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Problem Set 4

"I pledge my honor that I have abided by the Stevens Honor System."

Problem 1

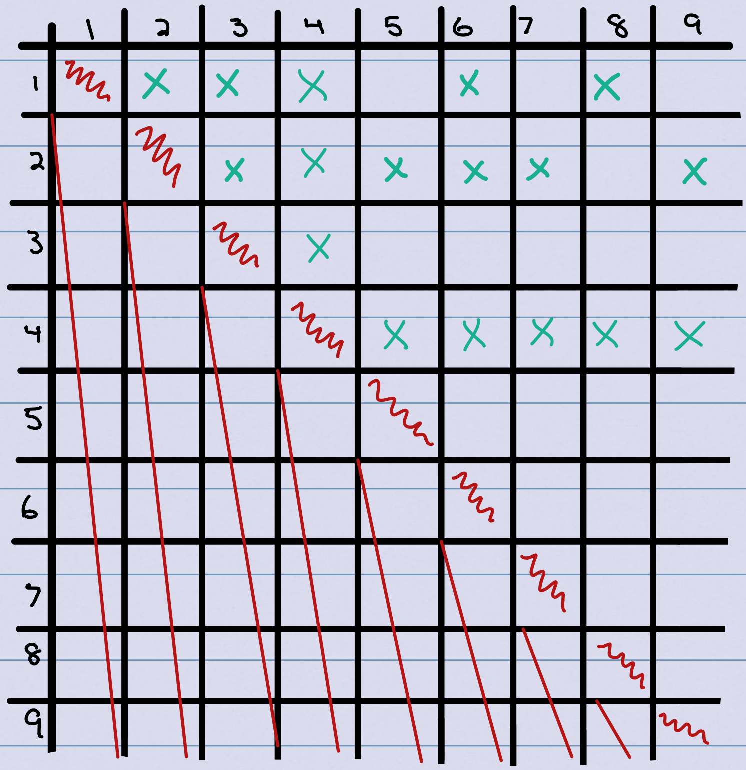
a.)

	1	2	3	4	5	6	7	8	9
1				X					
2				X					
3				X					
4					X	X	X	X	X
5									
6									
7									
8									
9									

Step 1: Mark off pairs of accept/reject States. This case is anything including 4.

	1	2	3	4	5	6	7	8	9
1		X	X	X		X		X	
2				X					
3				X					
4					X	X	X	X	X
5									
6									
7									
8									
9									

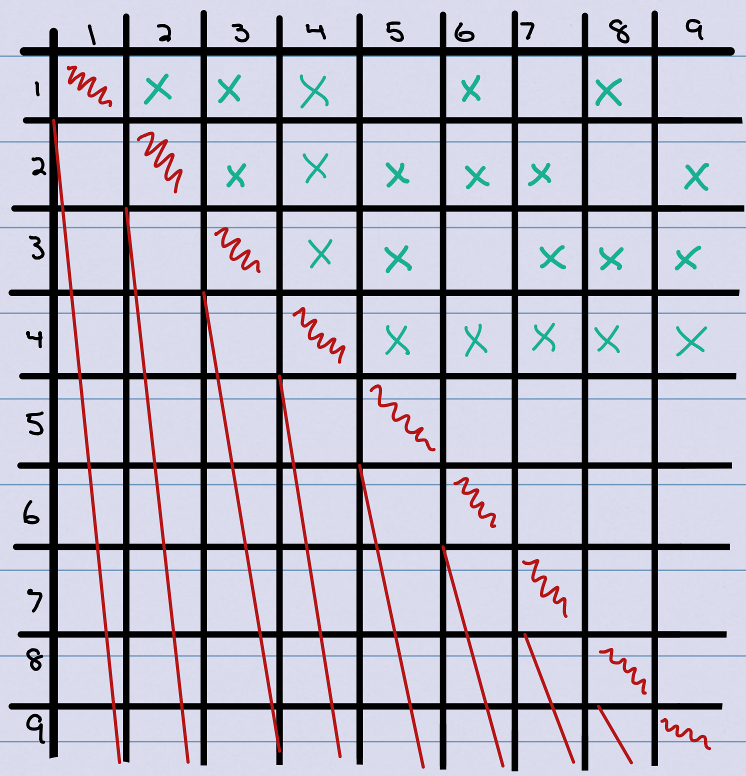
Step 2: Check every pair for $(\delta\{1,a\}, \delta\{j,a\})$ If this leads to a distinguishable pair mark them off. If not, like shown, don't mark them until they're in distinguishable ($j = 2$-9)



Step 3: Repeat this process for all numbers until there are 0 boxes to "x" out.

$(\delta\{2,a\}, \delta\{j,a\})$

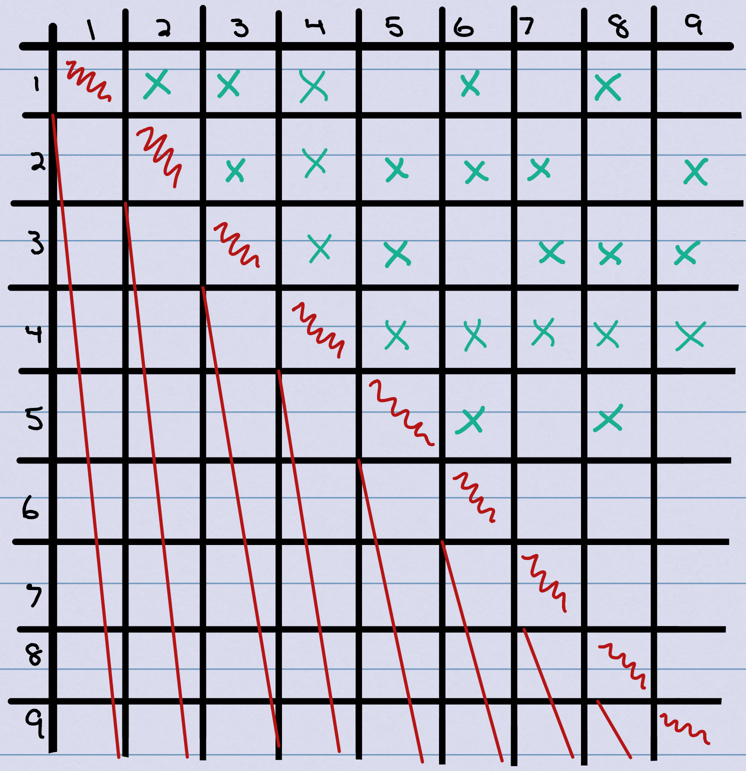
$(j = 1, 3-9)$



Step 4: Checking

$(\delta\{3,a\}, \delta\{j,a\})$

$j = (1-2, 4-9)$

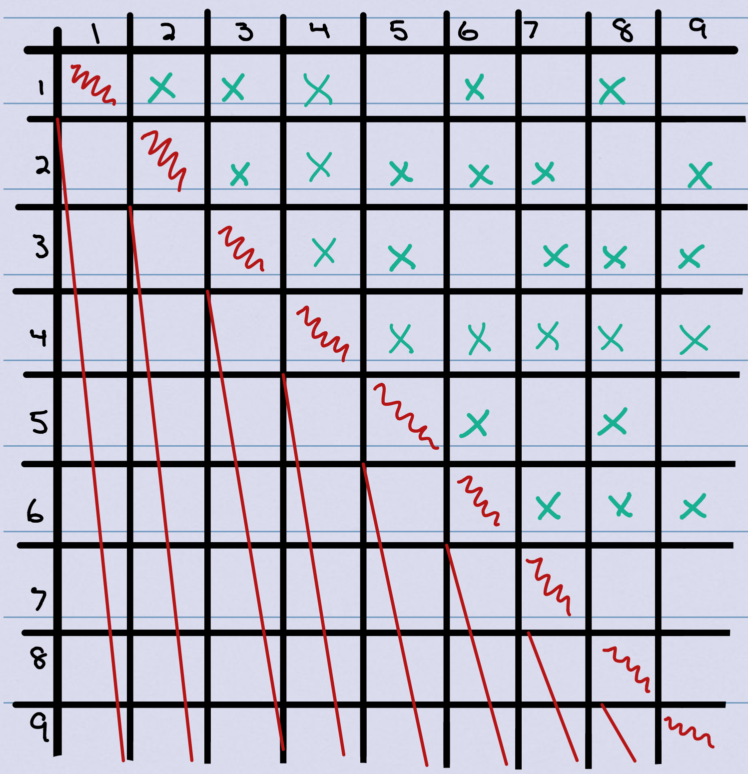


Step 5: Checking

$(\delta\{5,a\}, \delta\{j,a\})$

$j = (1-3, 6-9)$

We can skip step 4 because we have done it in step 1 already.



Step 6: Checking

$(\delta\{6,a\}, \delta\{j,a\})$

$j = (1-5, 7-9)$

	1	2	3	4	5	6	7	8	9
1		X	X	X		X		X	
2			X	X	X	X	X		X
3				X	X		X	X	X
4					X	X	X	X	X
5						X		X	
6							X	X	X
7								X	X
8									
9									

Step 7: Checking

$(\delta\{7, a\}, \delta\{j, a\}$

$j = (1\text{-}6, 8\text{-}9)$

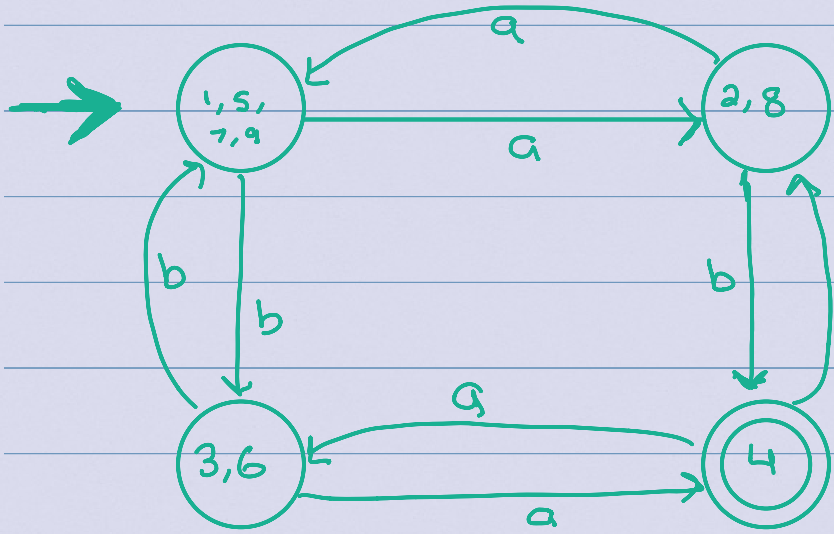
	1	2	3	4	5	6	7	8	9
1		X	X	X		X		X	
2			X	X	X	X	X		X
3				X	X		X	X	X
4					X	X	X	X	X
5						X		X	
6							X	X	X
7								X	X
8									X
9									

Step 8: Checking

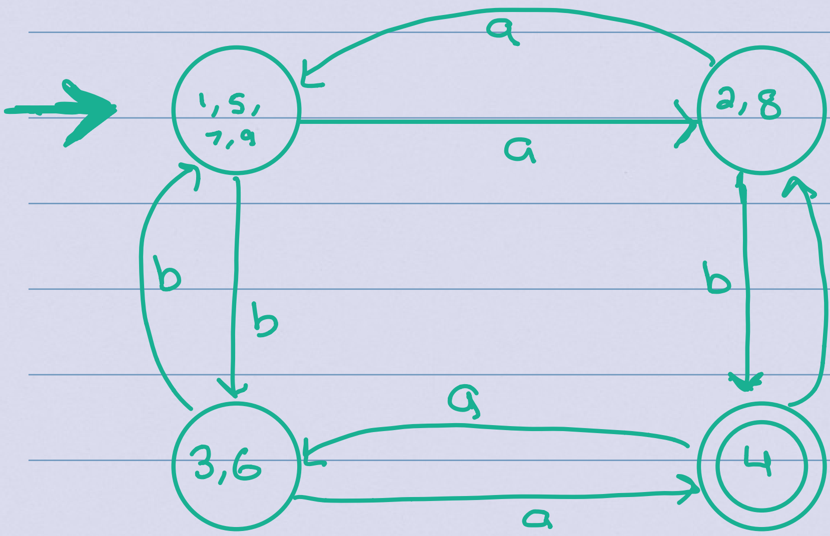
$(\delta\{8, a\}, \delta\{j, a\})$

$j = (1\text{-}7, 9\}$

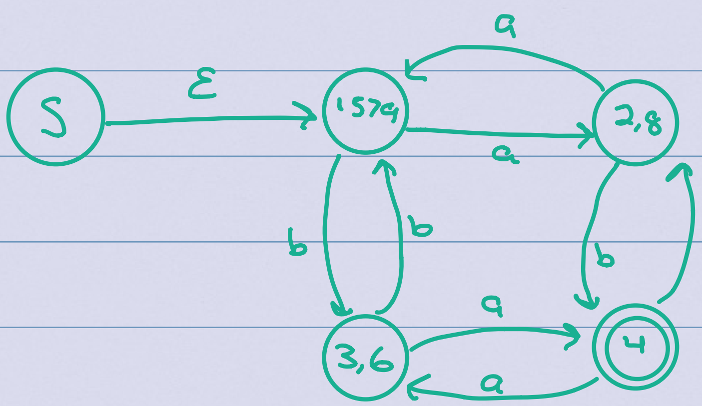
· Since we have filled out all tables, we can now create the minimilized DFA.



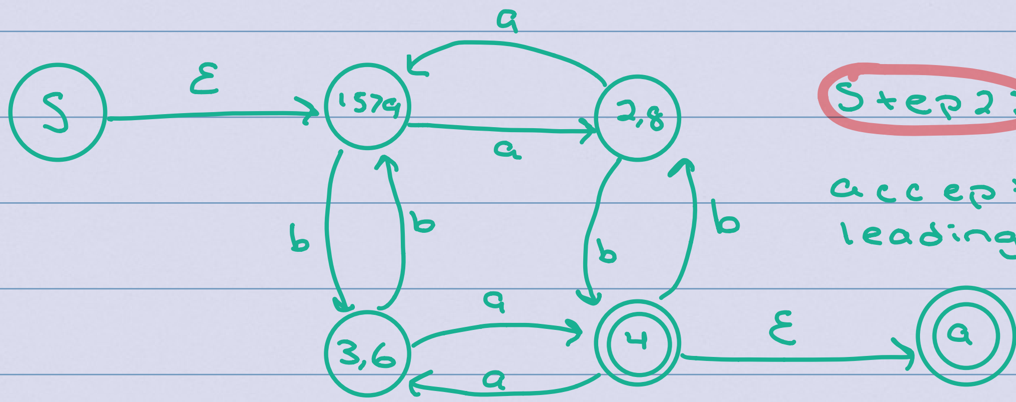
Problem 2



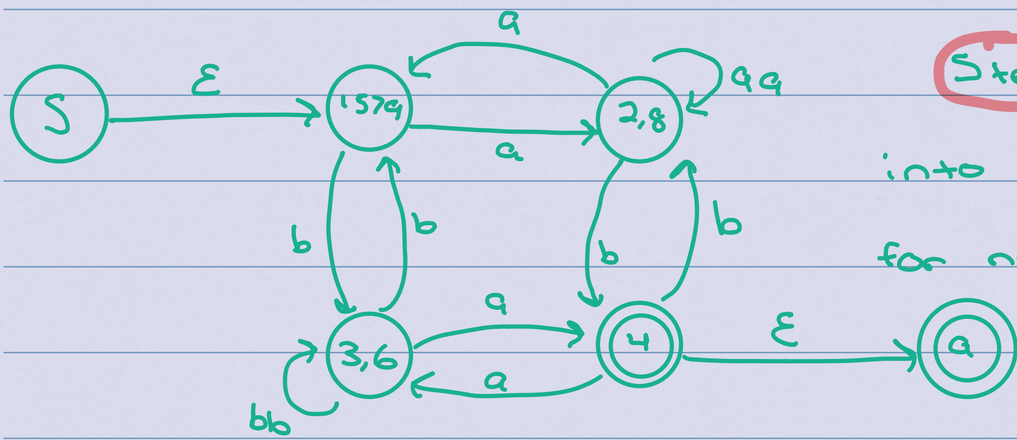
Initial DFA



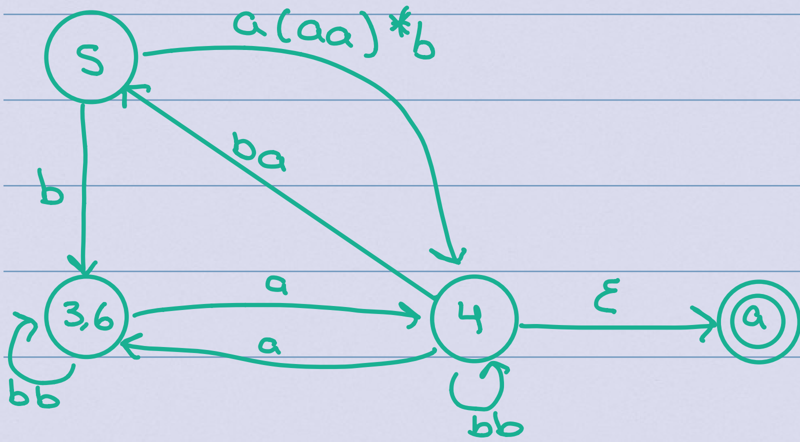
Step 1: Add a new start state with an ε state leading to the old one.



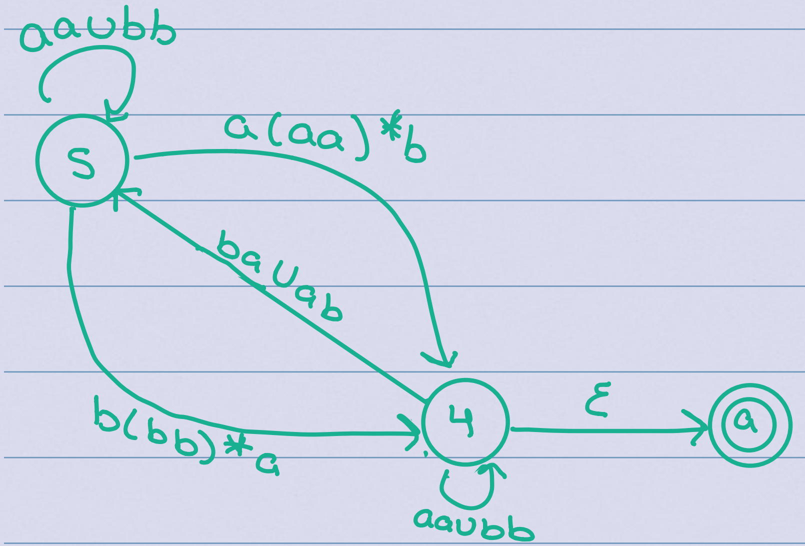
Step 2: Add a new accept state w/ an ε leading from the old one



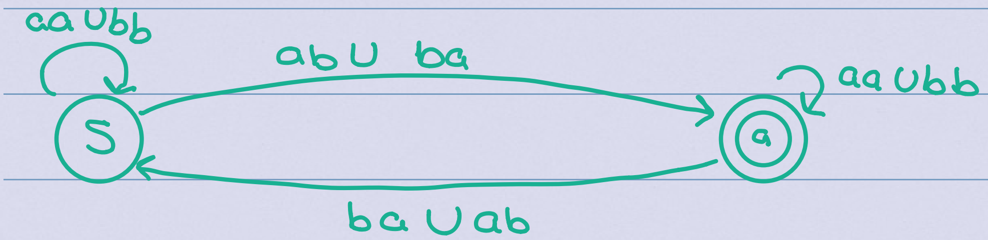
Step 3: Condense S into 1579 accounting for new transitions



Step 4: Repeat process used in Step 3 for 2,8.



Step 5: Process repeated for state 3, 6.



Step 6: Final aa∪bb product. Notice the absence of the $(aa)^*$ & $(bb)^*$ in transitions, as they are accounted for in the self-loops.

From this final GNFA, the language can be represented as:

$$\boxed{((bb \cup aa)^* (ab \cup ba)(aa \cup bb)^* (ba \cup ab))^* (bb \cup aa)^* (ab \cup ba)(aa \cup bb)^*}$$