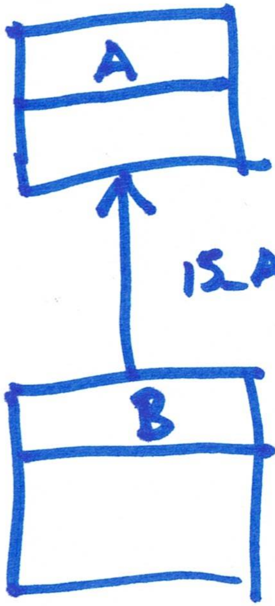
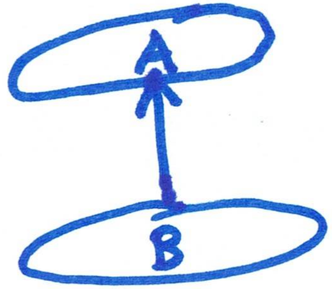
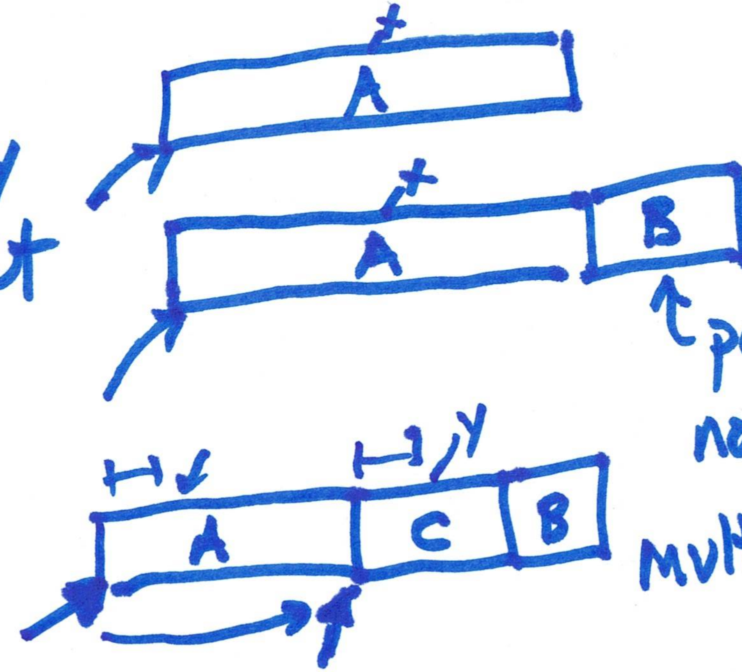


UML
class
diagram



promotion
digraph

memory
layout



parts of B
not in A.

multiple inheritance.

DETERMINISTIC FINITE AUTOMATON (DFA)

$(Q, \Sigma, \delta, q_0, F)$

Q : is a set of states

Σ : finite alphabet

δ : transition function $Q \times \Sigma \to Q$

q_0 : $\in Q$ (start state)

F : $\subseteq Q$ (final states)

 : start state

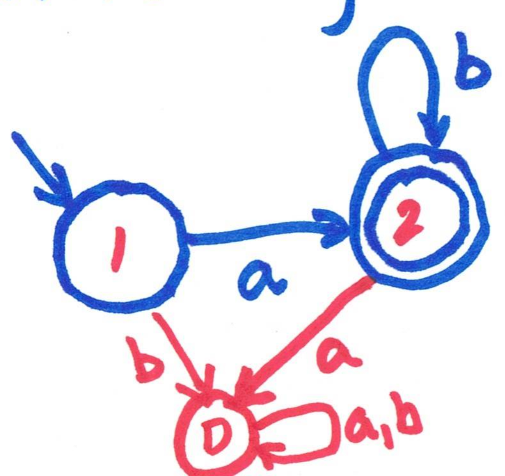
 : state  : $\in F$

Σ is chars. on edges

e.g. $\{a, b\}$

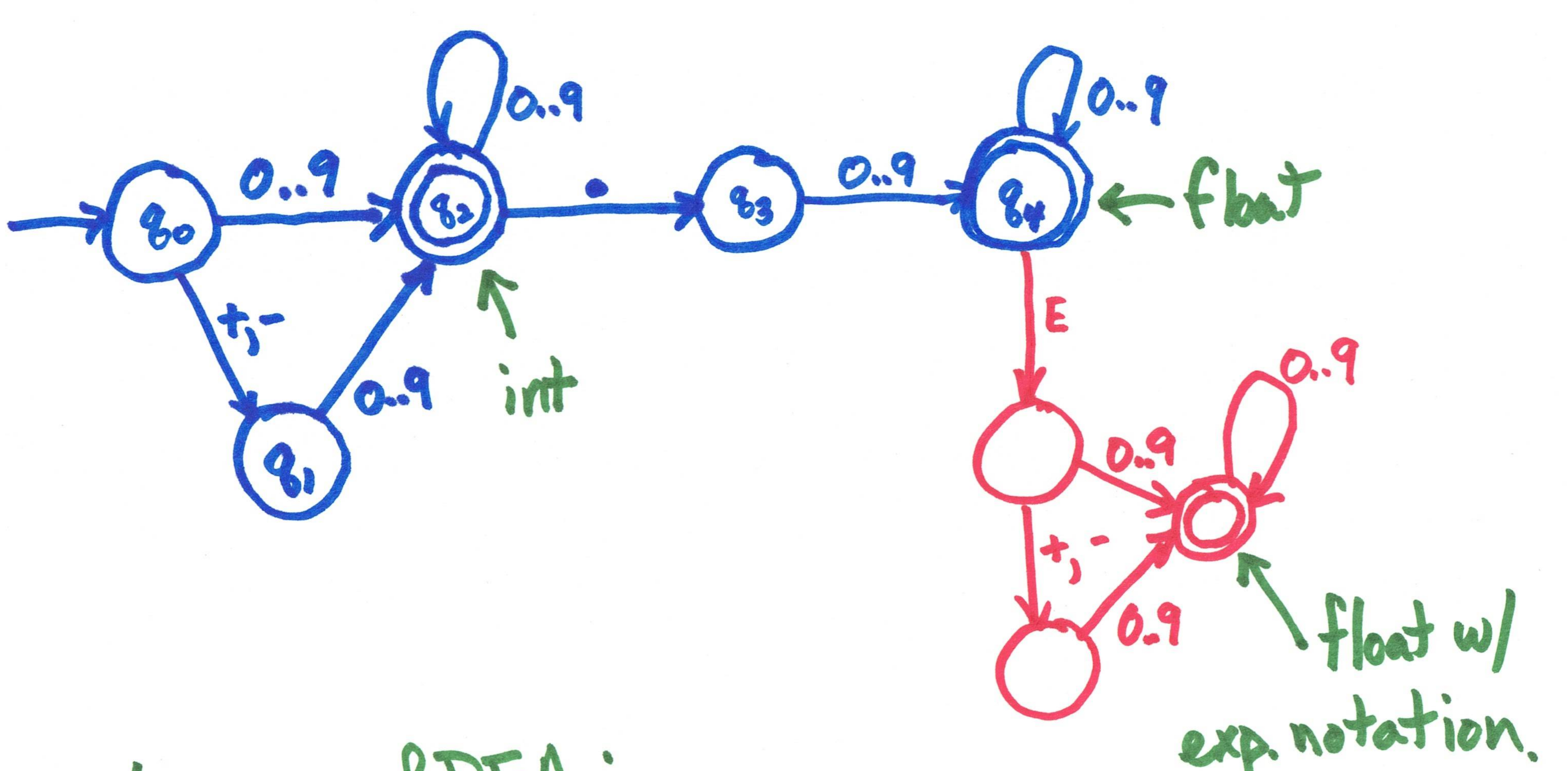
transition diagram:

ab^*



$1 \xrightarrow{a} 2$ $\delta(1, a) = 2$

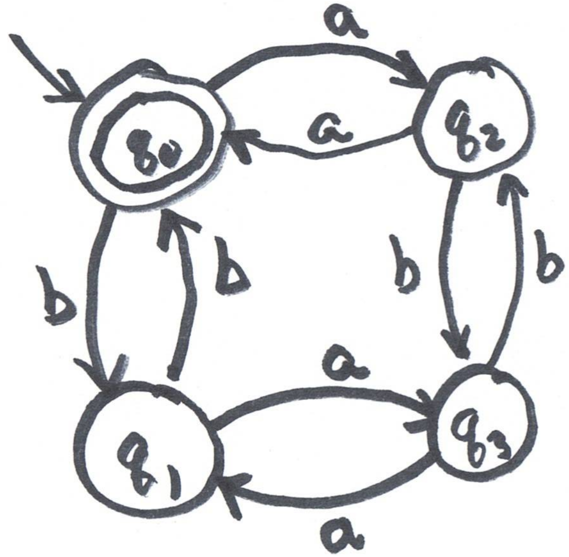
D : Dead state



language of DFA :
set of all strings on Σ
that the DFA accepts.

$(+|-)^? [0..9]^+ (. [0..9]^+ (E (+|-)^? [0..9]^+)^?)^?$

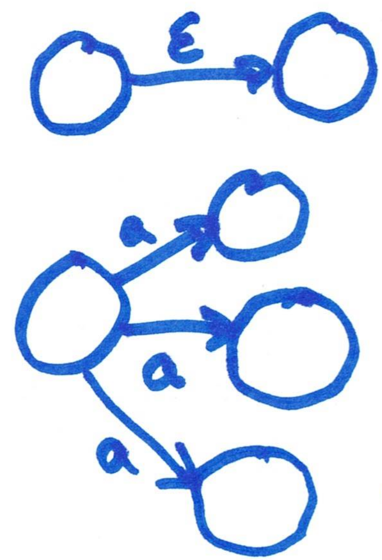
Exercise: what does this DFA recognize?



NONDETERMINISTIC FINITE AUTOMATON (NFA)

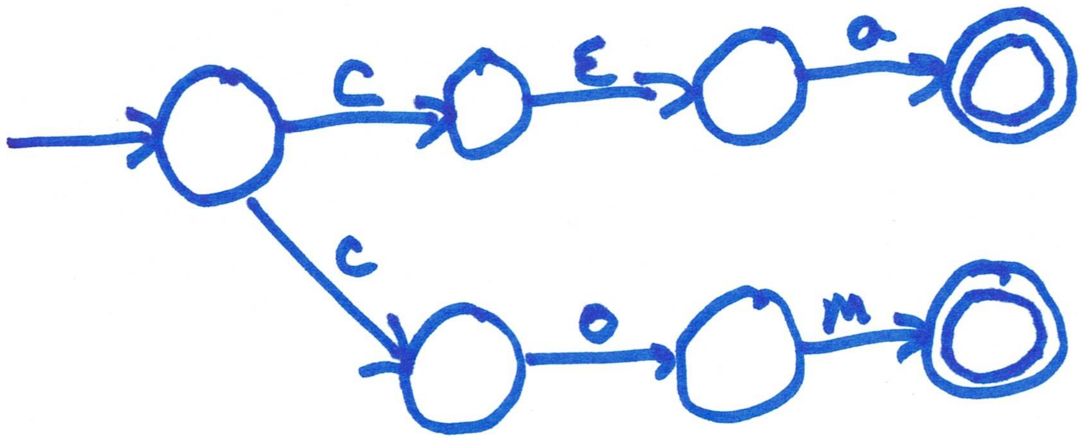
$(Q, \Sigma, \delta, q_0, F)$

$\delta: Q \times (\Sigma \cup \{\varepsilon\}) \to 2^Q$



allowed

NFA <u>ACCEPTS</u> A STRING IF $\exists$ A PATH FROM q_0 to a final state labelled with the string (including epsilons)



"ca"

"com"

$L(M) = \{ca, com\}$

language

machine

$(ca|com)$

NFA M $\longrightarrow$ DFA M′

$L(M) = L(M')$ they accept the same strings.

<u>SUBSET CONSTRUCTION</u>

$M'.\Sigma = M.\Sigma$

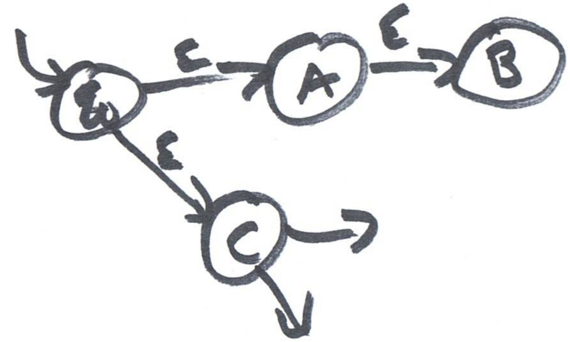
$M'.Q \subseteq 2^{M.Q}$ (each state of M' corresponds to a subset of states of M)

$M'.q_0 = \varepsilon\text{-closure}(M.q_0)$

$M'.F = \{q \in M'.Q \mid q \text{ contains a final state of } M\}$

δ is the tricky part.

M



M′

$M'.\delta(d,a)$ $\qquad\qquad d \in Q$

$\hookrightarrow N \subseteq M.Q$

$$M'.\delta(d,a) = \varepsilon\text{-closure}\left(\bigcup_{n \in N} \delta(n,a)\right)$$