# CSCI 301 - Assignment 6, Fall 2024

Your name here

Modify the .tex source file for this document, adding your answers below each question.
This is an individual assignment. See the syllabus for the collaboration policy.

Any finite automata you draw should be drawn in LaTeX using Tikz. This document contains three example FAs drawn using this library; the first of these, below, has explanatory comments to help you understand the syntax. You can also find a detailed tutorial on drawing FAs with Tikz here: `https://www3.nd.edu/~kogge/courses/cse30151-fa17/Public/other/tikz_tutorial.pdf`. Here is an example DFA drawn with Tikz to get you started. Explanatory comments are included in the source file. Please delete this paragraph and the machine below in your solutions.


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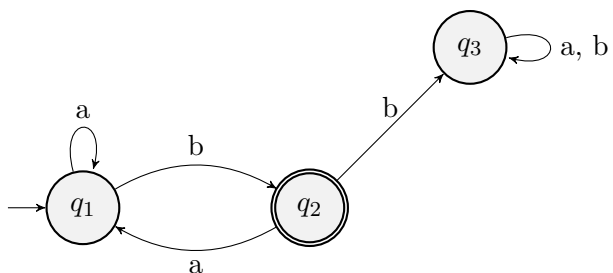
1. (5 points) Using the definition of a regular language, prove that the language

$$L = \{w : w \text{ as a binary number is divisible by 4}\}$$

   is regular.

2. (5 points) Draw a DFA that accepts the set of all strings over $\Sigma = \{0, 1\}$ that contain exactly one doubled digit in them. In other words, either 00 or 11 occurs in the string, but not both, and it only occurs once. For example, 110, 010100, 00, 1010110 would be accepted, while 0000, 101, 110100, and 11101 would be rejected.

3. (10 points) In this problem, you will convert the following NFA to a DFA.
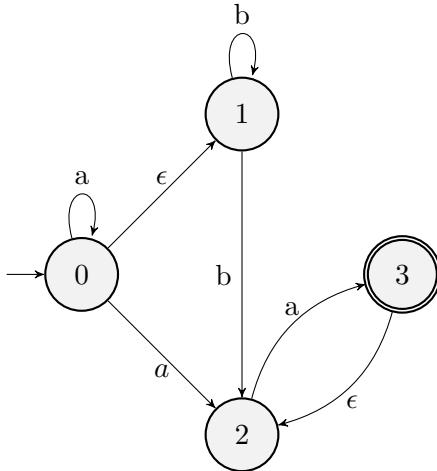
(a) (2 points) Give the ϵ-closure of each state:

State	ϵ-closure
$C_\epsilon(0)$	(your answer for state 0 goes here)
$C_\epsilon(1)$	
$C_\epsilon(2)$	
$C_\epsilon(3)$	

(b) (3 points) Give the transition table for the DFA. Your table only needs to include reachable states. The first state is done for you; add an additional row for every reachable state.

State	a	b
$\{0,1\}$	$\{0,1,2\}$	$\{1,2\}$

(c) (5 points) Draw the resulting DFA, using states named with just the digits (for example, state $\{0,1\}$ would be renamed 01. Here's a sample tikz DFA to get you started; replace this with your machine.