There are four problems labeled A–D. The first two problems are routine. "Routine" doesn't mean "easy", but it means "doable once you've practiced enough". On an exam, you are expected to complete routine problems like these quickly. If you want more practice, then do more problems from the book on your own or with the prefect.

A. Do Exercise 1.5c from our textbook (which as about `ab` and `ba`). The problem intends for you to show two DFAs: a "warm-up" one and then the actual answer.

B. Do Exercise 1.6j from our textbook (which is about two `0`s and one `1`).

This next problem is similar to the ones above but closer to a real application. It's about checking the validity of an HTML file. You don't need to know HTML. (It might be better if you didn't.) To keep the problem manageable, we use a highly simplified version of HTML, and we ignore all of the text in the file other than the tags. The HTML file is regarded as a string over the 14-symbol alphabet

$$\Sigma = \{\texttt{html}, /\texttt{html}, \texttt{head}, /\texttt{head}, \texttt{title}, /\texttt{title}, \texttt{body}, /\texttt{body}, \texttt{ul}, /\texttt{ul}, \texttt{li}, /\texttt{li}, \texttt{a}, /\texttt{a}\}.$$

We consider the file to be valid if and only if it meets the following criteria. (Later in this course, we will develop a more precise method of stating such criteria.)

- The file must begin with `html` and end with `/html`. These two tags cannot occur anywhere else in the file.

- Immediately after `html` there must be a *header*, which begins with `head` and ends with `/head`. These two tags cannot occur elsewhere.

- The header may contain no tags at all. If it contains any tags, then it must contain a single *title* and nothing else. A title begins with `title`, ends with `/title`, and contains no other tags. These two tags cannot occur elsewhere.

- Immediately after the header there must be a *body*, which begins with `body` and ends with `/body`. These two tags cannot occur elsewhere.

- The body may contain any number (0 or more) of *unordered lists*. An unordered list begins with `ul` and ends with `/ul`.

- An unordered list may contain any number of *list items*. A list item begins with `li` and ends with `/li`.

- Within any list item there can occur any number of *anchors*. An anchor begins with `a` and ends with `/a`, with no intervening tags. Also, within the body but outside any unordered lists, there can occur any number of anchors.

C. Draw a DFA that accepts valid HTML and rejects invalid HTML, as just defined. To keep your drawing clear, please show as few arrows as possible, by using this convention: If a state q has no outgoing transition arrow for a symbol a, then it is understood that the machine rejects its input when it is in state q and sees symbol a.

The last problem is more challenging. If you're rusty on binary arithmetic, then you might want to practice ahead of time. Of course, I can help. :)

D. Do Problem 1.32 from our textbook (which is about adding integers in binary).