
How often does the algorithm compare two pairs? Use the repertoire method!

Problem 5-2

Compute the number of iterations of the **while**-loop for $0 < i$ and arbitrary j.

```
while i ≤ j
    i := i + j;
    if i > j then j := j + 10;
```

Homework Assignment 5-1 (10 Points)

Use summation factors to solve the following recurrence:

$$\begin{aligned} a_0 &= 0 \\ a_n &= \frac{a_{n-1}}{n} + \frac{1}{(n-1)!} \qquad \text{for } n \geq 1 \end{aligned}$$

Homework Assignment 5-2 (10 Points)

Use the repertoire method to find a closed form for the following recurrence:

$$\begin{aligned} a_0 &= 5 \\ a_1 &= 9 \\ a_n &= na_{n-1} + n^2 a_{n-2} - n^4 - 3n^2 + 5 \qquad \text{for } n \geq 2 \end{aligned}$$