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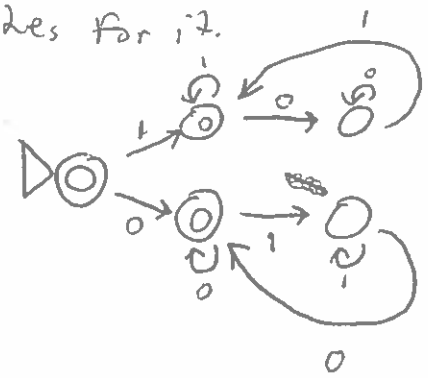
9/28/15

F.C.S

I completed this assignment without assistance

1. a) This isn't regular. Imagine you have a finite string of 2^n a's. And, a finite automaton with $P < 2^n$ states used to recognize it. There must be a substring of length P or less that is part of the loop. By the pumping lemma, we can traverse the loop twice, & still have a string in a regular language. That won't work here, because we know $2^n < 2^n + P < 2^{n+1}$. Therefore, the language with the 2^n rule won't be regular.

b) This is a regular language. The following FSA codes for it.



c) This is not regular. Take an FSA with P states. Make some string of length P that is not a palendrome. Reverse it, & combine the two to get a word. By the pumping lemma, some substring in the 1st P characters can be repeated, if the language is regular. However, doing so should result in a string not in the language.

(Note: in the Pumping game, my suitable string was 101001000... until the pattern was length P, & reversed. That worked many times)

2. Pumping Game:

#5: $L = \{ a^n b^R a^{n+R} \mid R, n \in N \}$, $P = 4$

- I chose $a^5 b^4 a^9$
- substring from the computer: 1st 3 a's
- I made it into $a^8 b^4 a^9$, which isn't in the language.

#15: $L = \{ a^n b^{n^2} \mid n \in N \}$, $P = 15$

- I chose $a^{15} b^{225}$, computer chose 1st 2 characters as a substring
- I create $a^{17} b^{225}$, which wasn't in the language

3. See provided JFLAP file, for #5 shown above.
I chose to believe that the natural #s start at 1.