

Name: _____

CSCI 380: Activity 4

Regular Expressions

Team Roles	Team Member
Facilitator: reads the questions aloud, keeps track of time and makes sure everyone contributes appropriately.	
Spokesperson: talks to the instructor and other teams.	
Quality Control: records all answers & questions, and provides team reflection to team & instructor.	
Process Analyst: considers how the team could work and learn more effectively.	

Note

If you have 3 people, combine Facilitator & Process Analyst.

Learning Objectives

1. Understand the components of a regular expression
2. Use regular expressions for pattern matching



In this Activity, you will find two **Modules** and one **Reflection** section.

start time:

Model I. Regular Expressions (10 min)

A **regular expression** over symbols in Σ^* is defined as follows:

- \emptyset, λ and $s \in \Sigma$ are all primitive regular expressions.
- If r_1 and r_2 are regular expressions, so are $r_1 + r_2, r_1 \cdot r_2, r_1^*$ and (r_1) .
 - $+$ is the **union** of two regular expressions. $L = \{a, b, c\}$ can be written as $a + b + c$.
 - \cdot is the **concatenation** of regular expressions.
 - $*$ is **star-closure**. Recall that $L^* = L^0 \cup L^1 \cup \dots$
 - So $(a + (b \cdot c))^*$ is the star-closure of $\{a\} \cup \{bc\}$
- You can only have a *finite* application of the rules in bullet 2 above.

Explore the Model Questions

- What are three strings that are represented in regular expressions below?
 - $(a + b)^*(a + bb)$
 - $(aa)^*(bb)^*b$
- Write a regular expression for the language where each word has at least one pair of consecutive zeros.

Critical Thinking Questions

- Write a regular expression for the language where each word has no pair of consecutive zeros.
- Write an NFA that represents the language $(a + bb)^*(ba^* + \lambda)$

STOP

Wait for all teams to complete this model. The spokesperson will be reporting out to the rest of the class.

start time:

Model II. Python Regular Expressions (20 min)

Most programming languages have a regular expressions library, although the syntax is slightly different than what we've learned above. Read about the regular expressions module in **Python**.

<https://docs.python.org/3/library/re.html>

Explore the Model Questions

1. How are each of the operators for combining regular expressions denoted in Python?
 - a. +
 - b. ·
 - c. *
2. Write Python regular expressions that will recognize the following regular expressions. Demonstrate that these regular expressions work on testing data.
 - a. $(a + b)^*(a + bb)$
 - b. $(aa)^*(bb)^*b$
 - c. $(a + bb)^*(ba^* + \lambda)$

Critical Thinking Questions

3. Write a Python program that will recognize properly-formatted phone numbers. For example, it should recognize numbers like (501) 555-1212. Again demonstrate that your regular expression works on testing data.

Looking Back - Group Reflection

Review the job descriptions on your role card. Evaluate privately on how well you performed in your role. Provide the following using the **SII framework**:

S – *Strength* (Also what specifically did you do that would indicate that it was a strength)

I – *Improvement Area*

I – *Insight* concerning either the process or the content of the activity

**Facilitator**

List below how long each Model took your group:

- Model I:
 - Model II:
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Process Analyst

Give feedback to each of your other team members with a **strength** that you observed, either in their role or their process skills.

Quality Control

Summarize the activity for your group members, by answering the following questions.

1. Do you think the set of regular expressions that can be written Python is different than the set of regular languages using the definition from Module 1?
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Spokesperson

Gather up the name cards and any other materials and place them on the back table.