

## Example: Context Free Grammar<sub>JF</sub>

Enter a context-free grammar that generates the following language L over the alphabet  $\Sigma = \{a, b\}$ :

$$L = \{ w \mid w \text{ contains at least two } a \text{ symbols} \}$$

### Sample Solution (see CFG\_xaxax.jff)

Consider that the only constraint is two appearances of the symbol **a** and that any number of symbols may appear before and between them.

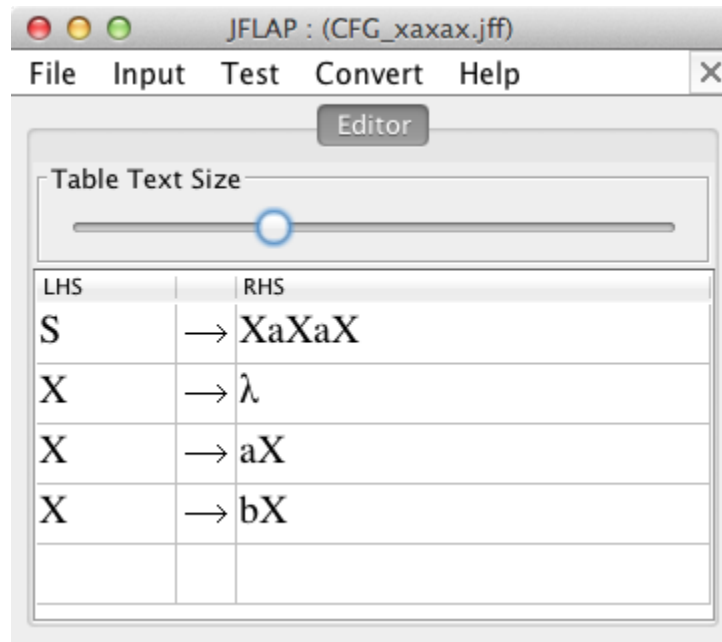
This suggests that the start symbol produce the required number of **a** symbols surrounded and separated by arbitrary strings.

$$S \rightarrow XaXaX$$

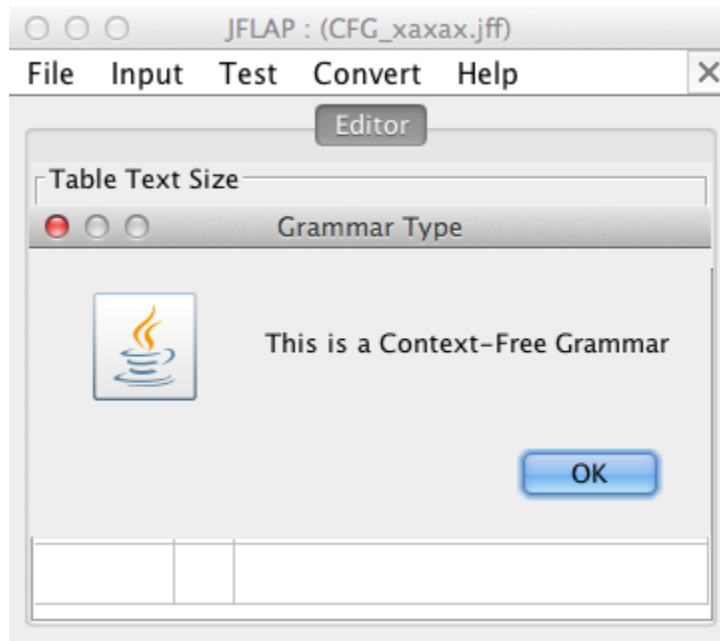
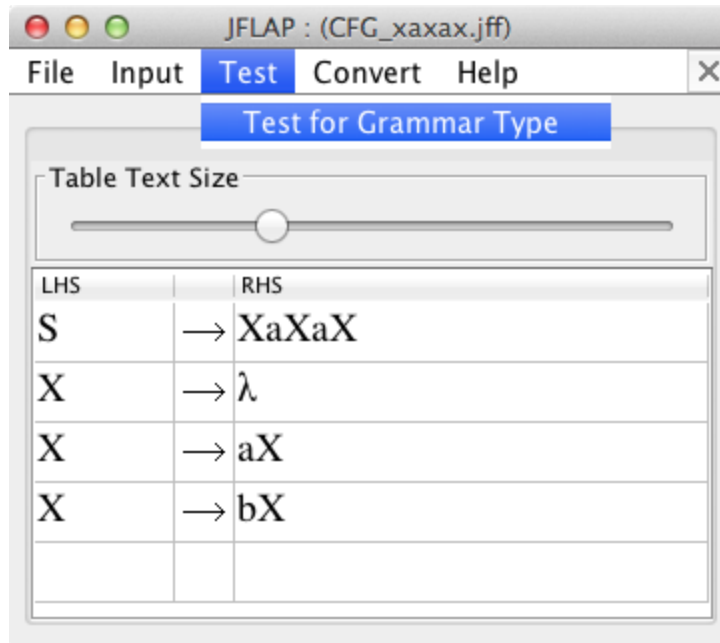
The remaining rules combine to produce all strings over  $\{a, b\}^*$ .

$$X \rightarrow \varepsilon \mid aX \mid bX$$

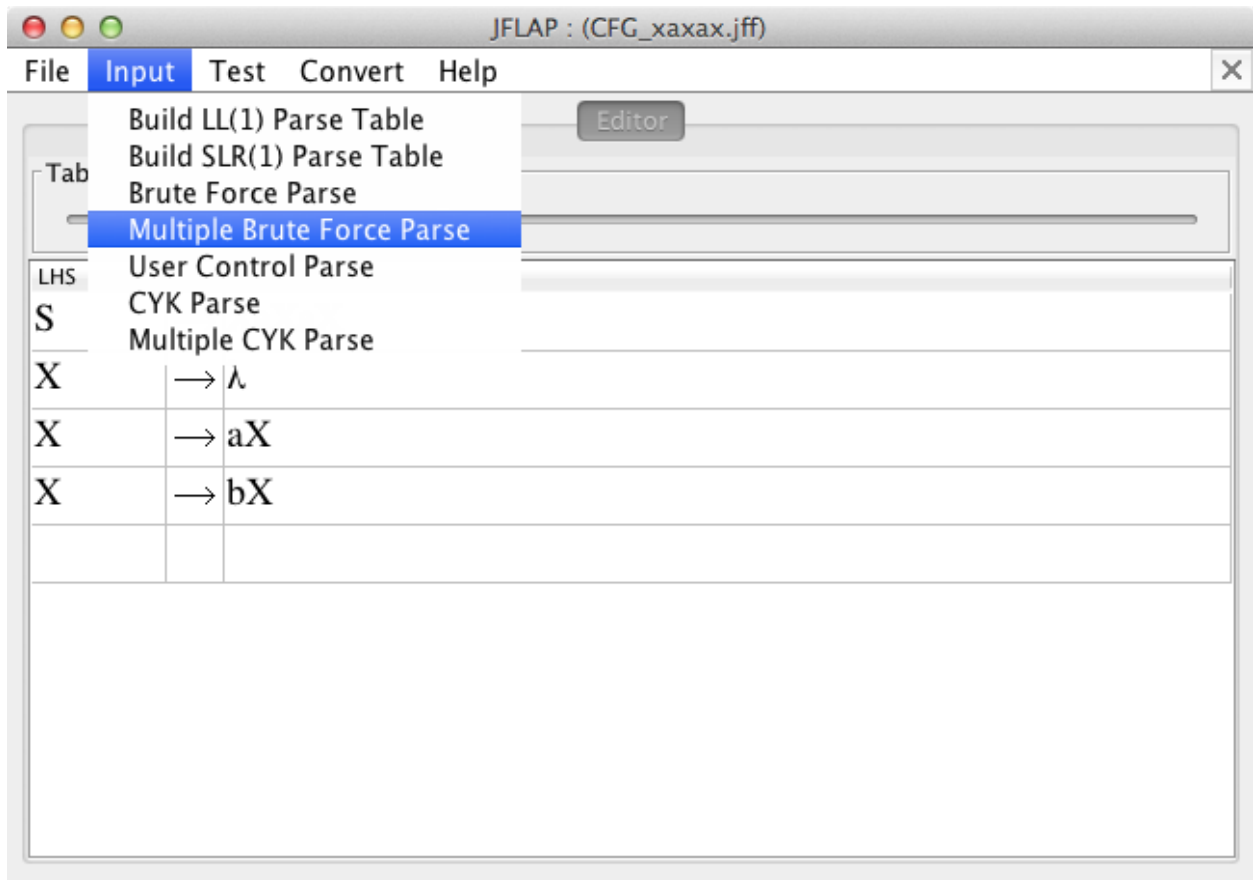
1. Enter this grammar into JFLAP.

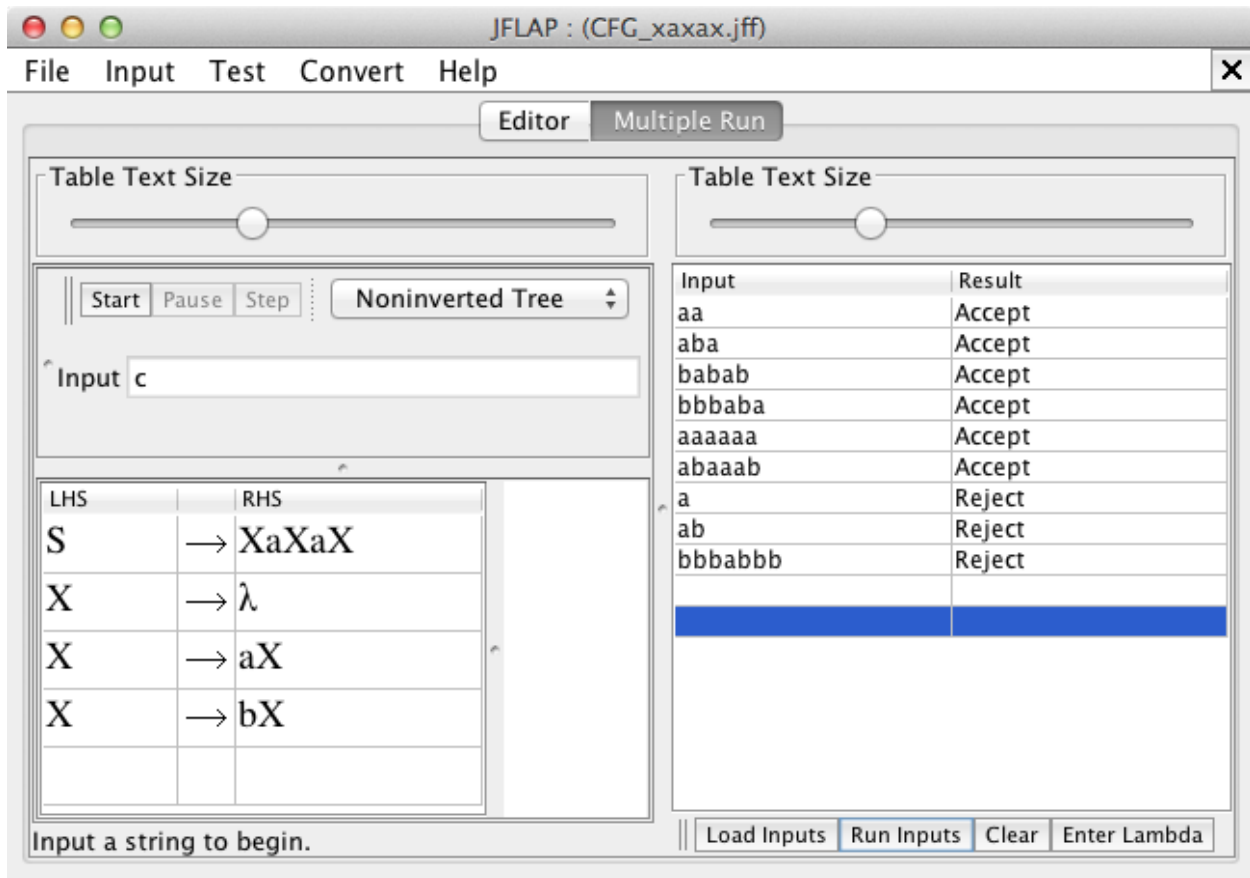


2. Check the type of grammar using *Test > Test for Grammar Type*.



3. Verify known strings using *Input > Multiple Brute Force Parse*.





Now use the Generate Language feature of JFLAP (8 or higher) to produce all strings of length 3.

