

Homework 01

Guidelines for homework assignments:

- All homework assignments should be neatly written with answers to questions presented in numerical order. Make sure that you attempt problems starting at the top of the sheet proceeding downward. Have enough empty space between one problem and the next.
- Be sure to answer all parts of each question.
- Your answers must contain detailed work and explanations for your steps. This is a MUST. 50% of credit will be deducted from your score if no detailed work is shown. To get full credit, you must show all your work.
- Your submission must be in PDF format, any other formats will not be accepted on Canvas.
- Late submission is not accepted.
- Email submission is not accepted. You must submit your homework assignments on Canvas.
- Your instructor will deduct points if your answer is hard to understand because of poor grammar or poor handwriting.

P01. Language (15 points)

Consider the language S^* , where $S = \{aa, aba, baa\}$,

P01.a (3 points) is “baaabaaa” in the language? Why?

P01.b (3 points) is “baaaaababaaaa” in the language? Why?

P01.c (3 points) is “abaabaabaaaa” in the language? Why?

P01.d (3 points) is “baaaaaaabbabaaaaa” in the language? Why?

P01.e (3 points) Can any word in this language have a substring of “bb” or an odd total number of a’s? why?

P02. Recursive Definition (8 points)

On page 13 in the Textbook, a language called **PALINDROME** is defined over the alphabet $\Sigma = \{a, b\}$:

$$\text{PALINDROME} = \{\Lambda, \text{ and all strings } x \text{ such that } \text{reverse}(x) = x\}$$

When asked to give a recursive definition for the language **PALINDROME** over the alphabet $\Sigma = \{a, b\}$, a student wrote:

Rule 1: **a** and **b** are in **PALINDROME**

Rule 2: If **x** is in **PALINDROME**, then so are **axa** and **bx b**

Unfortunately, all the words in the language defined above have an odd length and so it is not all of **PALINDROME**. Fix this problem (4 points) and explain why (4 points).

P03. Regular Expression (7 points)

Construct a regular expression for all words in which **a** appears tripled, if at all. This means that every clump of **a**’s contains 3 or 6 or 9 or 12... a’s. For example, b, bb, bbb, baaa, aaabbaaa, aaaaaaaaa, are all in this language.