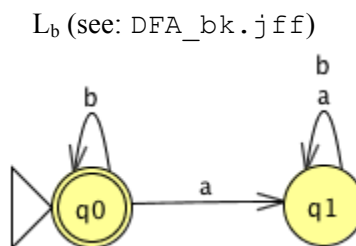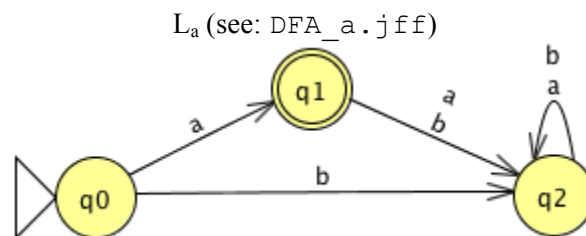# Example: Combine Two Automata
Using JFLAP "Combine Automata" Feature$_{JP}$

Consider the language L over the alphabet { a, b } comprised of all strings that have exactly one a, appearing as the initial symbol of the string, and which may have zero or more b symbols following that initial a.

$$L = \{a, ab, abb, abbb, ...\}$$

This language may be seen as the concatenation of language L_a {a} and language L_b { ε, b, bb, bbb, bbbb, … }. L_a may be represented by regular expression **a** and language L_b by regular expression **b***. They may also be represented by the following DFA.

L_a (see: `DFA_a.jff`)

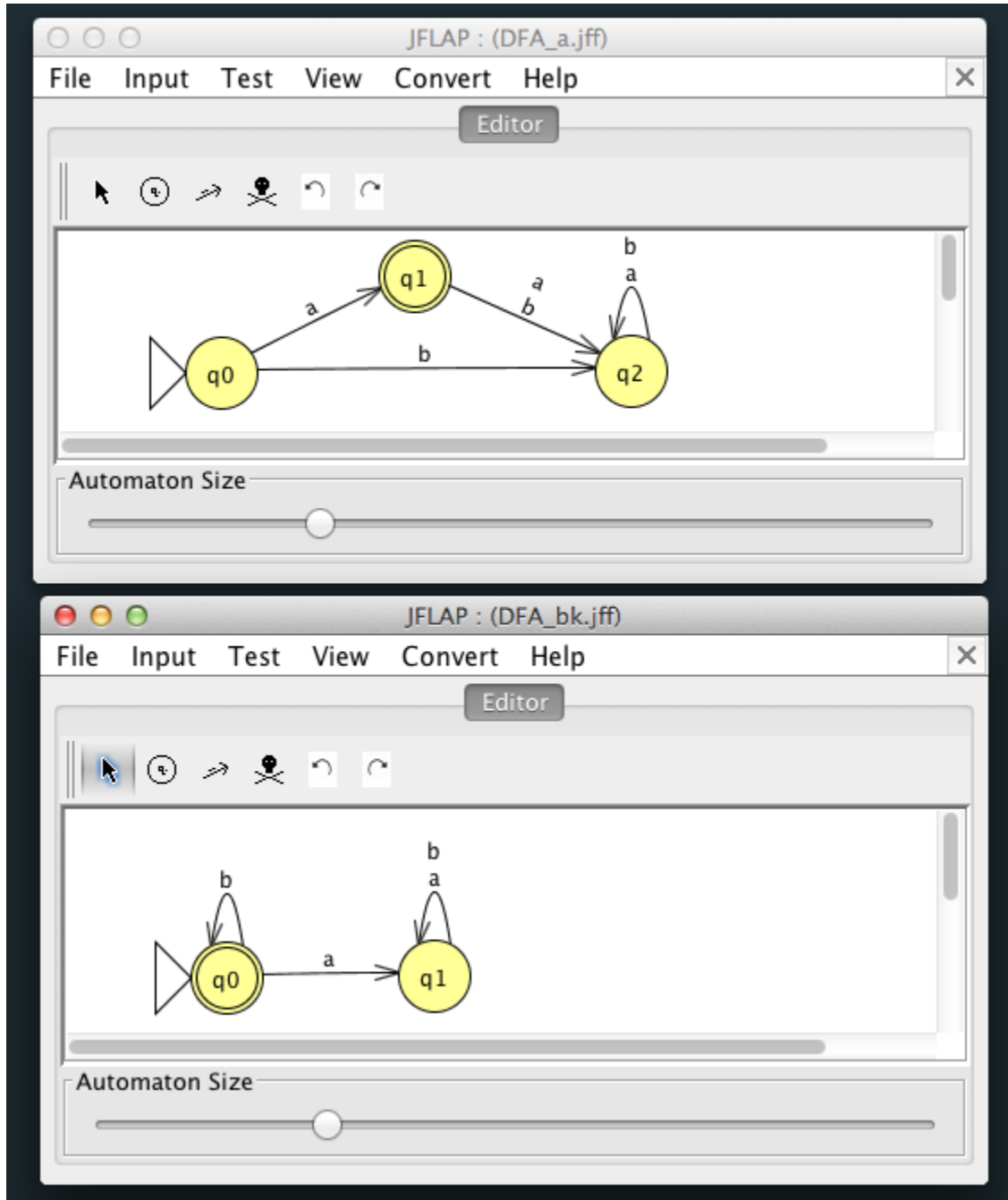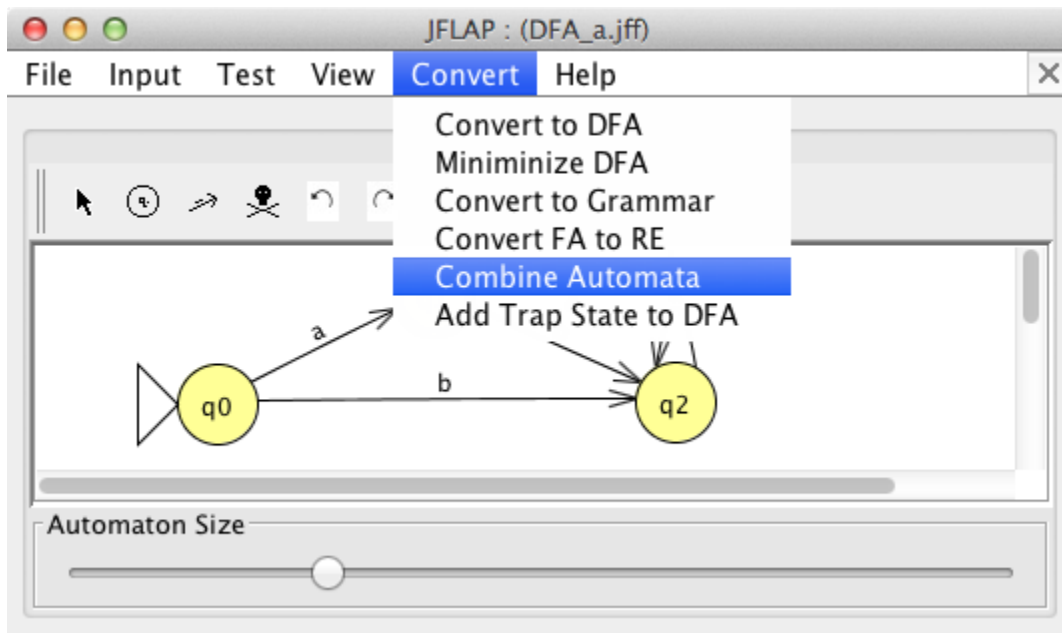
L_b (see: `DFA_bk.jff`)

TASK

Use the JFLAP *Combine Automata* feature to create an NFA that is the concatenation of these two DFA.
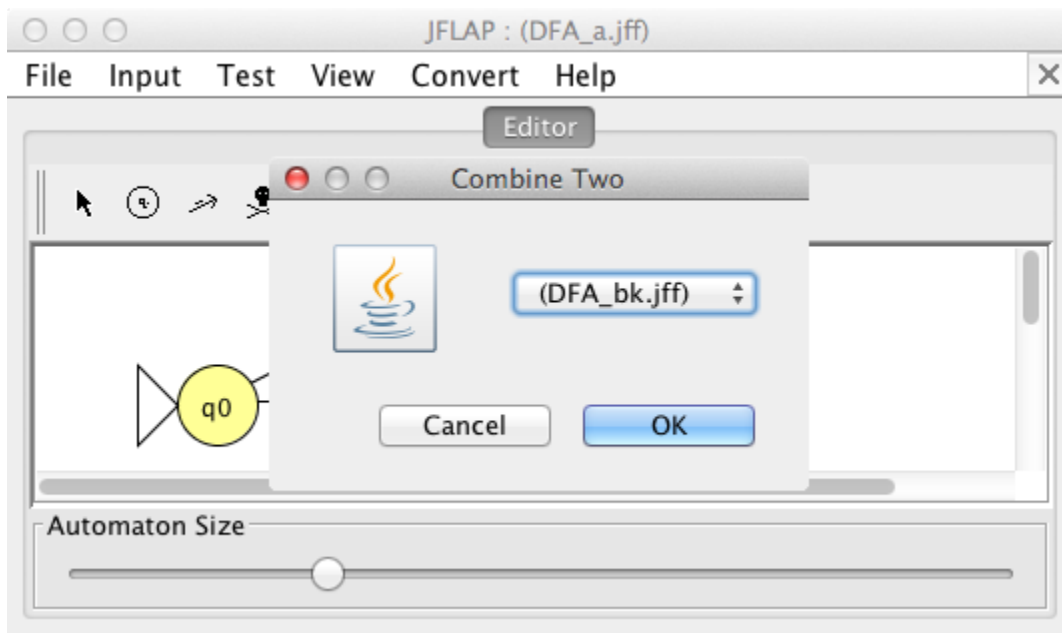
Sample Solution

1. Begin by creating these two DFA (or opening the files if provided).

2. Select the *Convert > Combine Automata* menu item from one of the windows.
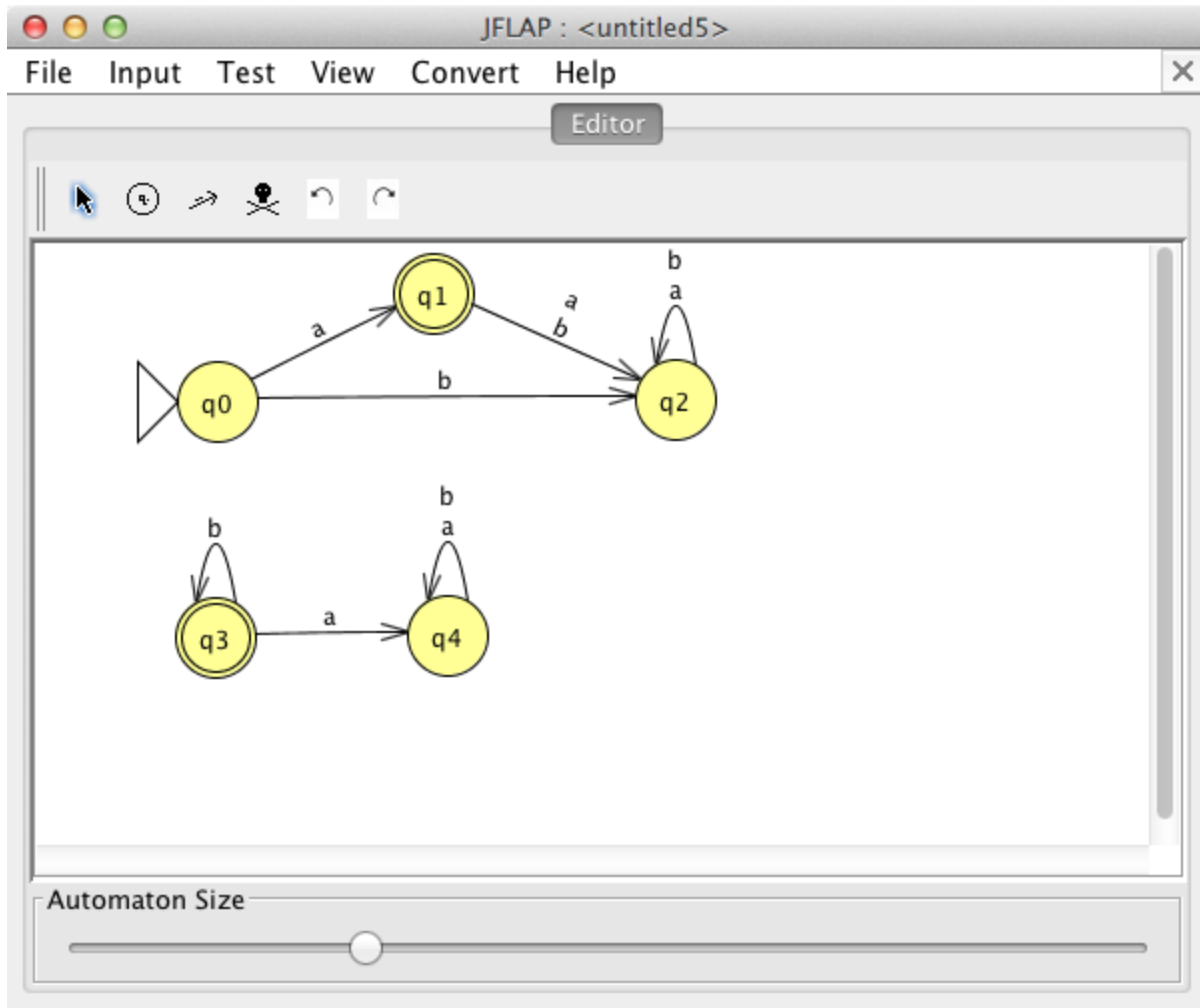

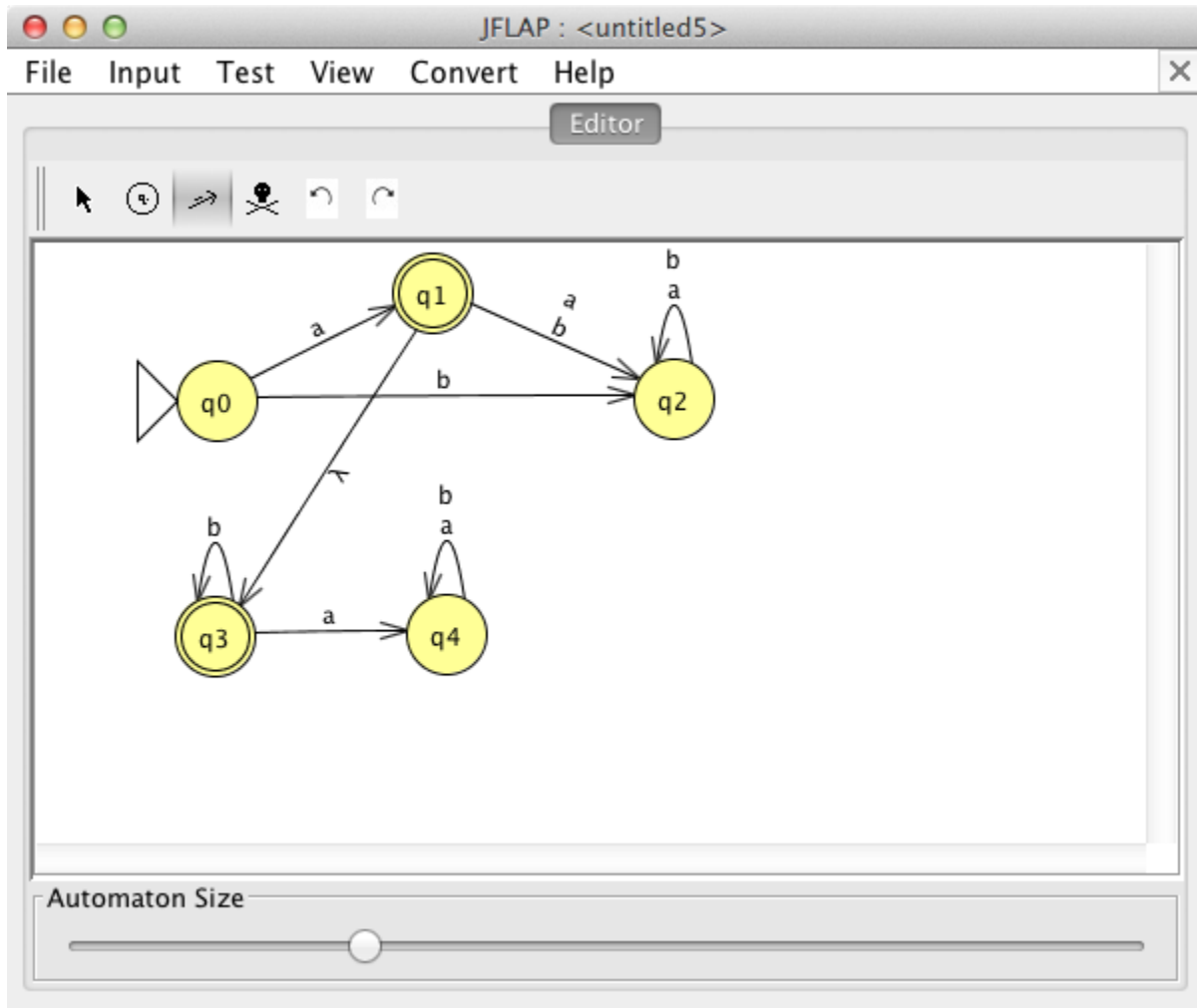This should result in a new dialog being displayed, entitled "Combine Two".

3. Ensure that the other DFA is selected in the drop-down menu (in this case, DFA_bk.jff) and select OK.

The dialog should disappear and a new automaton editor window should be created containing both automata.

Note that the copy of the automaton from whose editor you initiated the "Combine Automata" operation remains unchanged. The copy of the other automaton has lost its initial state designator and the state labels have been changed to make them unique, but is otherwise structurally the same.

4. Represent the concatenation of these two languages by attaching the final state of the first to the (previously) initial state of the second with an ε-transition.

5. Check the resultant NFA using a set of known accepted and rejected strings.

(See: `NFA_abk.jff`)

You may also check the resultant NFA with the regular expression ab* by (i) entering the expression **ab*** using the JFLAP Regular Expression Editor, (ii) using "Convert > RE to FA" with "Step to Completion" and "Export", and (iii) "Text > Compare Equivalence".

References

JFLAP Tutorial, *Combining Automata*
http://www.jflap.org/tutorial/fa/combine/index.html
[Accessed 1 July 2014]