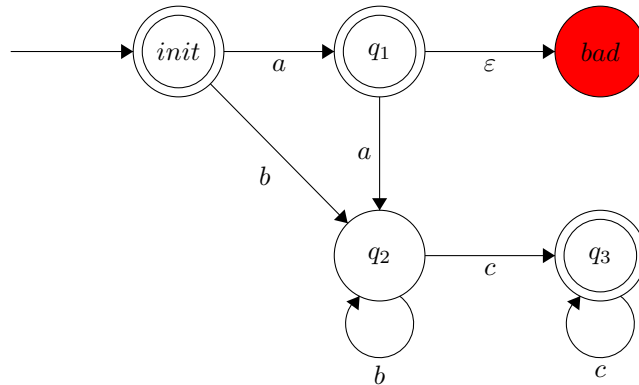


PS04-01

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- a. When $i \neq 1$, the number of bs and cs is not important. However, if $i = 1$, then the DFA must output $a^n b^n$, which is not possible, as illustrated by the DFA below. The state *bad* is where the machine must, but cannot calculate $a^n b^n$.



- b. Given $w \in F$ and $w = xyz$, if $|xy| = 1$, the $x = \varepsilon$ and $y = a$. If you were to pump y any number of times, then the $w = xy^t z \in F$.
- c. The Pumping Lemma is a requirement for a language to be regular but not a guarantee. Let P be a predicate meaning that language A passes the pumping lemma. We know that $\neg P \Rightarrow \neg \text{regular}(A)$, but the equation is not biconditional, as proven by parts *a* and *b* above. $P \not\Rightarrow \text{regular}(A)$.