

Theoretical Computer Science – Exercise 7

SS 2022
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Please prepare the following exercises at home prior to the tutorial:

Exercise 1

Create a RegEx to check the validity of an e-mail address. Consider the following properties:

- Must contain exactly one @
- The local part (i.e., left of the @) can only contain numbers, latin letters, and special characters from the set {., _ %, +, -} and must contain at least one symbol.
- The global part (i.e., after the @) can only contain numbers, latin letters, and special characters from the set {., -}.
- There is no top-level domain (e.g., the “de” at the end) with less than 2 characters.
- Consider only lowercase letters

Validate your RegEx on <https://pythex.org/>.

Exercise 2

Create a RegEx that describes the subset of e-mail addresses available at TH Rosenheim. Consider the following properties.

- Top-level domains: {de, com}
- Domains (abbreviated): {fh-r, hs-r, th-r}
- Optional subdomains: {stud}
- Local part: {firstname.lastname, firstname.m.lastname }, where “m” is the first letter of the middle name
- Consider only lowercase letters

Examples:

max.mustermann@stud.th-r.de

jane.c.doe@hs-r.com

Validate your RegEx on <https://pythex.org/>.

Exercise 3

Use the pumping lemma to show that the following language is not regular:

$$L = \{a^i b^j c^k \mid i \leq j; i, j, k \in \mathbb{N}_0\}.$$

Exercise 4

Use the pumping lemma to show that the following language is not regular:

$L = \{a^q \mid q \text{ is a square number}\}$

Hints:

- Square numbers are: $1^2 = 1$, $2^2 = 4$, $3^2 = 9$, $4^2 = 16$, $5^2 = 25$, $6^2 = 36$, ...
- Choose a word w of a length that is a square number that depends on minimum length n
- Show that by repeating y once you cannot get a square number any more

We will do the following exercises together during the tutorial:

Exercise 5

Use the pumping lemma to show that the following language is not regular:

$L = \{a^i b^j c^k \mid i > j; i, j, k \in \mathbb{N}_0\}$.