CSC236 tutorial exercises, Week #11

(best before Thursday afternoon)

Here are your tutorial sections:

Surname	Time	Room	TA
A–K	Friday 11	SS1088	Zhaowei
L–Tg	Friday 11	SS2105	Hamed
Th–Z	Friday 11	BA2175	Gal
A–L	Friday noon	AB114	Wen
M–Z	Friday noon	BF323	Lauren
A–K	Friday 1	BA1170	Ammar
L–Tg	Friday 1	AB107	Alex
Th–Z	Friday 1	AB114	Shems
A–K	Thursday 8	BA2139	Zach
L–Tg	Thursday 8	BA2185	Ekansh
Th–Z	Thursday 8	BA2195	Danniel

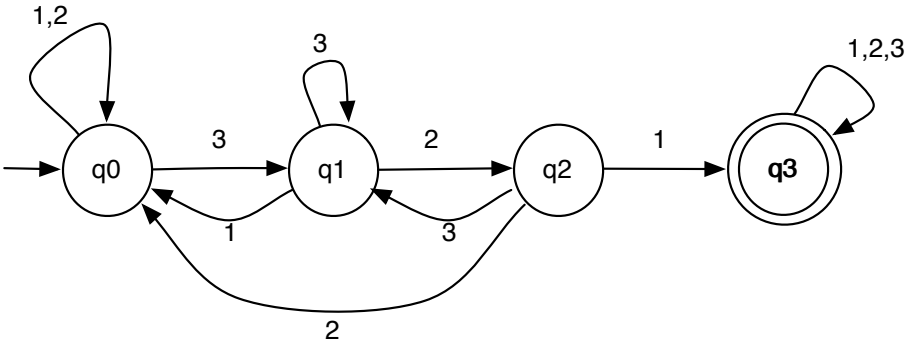
These exercises are meant to give you practice devising DFSAs and manipulating formal languages. They are based on sections 7.1 and 7.3 of the Course Notes.

1. Devise a DFSA over the alphabet $\Sigma = \{1, 2, 3\}$ that accepts the language of finite strings that include 321 as a substring.

   (a) Draw the automaton

   (b) Write down all the parts that define the automaton you've drawn (Alphabet Σ, State space Q, transition function δ, etc)

Solution:



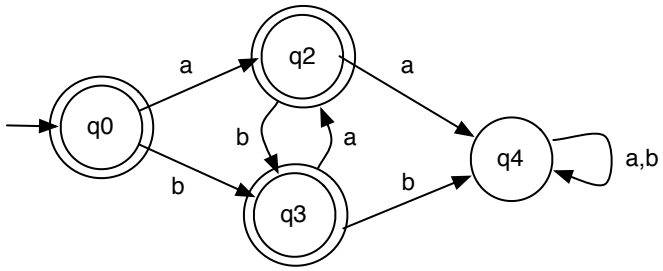
$\Sigma = \{1, 2, 3\}$
$Q = \{q_0, q_1, q_2, q_3\}$
`start state` : q_0
`Final(accept) states` : $F = \{q_3\}$

δ:

	1	2	3
q_0	q_0	q_0	q_1
q_1	q_0	q_2	q_1
q_2	q_3	q_0	q_1
q_3	q_3	q_3	q_3

Let $\Sigma = \{a, b\}$. Consider the language that consists of all strings that contain neither consecutive a's nor consecutive b's. Draw DFSA that accepts this language.

Solution:



Suppose L is the language of finite binary strings consisting of one or more 1 concatenated with one or more 0. Describe with an English sentence each of the following: Rev(L), L^*, and Rev(L)$\circ L^*$.

Solution:

- Rev(L) is a language that consists of all strings that start with one or more 0s and finish with one or more 1s. For example, 01,00111, 00001, etc.
- L^* is a language that consists of an empty string and strings containing any number of repetitions of the strings that start with one or more 1 concatenated with one or more 0. For example, 1010, 11111000, 10101010000, 111001100010 etc
- Rev(L)$\circ L^*$ is a language that consists of all strings that start with one or more 0s, followed by one or more 1s concatenated with any number of repetitions of one or more 1s followed by one or more 0s. For example, 001, 01100, 0110, 0011100110010, etc