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Department of Computer Science
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CSEN 502 Theory of Computation, Winter Term 2021
Assignment2

Exercise 2-1

Reading

- Read section 0.4 and the section on strings and languages in Chapter 0 of the text (pp. 13–14).

Exercise 2-2

Exercises from Textbook

Sipser (*pp* 27): Solve exercises 0.8,0.9,0.10, 0.11, 0.12

Exercise 2-3

Extra Problems

a) Using mathematical induction, prove that

$$1 + 3 + 5 + \cdots + (2n - 1) = n^2$$

for any positive integer n.

b) Let $\Sigma = \{\beta, \mathtt{a}, \mathtt{b}\}$, where β denotes a blank (an empty space), so $w\beta \neq \beta w \neq w$, for any string w. Compute each of the following.

1. $|\varepsilon\varepsilon|$
2. $|\beta\beta|$
3. $|a\beta\beta b|$
4. $|\beta\varepsilon|$

c) Find all prefixes, suffixes, and substrings of the string `abbabc`.

d) Let $\Sigma = \{\mathtt{a}, \mathtt{b}, \mathtt{c}, \mathtt{d}, \mathtt{e}\}$ and $L = \bigcup_{n=1}^{6} \Sigma^n$. How many strings in L have `ab` as a proper prefix?

Exercise 2-4

Programming

Using your favorite programming language, implement an abstract data type for strings. Your implementation should include the following methods/functions/clauses:

a) one for getting all the prefixes of a given string.

b) another for getting all the suffixes of a given string.

c) using the above two methods, get all the substrings of a given string.