

# CSC236 Tutorial Exercises, March 23/24

(Sample Solution)

Here are your tutorial sections:

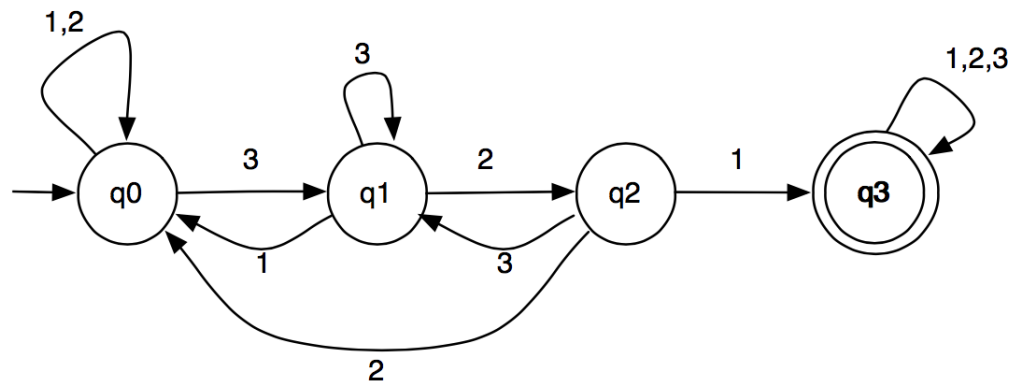
Surname	Time	Room	TA
A-K	Thursday 6-7pm	BA2145	Ethan
L-R	Thursday 6-7pm	BA2155	Zach
S-Z	Thursday 6-7pm	BA2175	Ekansh
A-H	Friday 11am-12pm	UC85	Wen
I-R	Friday 11am-12pm	UC87	Felipe
S-Z	Friday 11am-12pm	UC144	Ryan

These exercises are meant to give you practice devising DFSAs and manipulating formal languages.

- 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

**Sample solution:**



- (b) Write down all the parts that define the automaton you've drawn (Alphabet  $\Sigma$ , State space  $Q$ , transition function  $\delta$ , etc)

**Sample solution:**

$$\Sigma = \{1, 2, 3\}$$

$$Q = \{q_0, q_1, q_2, q_3\}$$

$q_0$  is start state

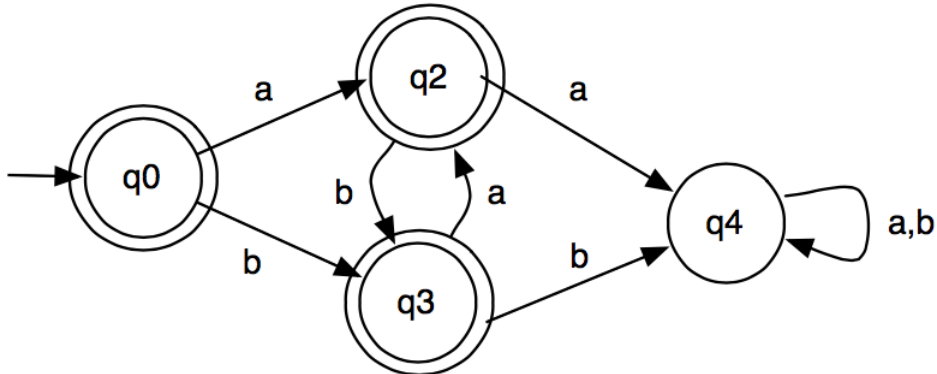
$$F = \{q_3\}$$

$\delta$ :

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

2. 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.

**Sample solution:**



3. 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:  $\text{Rev}(L)$ ,  $L^*$ , and  $\text{Rev}(L) \circ L^*$ .

**Sample solution:**

- $\text{Rev}(L)$  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
- $\text{Rev}(L) \circ L^*$  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