1.3 Build this DFA using JFLAP. Since JFLAP starts with state q0, create states q0 to q5 and delete state q0 to match the table in your book).

a. What does \{u,d\} represent in the definition?

b. The 4\textsuperscript{th} element of the definition is q3. The fifth element is \{q3\}. Why is the 4\textsuperscript{th} element a single item but the 5\textsuperscript{th} element a set?

1.3 \frac{1}{2} Build an NFA for each of the following. \(\Sigma = \{A, B, C\}\)

a) \{w \mid w \text{ has at least one } C \text{ AND (at least two } A\text{ OR at least three } B\text{)} \}

Denote in the document what state of computation each state in the NFA represents. For example, \textit{state q0 represents that an even number of 0s has been processed}.

b) \{w \mid w \text{ has at least two } A\text{ AND at least two } B\text{)} \}
Denote in the document what state of computation each state in the NFA represents.

c) \{xy \mid x \text{ starts with } A\text{ and ends with } B, y \text{ starts with } B\text{ and ends with } B\} 
Denote in the document what state of computation each state in the NFA represents.

1.5
b \{w \mid w \text{ does not contain the character } b\}

c \{w \mid w \text{ does not contain either of the substrings } ab\text{ or } ba\}

h \{w \mid w \text{ is any string except the strings } aa\text{ and } bb\}

1.6
d

k

1.7 d, g, h

1.10 b

1.13

1.14a,b

1.31
1.31 ½

**Doubled**

For a language $A$, let the Doubled of that language be:

$$\{w \mid w = a_1a_1a_1...a_k, \text{ where } a_1..a_k \in A, a_i \in \Sigma \}.$$

Show that the class of regular languages is closed under Doubled.

“Show that $L$ is regular.” means build a machine (either circles and arrows or a formal description).

**Don't forget to test your machines! Pay attention to NFA vs DFA questions.**

Type up your answers in a Google Doc and share that document with the instructor, or type up in a Word document or equivalent and submit a hard copy.

For questions that ask for an NFA or DFA:

- Build the machine in JFLAP. Save the machine as an image. Insert this image into the document you produce, properly labeled.

NOTE: You do not need to email me any JFLAP files.