

## 9th Exercise sheet for Advanced Algorithmics, SS 15

**Hand In:** Until Wednesday, 24.06.2015, 12:00am, in lecture, exercise sessions, hand-in box in stairwell 48-6 or via email.

### Problem 24

- Show that  $a^n$  can be computed with  $\mathcal{O}(n^2 \log n)$  bit operations for constant  $a \in \mathbb{N}$ .
- Give a sharper upper bound than the one in part a). How can it be attained?

### Problem 25

Let  $\Sigma = \{+, -\}$  and for  $j \leq i$

$$L(i, j) = \{w \in \Sigma^* \mid |w|_+ = i + j, |w|_- = j\}$$

the language of all sequences of  $i + j +$  and  $j -$ .

Show that at least a third of all words in  $L(i, j)$  contain (properly) more  $+$  than  $-$  in every suffix.

### Problem 26

Analyze the behaviour of algorithm PRIME<sub>NUMBER</sub>( $\ell, k$ ) for

- $k = 2 \cdot \lceil \log_2 \ell \rceil$  and
- $k = 2 \cdot (\lceil \log_2 \ell \rceil)^2$ ,

respectively.