

CPSC 351 — Tutorial Exercise #6

Additional Practice Problems

About These Problems

These problems will not be discussed during the tutorial, and solutions for these problems will not be made available. They can be used as “practice” problems that can help you practice skills considered in the lecture presentations for Lectures #7 and #8, or in Tutorial Exercise #6.

Practice Problems

These problems concern regular expressions and languages over the alphabet $\Sigma = \{a, b, c\}$.

1. Consider the string

$$\omega = (((a)^* \circ (b)^*) \circ (c)^*).$$

- (a) Using the definition of a “regular expression”, prove that ω is a regular expression over Σ .
 - (b) Give a parse tree for ω .
 - (c) Consider the string $\lambda = ac$. Say whether ω belongs to the language of ω , and describe how to prove that your answer is correct.
 - (d) Consider the string $\mu = aaa$. Say whether μ belongs to the language of ω , and describe how to prove that your answer is correct.
 - (e) Describe, in reasonably simple English, the language of the regular expression ω .
2. Repeat the previous question — this time using the string

$$\omega = ((\Sigma \cup \lambda) \circ (\Sigma \cup \lambda)).$$

3. Give regular expressions over Σ for each of the following sets, and explain **briefly** why your answer is correct.
 - (a) The set of strings in Σ^* with length *at most* three.
 - (b) The set of strings in Σ^* that end with either “b” or “c”.
 - (c) The set of strings $\omega \in \Sigma^*$ such that aa is a substring of ω .