Suppose \( L_{01} = \{ w \in \{0, 1\}^* \mid \text{the last two symbols are } 01 \} \).

**Possible NFA**

![NFA Diagram](image)

**DFA Construction**

<table>
<thead>
<tr>
<th>Transition State</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current State</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>{1}</td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td>[3]</td>
<td>[4]</td>
<td>[4]</td>
</tr>
<tr>
<td>[1, 2]</td>
<td>[1, 2, 4]</td>
<td>[1, 3]</td>
</tr>
<tr>
<td>[1, 2, 3, 4]</td>
<td>[1, 2, 4]</td>
<td>[1, 3]</td>
</tr>
<tr>
<td>[1, 3]</td>
<td>[1, 2, 4]</td>
<td>[1, 4]</td>
</tr>
<tr>
<td>[1, 3, 4]</td>
<td>[1, 2, 4]</td>
<td>[1, 4]</td>
</tr>
<tr>
<td>[1, 4]</td>
<td>[1, 2, 4]</td>
<td>[1, 4]</td>
</tr>
<tr>
<td>[2, 3]</td>
<td>[4]</td>
<td>[3, 4]</td>
</tr>
</tbody>
</table>

*Note: X marks the initial state and \( \times \) marks states that are not reachable.*
The class of languages accepted by a DFA (same as NFA) is called regular language.

\[ \{0,1,3\} : \{0,1\}^* \]

Patterns

\[ L_1 = \{ 01, 0101, 010101, \ldots (01)^i \} \]

\[ L_2 = \{ 00, 0000, (00)^i, 00(00)^* \} \]

Syntax of regular expression for \( \in \)

1. \( a \in \Sigma \) is r.e. defining \( \{a\} \)
2. \( \emptyset, \epsilon \) are r.e. defining \( \emptyset, \{\epsilon\} \)
3. If \( r, s \) are r.e. then \( r + s \) is regular expressed by \( RUS \)

where \( R, S \) are sets corresponding to \( r, s \)
4. If \( r, s \) are r.e., then \( r \cdot s \) is r.e.,

\[
\text{denoted } R \cdot S
\]

\[
\text{Kleene star } ^{\ast}
\]

5. If \( r \) is regular, then \( r^* \) is regular

\[
\text{denoted } R^*
\]

Comment: If \( r \) is r.e., putting parentheses

to also allow \((r)\)

\[
\underline{\text{Examples:}}
\]

\[
L_1 = (01)^*
\]

\[
(0+1)^* : \text{all possible strings over } 0, 1
\]

\[
\text{including } \varepsilon
\]

\[
(0+1)^* \text{ 1 (00 + 01 + 10 + 11)} \text{ 3rd symbol for right in 1}
\]

\[
* \text{ or not r.e.}
\]

The class of

languages that can be represented

using regular expressions are equivalent
to regular languages (which can be accepted
by DFA)