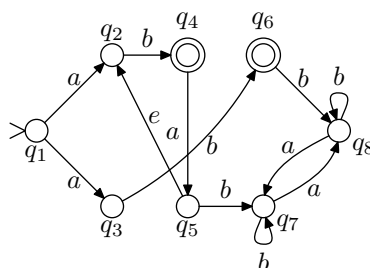**Ordinary exercises:**

1. Find the *smallest* deterministic finite state automaton that accepts the same language as the following nondeterministic one:

2. Consider the following two regular expressions:

$$R_1 = b^*a(a^*b^*)^*$$
$$R_2 = (a \cup b)^*a(a \cup b)^*$$

Do they define the same language? Justify your answer by constructing the corresponding deterministic automata.
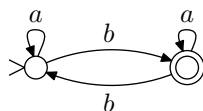
3. Prove that the language

$$L = \{aa^*b^nc^n \mid n \geq 0\}$$

is not regular. Hint: remember that the intersection of two regular languages is always regular.

Demonstraatiotehtävät:

4. Use a systematic algorithm to construct the regular expression that corresponds to the following finite state automaton:

5. Prove that the language $L = \{ww^R \mid w \in \{a, b\}^*\}$ is not regular.

6. Let L be a regular language. Prove that the language $L' = \{xy \mid x \in L \text{ and } y \notin L\}$ is regular.