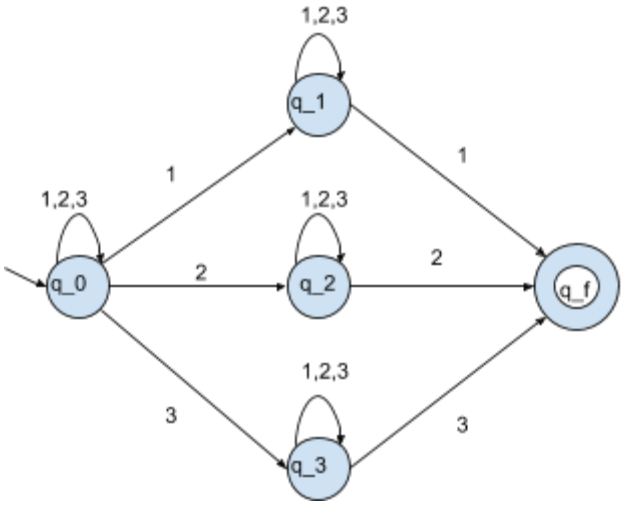
Finite Automata

1. Given the FA: $M = (Q, \Sigma, \delta, q_0, F)$, $Q = \{q_0, q_1, q_2, q_3, q_f\}$, $\Sigma = \{1, 2, 3\}$, $F = \{q_f\}$,

δ	1	2	3
q_0	$\{q_0, q_1\}$	$\{q_0, q_2\}$	$\{q_0, q_3\}$
q_1	$\{q_1, q_f\}$	$\{q_1\}$	$\{q_1\}$
q_2	$\{q_2\}$	$\{q_2, q_f\}$	$\{q_2\}$
q_3	$\{q_3\}$	$\{q_3\}$	$\{q_3, q_f\}$
q_f	$\oslash$	$\oslash$	$\oslash$

Prove that $w = 12321 \in L(M)$

Sol.:
(chat for graph repres.)



//Nenisca Maria

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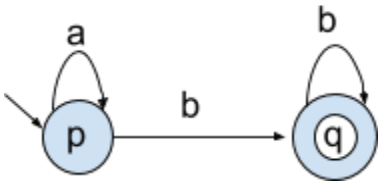
(q_0, 12321) |- (q_1, 2321) |- (q_1, 1) |- (q_f, epsilon) => $w = 12321 \in L(M)$

2. Find the language accepted by the FA below.



// Moldovan Vasilica

L = { $a^n b^m \mid n \in N,\ m \in N^*$ }

? L = L(M)

1. ? L $\subseteq L(M)$ <=> $\forall\ n \in N,\ m \in N^*,\ a^n b^m \in L(M)$

   Let $n \in N,\ m \in N^*$ be fixed.

   $$(p,\ a^n b^m) \overset{n}{\vdash} (p,\ b^m) \overset{m-1}{\vdash} (q,\ b^{m-1}) \vdash (q,\ \varepsilon)$$

   (i) (ii)

   (i) $(p,\ a^n) \overset{n}{\vdash} (p,\ \varepsilon),\ \forall n \in N$

   (ii) $(q,\ b^k) \overset{k}{\vdash} (q,\ \varepsilon),\ \forall\ k \in N$

   1.1 For n = 0: $(p,\ \varepsilon) \overset{0}{\vdash} (p,\ \varepsilon)$ - True

   1.2 P(k) -> P(k + 1)

   P(k): $(p,\ a^k) \overset{k}{\vdash} (p,\ \varepsilon)$ - (induction hypothesis) True

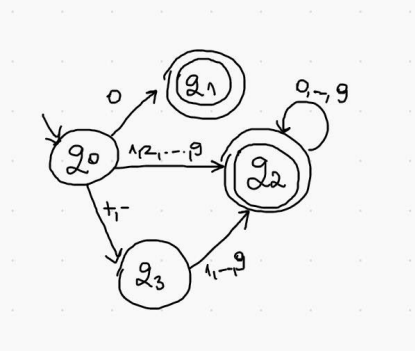
   $(p,\ a^{k+1}) \vdash (p,\ a^k) \overset{k}{\vdash} (p,\ \varepsilon)$ => P(k + 1) is True

   Ind. hyp.

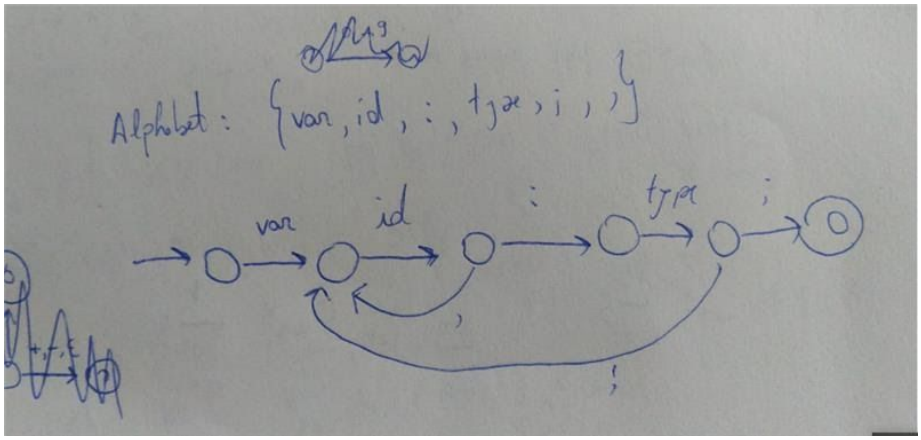
   From 1.1 and 1.2 => (i)

3. Build FAs that accept the following languages

a. Integer numbers



b. Variable declarations (Pascal, C, ...)



c. $L = \{0^n 1^m 0^q \mid n, m \in N^*,\ q \in N\}$

d. $L = \{0(01)^n \mid n \in N\}$

#todo: insert solutions