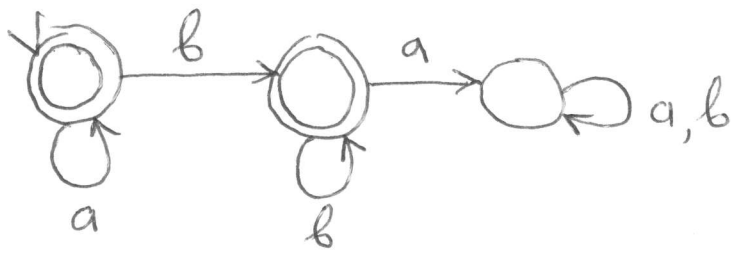
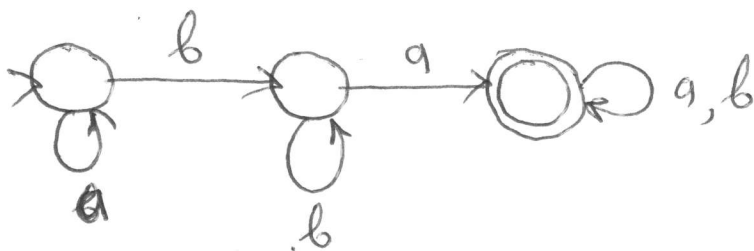


Problem class 1, 2019

- 1) Language of words $a^n b^m$ $n=0,1,\dots$
 $m=0,1,\dots$



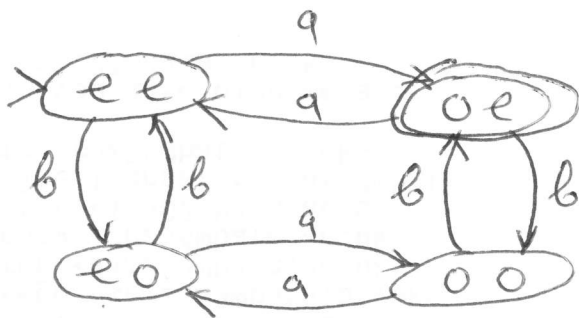
Complement language, i.e. language of words in $\{a,b\}^*$ that are not of the form $a^n b^m$:



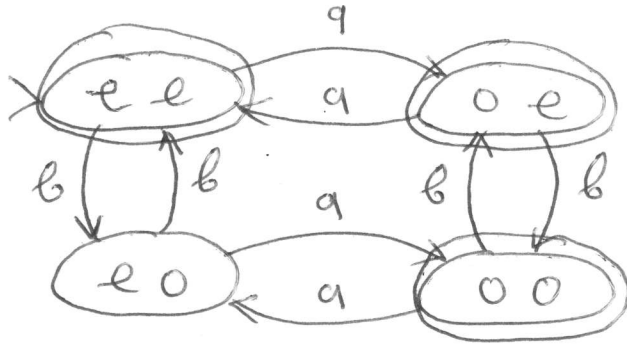
works only for DFA.

- 2) $\{w \in \{a,b\}^* \mid w \text{ has odd number of } a\text{'s} \text{ and even number of } b\text{'s}\}$

As input is scanned, the parity of letters a or of letters b seen so far is switching:

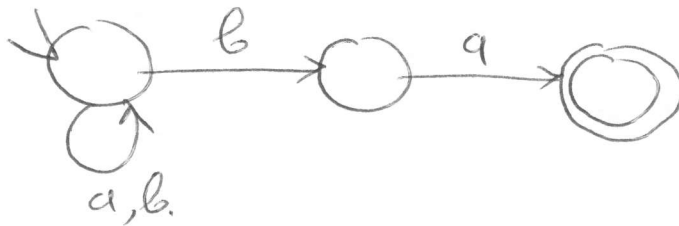


What about $\{w \mid w \text{ has odd number of } a\text{'s} \text{ or even number of } b\text{'s}\}$



3) $\{w \in \{a, b\}^* \mid w \text{ ends with } ba, \text{ i.e. } w = xba \text{ for some } x \in \{a, b\}^*\}$

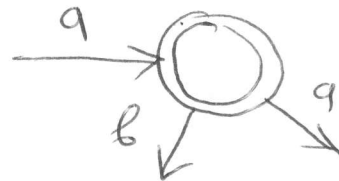
NFA easy:



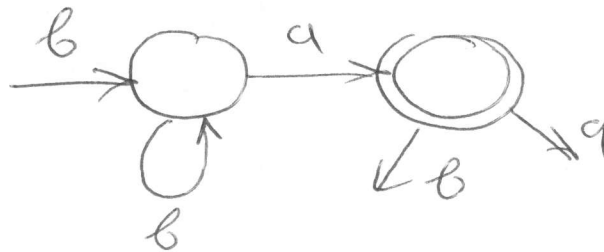
later we will have conversion algorithm.

FA:

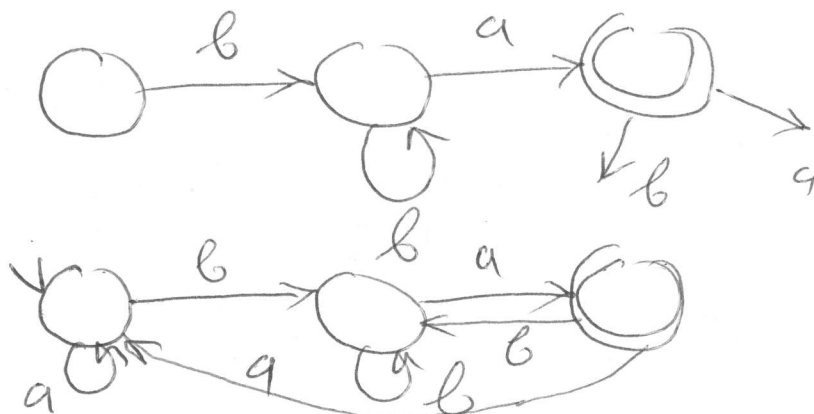
start with



then

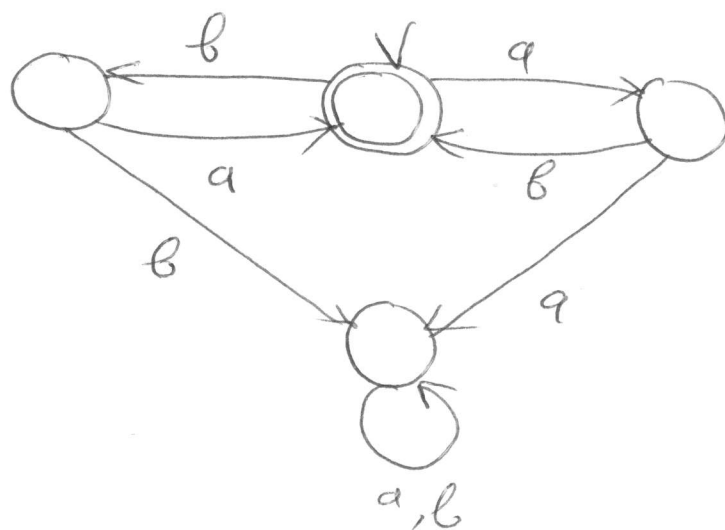


then



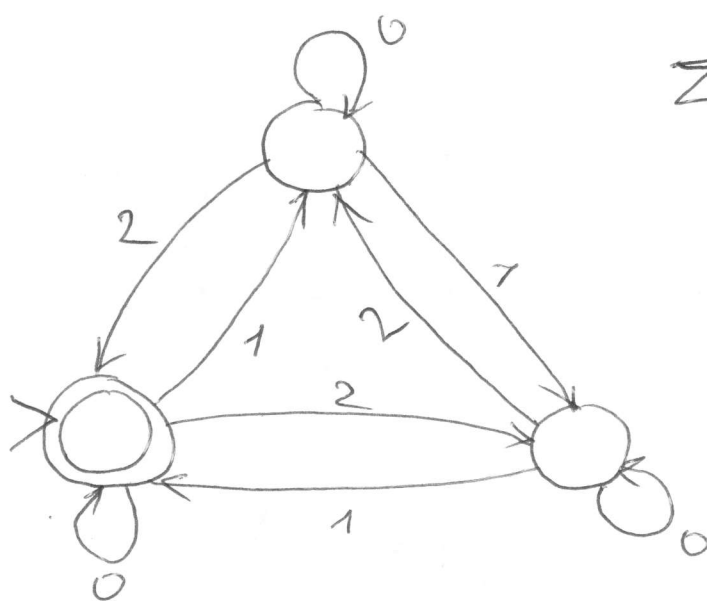
Opposite problem: having FA diagram describe language (later will have algorithm).

1)



Language: concatenation of ab and ba in any order: $\{w \in \{a, b\}^* \mid w = w_1 \dots w_n \text{ for some } n, \text{ such that } w_i \in \{ab, ba\}\}$.

2)



$\Sigma = \{0, 1, 2\}$

Language: exactly all words in Σ^* such that the sum of numbers in each word is divisible by 3.