ETH *zürich*
Departement Informatik

Theoretische Informatik

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https://courses.ite.inf.ethz.ch/theoInf20

# Exercises – Sheet 6

Zürich, October 23, 2020

Exercise 15

Construct nondeterministic finite automata for the following languages.

(a) $L_1 = \{x \in \{a,b\}^* \mid |x|_b \bmod 3 = 1 \text{ or } (x = ybz \text{ with } y,z \in \{a,b\}^* \text{ and } |z| = 3)\}$,

(b) $L_2 = \{a^n \mid n \in \mathbb{N} \text{ is divisible by } 3, 5, \text{ or } 7\}$ over the alphabet $\{a\}$.

Provide a graphic representation of your constructed automata and explain the ideas underlying your design. **10 points**

Exercise 16

(a) Applying the powerset construction, construct a finite automaton that is equivalent to the following nondeterministic finite automaton.
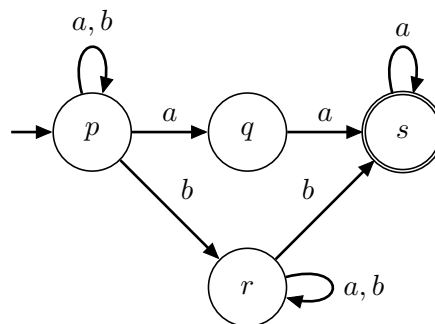
Provide a graphic representation of your constructed automaton. You can drop all nonreachable states.

(b) Prove that every deterministic finite automaton that is equivalent to the automaton from part (a) requires at least 6 states.

10 points

Submission: Friday, October 30, by 11:15 at the latest, either into the boxes in room CAB F 17.1 or as a clearly legible PDF via e-mail directly to the respective teaching assistant.