Exercise 1.36.

(a) Consider the language L of all strings of a's and b's that do not end with b and do not contain the substring bb. Find a finite language S such that $L = S^*$.

(b) Show that there is no language S such that S^* is the language of all strings of a's and b's that do not contain the substring bb.

Exercise 1.32.

For a finite language L, let $|L|$ denote the number of elements of L. For example, $|\{\Lambda, a, abab b\}| = 3$. This notation has nothing to do with the length $|x|$ of a string x.
The statement $|L_1 L_2| = |L_1||L_2|$ says that the number of strings in the concatenation $L_1 L_2$ is the same as the product of the two numbers $|L_1|$ and $|L_2|$.

Is this always true? If so, give reasons, and if not, find two finite languages $L_1, L_2 \subseteq \{a, b\}^*$ such that $|L_1 L_2| \neq |L_1||L_2|$.

Exercise 1.33.

Let L_1 and L_2 be subsets of $\{a, b\}^*$.

(b) Show that $L_1^* \cup L_2^* \subseteq (L_1 \cup L_2)^*$.

Exercise 1.37.

Let L_1, L_2 and L_3 be languages over some alphabet Σ. In each case below, two languages are given. Say what the relationship is between them. (Are they always equal? If not, is one always a subset of the other?) Give reasons for your answers, including counterexamples if appropriate.

(a) $L_1(L_2 \cap L_3)$ and $L_1L_2 \cap L_1L_3$

(b) $L_1^* \cap L_2^*$ and $(L_1 \cap L_2)^*$

(c) $L_1^*L_2^*$ and $(L_1L_2)^*$

Exercise 2.1. In each part below, draw an FA accepting the indicated language over $\{a, b\}$.

a. The language of all strings containing exactly two a's.

f. The language of all strings in which the number of a's is even.

g. The language of all strings in which both the number of a's and the number of b's is even.

g2. The language of all strings in which either the number of a's or the number of b's is odd (or both).

j. The language of all strings containing both bb and aba as substrings.

k. The language of all strings containing both aba and bab as substrings.

Exercise 2.2.
For each of the FAs pictured in Fig. 2.43, give a simple verbal description of the language it accepts.

a. on the blackboard

d.