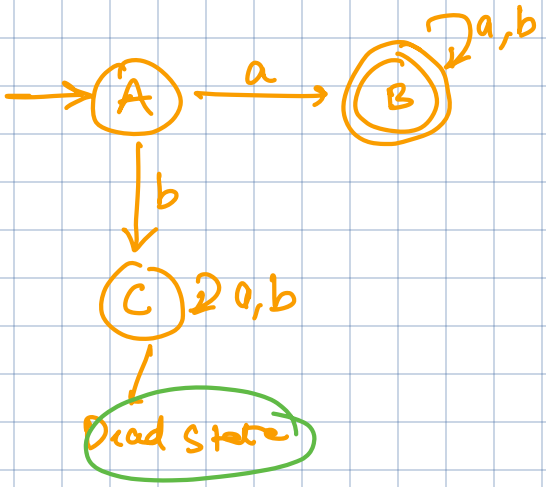
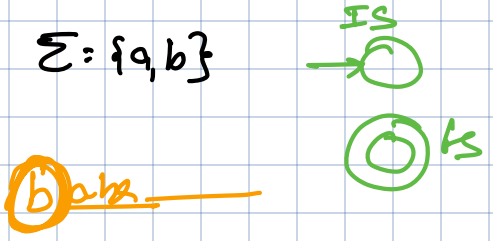
DFA (Deterministic Finite Automata)

↳ FA which contains $Q, \Sigma, \delta, q_0, f$ → final state

- Q → finite set of all states
- Σ → input alphabet
- δ → transition fns
- q_0 → initial state

Q: DFA which accepts strings 'a' start $\Sigma = \{a, b\}$





$Q = \{A, B, C\}$

$\Sigma = \{a, b\}$

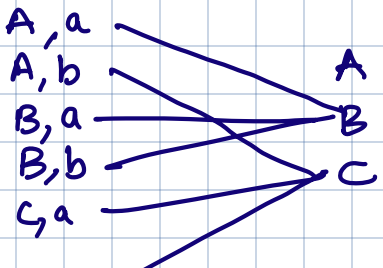
$q_0 = \{A\}$ → only one initial state

$F = \{B\}$

$F \subseteq Q$

$\delta: \quad Q \times \Sigma \rightarrow Q$

$\{ABC\} \times \{a\ b\}$



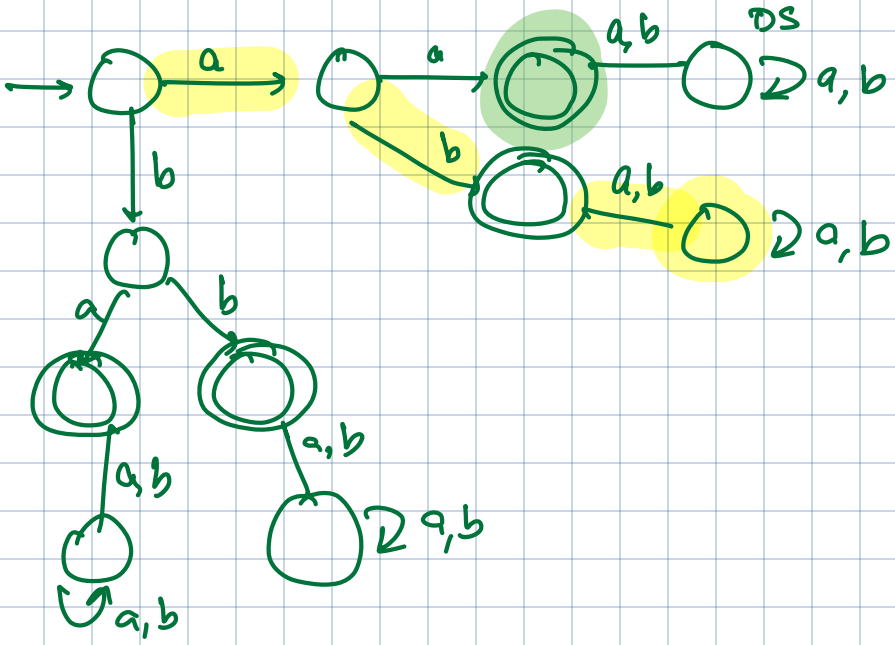
DFA: for every $Q \times \Sigma$ there will be exactly one transition.

c, b

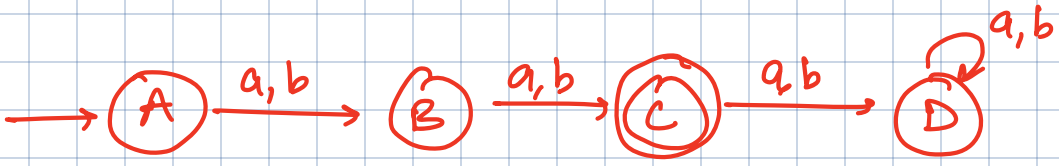
Type 1

Q: DFA which accepts set of all strings over {a,b} of length 2.

aa
ab
ba
bb



aba → not present in language (terminate on final state)



DFA should accept all strings which are in languages shouldnot accept the strings which are not in language.

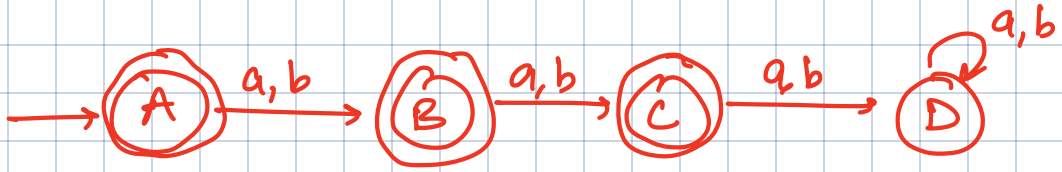
final state: accept
non final state: reject

ab

A $\xrightarrow{a}$ B $\xrightarrow{b}$ C

Q: DFA accepts set of all strings over {a,b} where length is atmost 2.

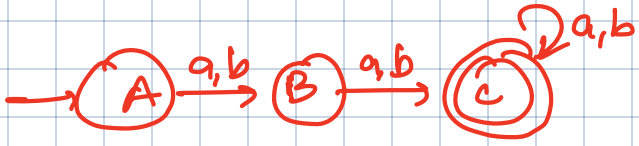
$L = \{\varepsilon, a, b, aa, ab, ba, bb\}$



ϵ accept:

initial state
final state

Q: length at least 2.



Length: exactly n length: min n+2 states

atleast n length: min n+1 states

atmost n length: min n+2 states

Type 2

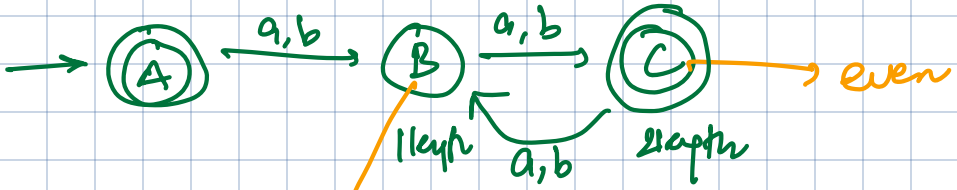
Q: DFA that accepts set of all strings over {a,b} such that length of string mod 2 = 0

↳ Even length

{0, 2, 4, 6 ....}

{ε, aa, ab, ba, bb, aaaa, aaab - - - }

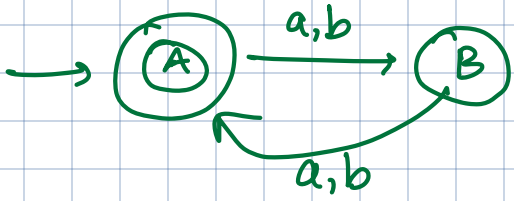
aba



aabb

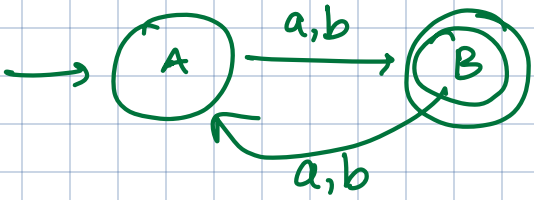
3 kyun 4 kyun aba

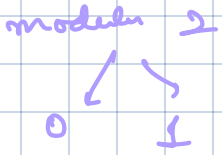
odd



A final : even

Q: String length mod 2 = 1

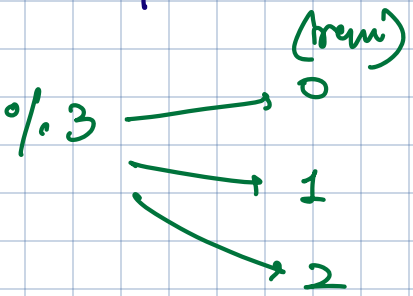




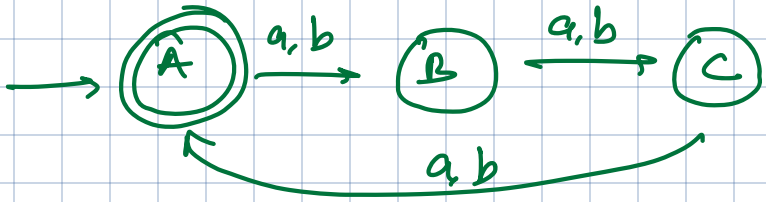
Q: String length mod 3 = 0

OR

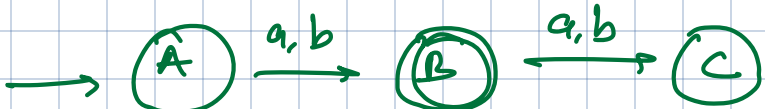
String length is divisible by 3.

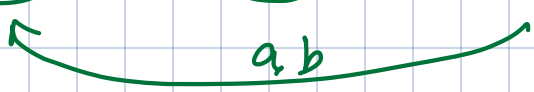


$|w| \bmod 3 = 0$



Q: $|w| \bmod 3 = 1$





$|w| \bmod n = 0$

minimal states: n states

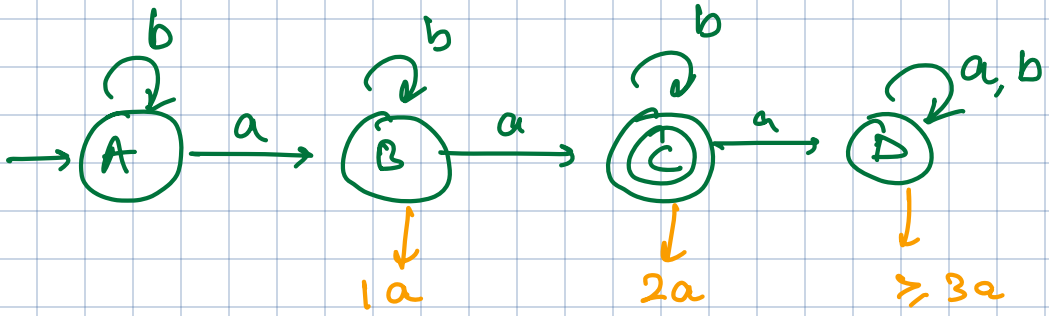
DFA

Type 3

Q:

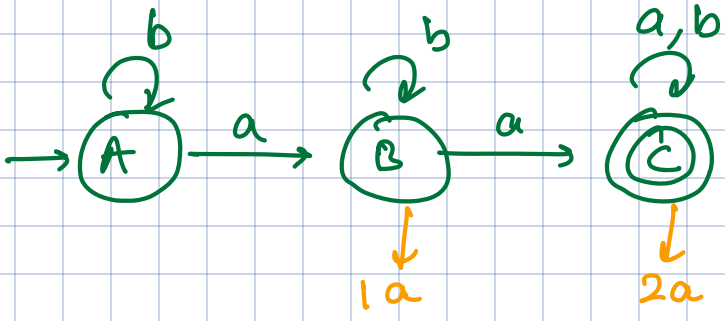
$n_a(w) = 2$ $\quad$ $w = \{a, b\}$

Strings in which no of a's are 2.



baab

Q: $n_a(w) \geq 2$



Q: $n_a(w) \leq 2$