

# Regular Languages and Finite State Machines

Remington Greko, Tyler Gutowski, Spencer Hirsch, Thomas Johnson

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1. Read the Wikipedia article on regular grammars. Summarize the salient points.
2. What is a Deterministic Finite Acceptor (DFA)?

A Deterministic Finite Acceptor is a machine that can process an input string from left to right. A Finite Acceptor is deterministic when there is only one thing that it can do for an input symbol. The DFA will either accept or reject the string. Once a String is accepted once, it will always be accepted.

A DFA can only read left to right, just as traditional in the English language. The DFA can only see one specific element of a string at a time, it cannot go backwards, nor skip ahead. A DFA also has a specific number of internal states, each different based on its current situation, such as when beginning a string.

The example from the book is a great example of a Deterministic Finite Acceptor,

$$M = (Q, \Sigma, \delta, q_0, F)$$

where

$Q$  is a finite set of **internal states**,

$\Sigma$  is a finite set of symbols called the **input alphabet**,

$\delta: Q \times \Sigma \rightarrow Q$  is a total function called the **transition function**,

$q_0 \in Q$  is the **initial state**,

$F \subseteq Q$  is a set of **final states**.

3. What is a Non-Deterministic Finite Acceptor (NFA)?

4. Explain why the languages accepted by DFAs and NFAs are the equivalent.

Indented section

5. Give a recursive definition of *regular expression* over an alphabet  $\Sigma$ .
6. Confirm you know how to use operating system commands to find regular expressions in a file.

<b>Name</b>	<b>Section</b>
Remington Greko	
Tyler Gutowski	
Spencer Hirsch	Question 2 and 4
Thomas Johnson	