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Project 5

CS 520

∑ = {a,b}

L₁ = {w Є ∑\*: #a(w) = #b(*w*)}—w has the same number of as and bs.

L₂ = {w Є ∑\*: #ab(*w*) = #ba*(w*)} — w has the same number of occurrences of  ab and ba substrings.

1.

Create a state diagram for the FSM that recognizes L₁, or prove that no such FSM is possible by using the Pumping Theorem and/or the regular language closure properties.

If  is regular then that means that an intersection with another regular language will also be a regular language.

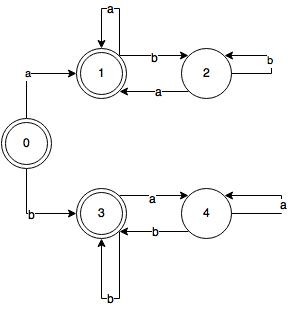
All regular languages when intersected with another regular language are also regular languages. So we have

We can now use the pumping lemma:

2.

     Create a state diagram for the FSM that recognizes L₂, or prove that no such FSM is possible by using the Pumping Theorem and/or the regular language closure properties.

It is possible to create a FSM of the second language. There are two possibilities of strings, ones that start with a’s and ones that start with b’s. The strings that start with a’s have to end with an a and have alternating b’s inside however the amount of b’s does not matter as long as they are followed by an a. The strings that start with b’s do the exact opposite, they must end with a b and have alternating a’s inside or any amount of a’s as long as it is eventually followed by a b.

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3.

        L = {(abc)ⁿaⁿ: n ≥ 0}.  Prove that L is not regular.  It's easier if you apply a closure property before using the Pumping Theorem.

        We first must assume that if this language is regular, then the reversal of the same language is also regular. The reverse language is L = {aⁿ(abc)ⁿ: n ≥ 0}.  Now we can apply the pumping theorem.