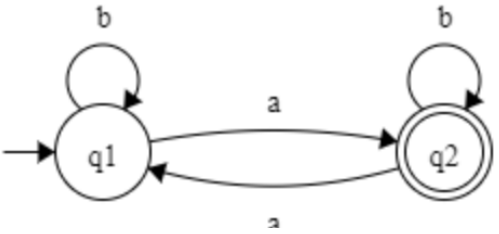
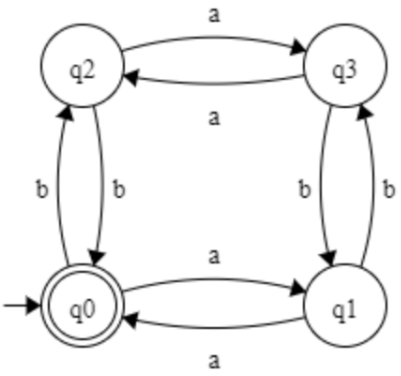
Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_a \in \dot{2}\}$

Describe the minimum DFA that recognizes the language of the words over {a,b} which have an even number of a's.



Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_a \in \dot{2} \wedge |w|_b \in \dot{2}\}$

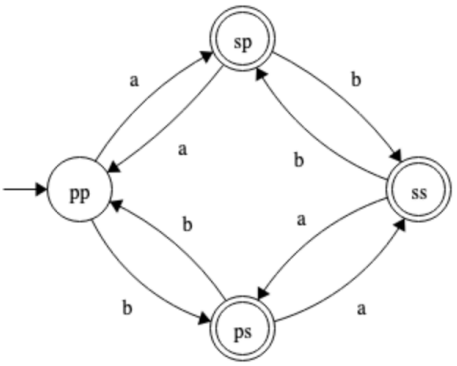
Describe the minimum DFA that recognizes the language of words over {a,b} with an even number of a's, and an even number of b's.



Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_a \notin \dot{2} \vee |w|_b \notin \dot{2}\}$

Describe the minimum DFA that recognizes the language of words over {a,b} with an odd number of a's or an odd number of b's.

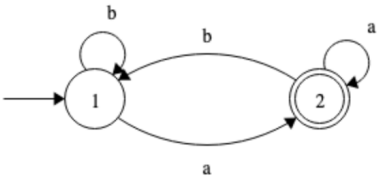
	a	b
pp	sp	ps
ps	ss	pp +
sp	pp	ss +
ss	ps	sp +



Minimum DFA for $\{w \in \{a,b\}^* \mid \exists x : w = xa\}$

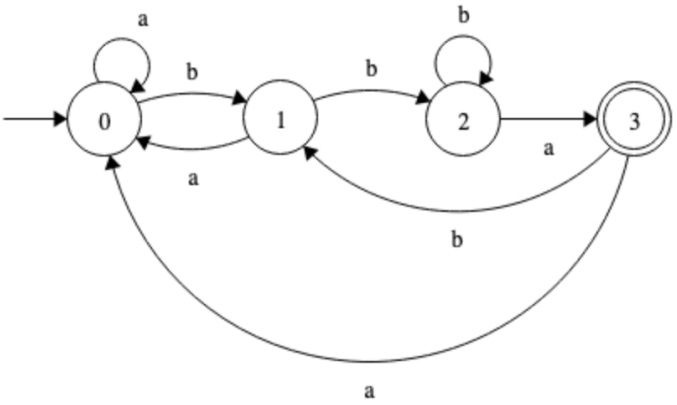
Describe the minimum DFA that recognizes the words over {a,b} that end in a.

	a	b
1	2	1
2	2	1 +



Minimum DFA for $\{w \in \{a,b\}^* \mid \exists x : w = xbba\}$

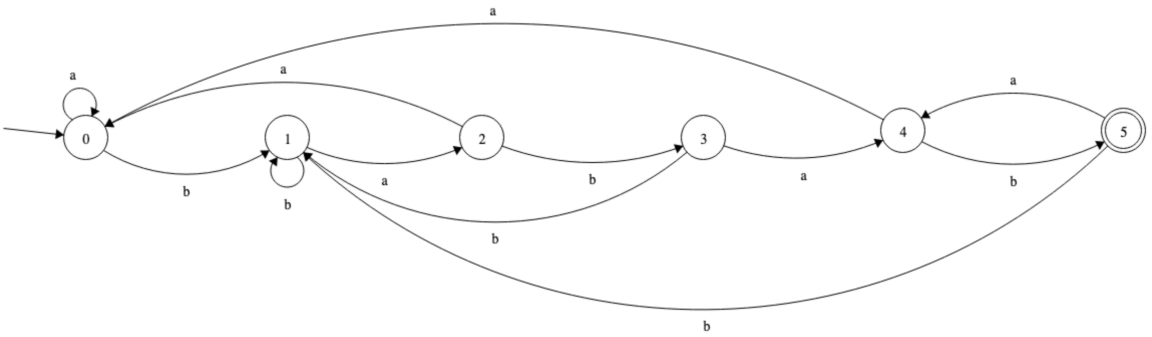
Describe the minimum DFA that recognizes the words over {a,b} ending with bba.



	a	b	
0	0	1	
1	0	2	
2	3	2	
3	0	1	+

Minimum DFA for $\{w \in \{a,b\}^* \mid \exists x : w = xbabab\}$

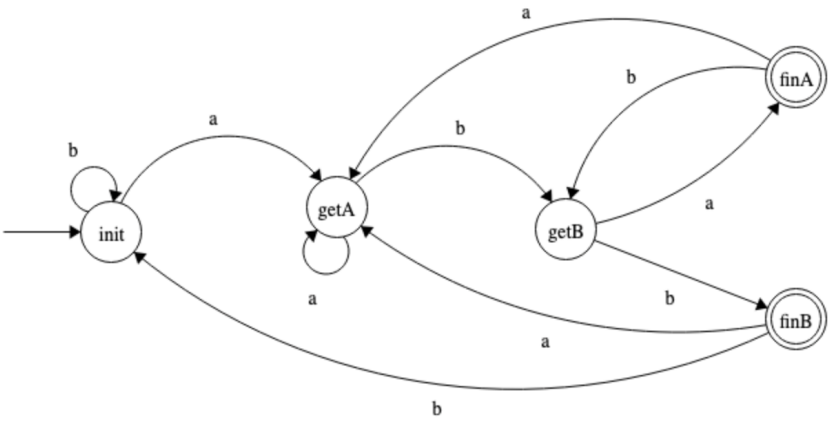
Describe the minimum DFA that recognizes the words over {a,b} ending with babab.



a	b	
0	0	1
1	2	1
2	0	3
3	4	1
4	0	5
5	4	1 +

Minimum DFA for $\{w \in \{a,b\}^* \mid \exists x,y : (w = xaby \wedge |y| = 1)\}$

Describe the minimum DFA that recognizes the words over {a,b} such that the symbol a appears in the third from the last position, and the symbol b appears in the penultimate position.

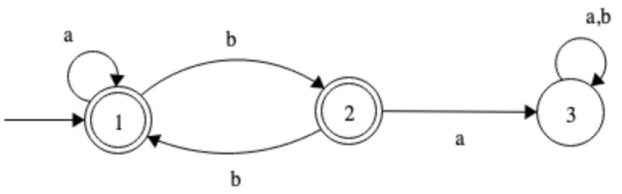


	a	b	
init	getA	init	
finA	getA	getB	+
finB	getA	init	+
getA	getA	getB	
getB	finA	finB	

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : (w = xay \Rightarrow |x|_b \in \dot{2})\}$

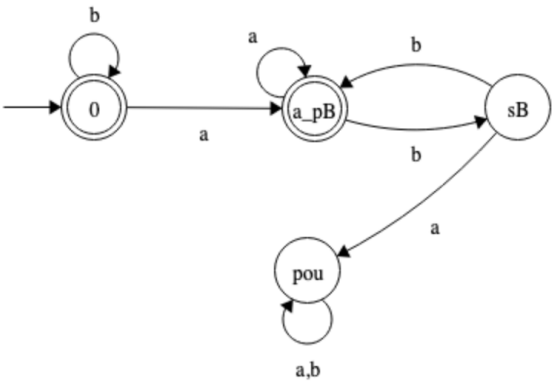
Describe the minimum DFA that recognizes the words over {a,b} such that to the left of each occurrence of a there is an even number of b's.

	a	b	
1	1	2	+
2	3	1	+
3	3	3	



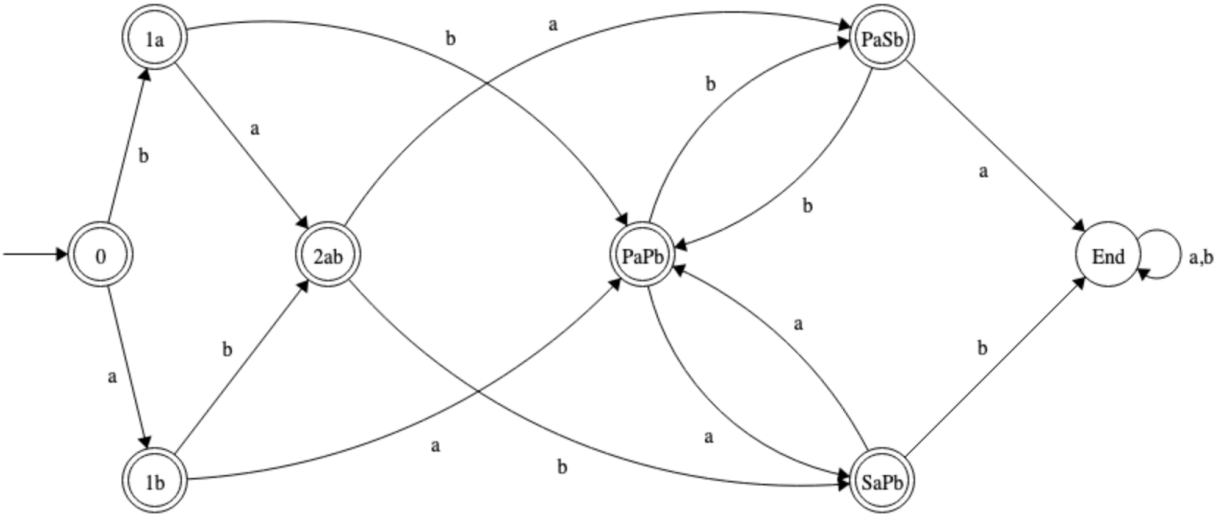
Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : (w = xay \Rightarrow |y|_b \in \dot{2})\}$

Describe the minimum DFA that recognizes the words over {a,b} such that to the right of each occurrence of a there is an even number of b's.



	a	b	
0	a_pB	0	+
a_pB	a_pB	sB	+
pou	pou	pou	
sB	pou	a_pB	

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : ((w = xy \wedge |x| \geq 3) \Rightarrow (|x|_a \in \dot{2} \vee |x|_b \in \dot{2}))\}$



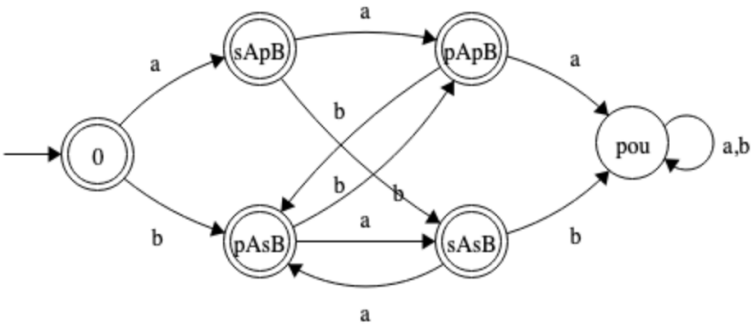
Describe the minimum DFA that recognizes the language of the words over {a,b} such that every prefix of length greater than or equal to 3 has an even number of a's or an even number of b's.

	a	b	
0	1b	1a	+
1a	2ab	PaPb	+
1b	PaPb	2ab	+
2ab	PaSb	SaPb	+
End	End	End	
PaPb	SaPb	PaSb	+
PaSb	End	PaPb	+
SaPb	PaPb	End	+

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : ((w = xy \wedge |x| \geq 3) \Rightarrow (|x|_a \in \dot{2} \vee |x|_b \notin \dot{2}))\}$

Describe the minimum DFA that recognizes the language of the words over {a,b} such that every prefix of length greater than or equal to 3 has an even number of a's or an odd number of b's.

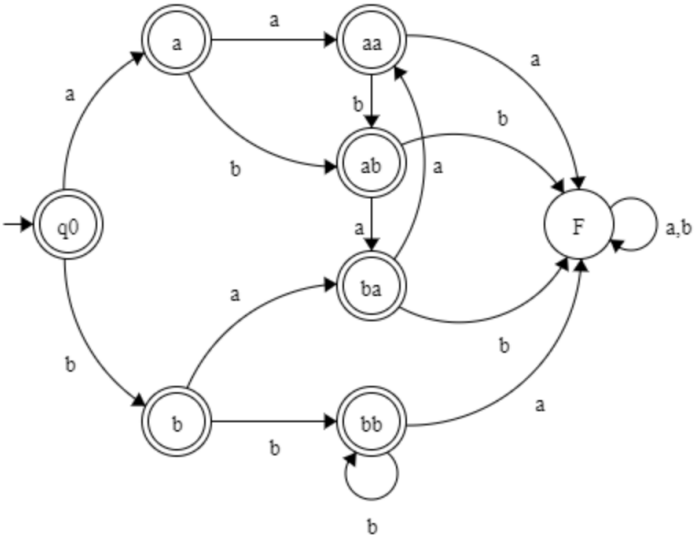
	a	b	
0	sApB	pAsB	+
pApB	pou	pAsB	+
pAsB	sAsB	pApB	+
pou	pou	pou	
sApB	pApB	sAsB	+
sAsB	pAsB	pou	+



Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y,z : ((w = xyz \wedge |y| = 3) \Rightarrow (|y|_a \in \dot{2} \vee |y|_b \notin \dot{2}))\}$

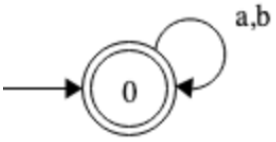
Describe the minimum DFA that recognizes the language of the words over {a,b} whose subwords of length 3 have an even number of a's or an odd number of b's.

	a	b	
q0	a	b	+
F	F	F	
a	aa	ab	+
aa	F	ab	+
ab	ba	F	+
b	ba	bb	+
ba	aa	F	+
bb	F	bb	+



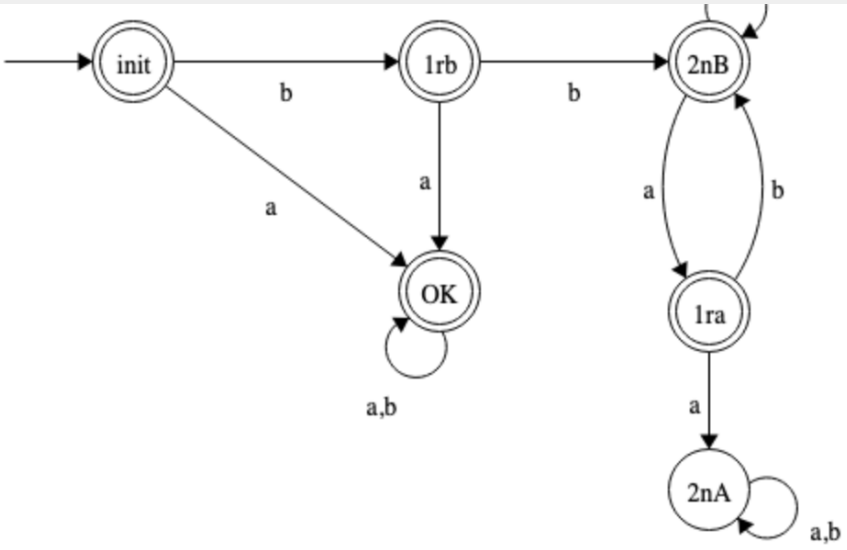
Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y,z : ((w = xyz \wedge |y| = 3) \Rightarrow (|y|_a \in \dot{2} \vee |y|_b \in \dot{2}))\}$

Describe the minimum DFA that recognizes the language of the words over {a,b} whose subwords of length 3 have an even number of a's or an even number of b's.



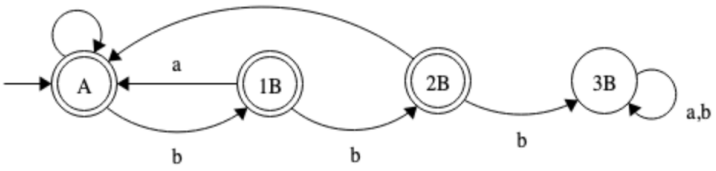
Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x : (w = bbx \Rightarrow |x|_{aa} = 0)\}$

Describe the minimum DFA that recognizes the words over {a,b} such that, if they start with bb, then they do not contain aa.



	a	b	
init	OK	1rb	+
1ra	2nA	2nB	+
1rb	OK	2nB	+
2nA	2nA	2nA	
2nB	1ra	2nB	+
OK	OK	OK	+

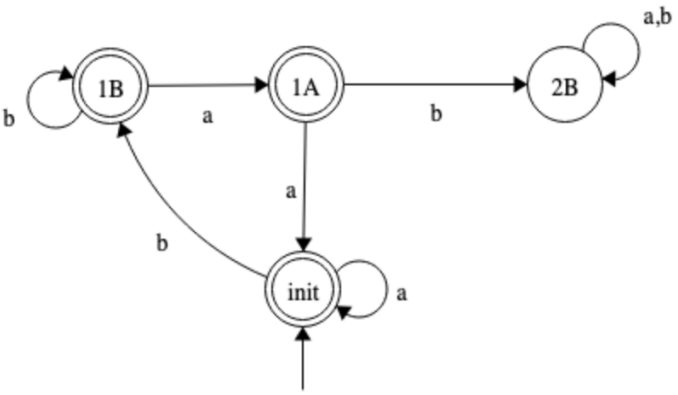
Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{bbb} = 0\}$



Describe the minimum DFA that recognizes the words over {a,b} that do not contain the subword bbb.

	a	b	
A	A	1B	+
1B	A	2B	+
2B	A	3B	+
3B	3B	3B	

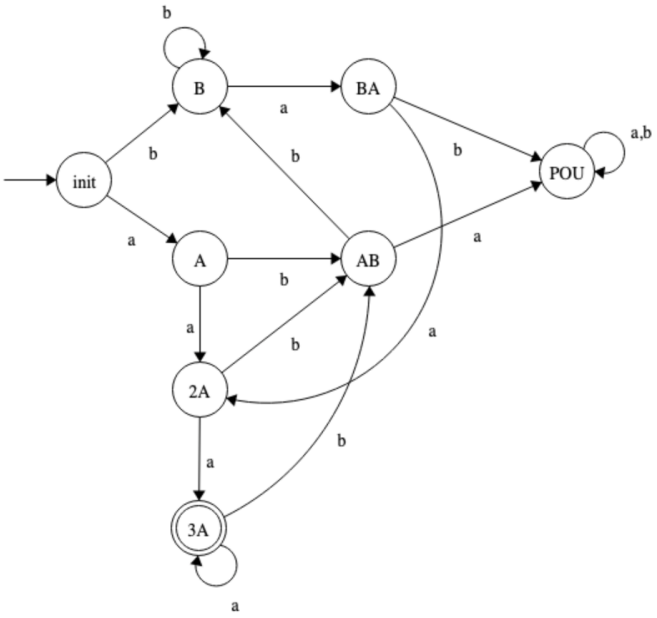
Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{bab} = 0\}$



Describe the minimum DFA that recognizes the words over {a,b} that do not contain the subword bab.

	a	b	
init	init	1B	+
1A	init	2B	+
1B	1A	1B	+
2B	2B	2B	

Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{aba} = 0 \wedge |w|_{bab} = 0 \wedge \exists x : w = xaaa\}$



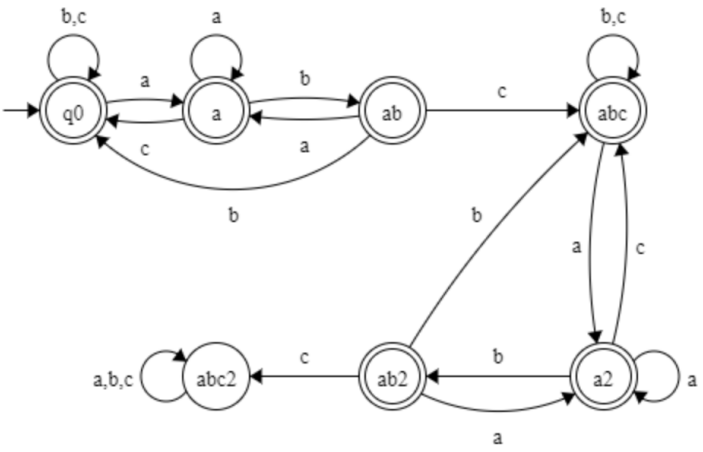
Describe the minimum DFA that recognizes the words over {a,b} that end in aaa, and do not contain aba or bab.

	a	b	
init	A	B	
2A	3A	AB	
3A	3A	AB	+
A	2A	AB	
AB	POU	B	
B	BA	B	
BA	2A	POU	
POU	POU	POU	

Minimum DFA for $\{w \in \{a,b,c\}^* \mid |w|_{abc} < 1\}$

Minimum DFA for $\{w \in \{0,1\}^* \mid \mathtt{value}_2(w) \in \dot{3}\}$

Describe the minimum DFA that recognizes the words over {a,b,c} that have at most one ocurrence of the subword abc.

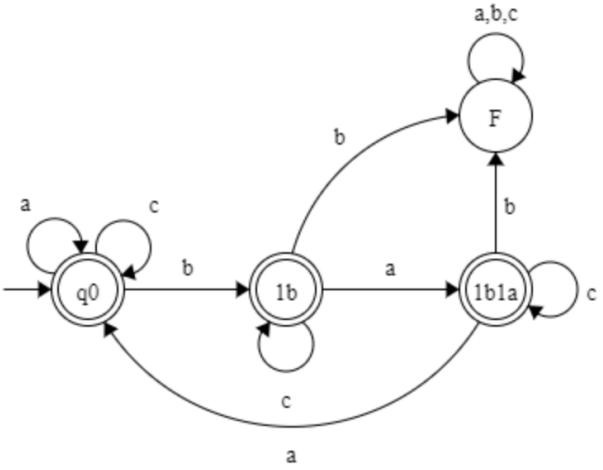


	a	b	c	
q0	a	q0	q0	+
a	a	ab	q0	+
a2	a2	ab2	abc	+
ab	a	q0	abc	+
ab2	a2	abc	abc2	+
abc	a2	abc	abc	+

Minimum DFA for $\{w \in \{a,b,c\}^* \mid \forall x,y,z : (w = xbybz \Rightarrow |y|_a \geq 2)\}$

abc2 abc2 abc2 abc2

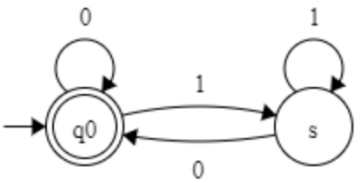
Describe the minimum DFA that recognizes the words over {a,b,c} such that between every two occurrences of b there are at least two occurrences of a.



	a	b	c	
q0	q0	1b	q0	+
1b	1b1a	F	1b	+
1b1a	q0	F	1b1a	+
F	F	F	F	

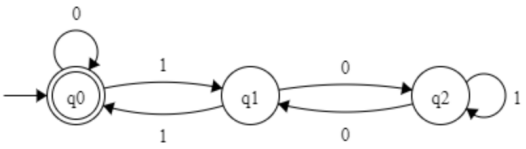
Minimum DFA for $\{w \in \{0,1\}^* \mid \mathtt{value}_2(w) \in \dot{2}\}$

Describe the minimum DFA that recognizes the words over {0,1} such that interpreted in binary represent a natural number multiple of 2 (in particular, the empty word represents 0, which is multiple of 2).



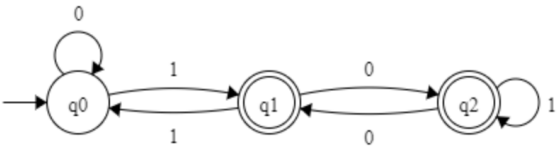
Minim DFA multiple de 3

Describe the minimum DFA that recognizes the words over {0,1} such that interpreted in binary represent a natural number multiple of 3 (in particular, the empty word represents 0, which is multiple of 3).



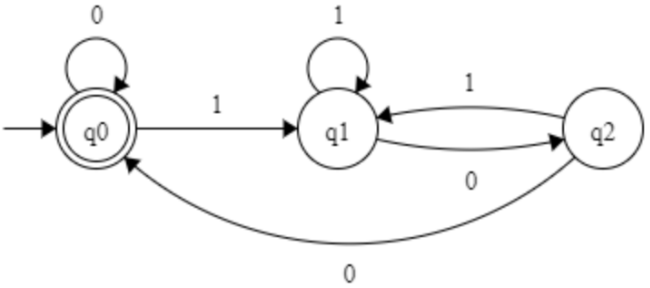
Minimum DFA for $\{w \in \{0,1\}^* \mid \mathtt{value}_2(w) \notin \dot{3}\}$

Describe the minimum DFA that recognizes the words over {0,1} such that interpreted in binary represent a natural number which is not multiple of 3 (in particular, the empty word represents 0, which is multiple of 3).



Minimum DFA for $\{w \in \{0,1\}^* \mid \mathtt{value}_2(w) \in \dot{4}\}$

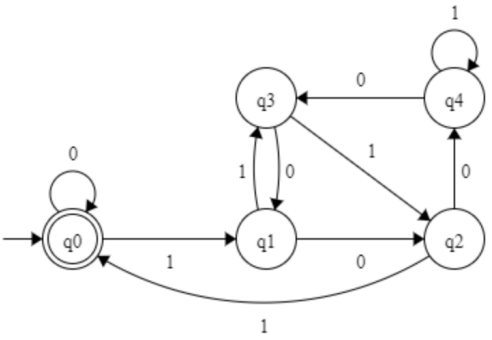
Describe the minimum DFA that recognizes the words over {0,1} such that interpreted in binary represent a natural number multiple of 4 (in particular, the empty word represents 0, which is multiple of 4).



	0	1	
q0	q0	q1	+
q1	q2	q1	
q2	q0	q1	

Minimum DFA for $\{w \in \{0,1\}^* \mid \mathtt{value}_2(w) \in \dot{5}\}$

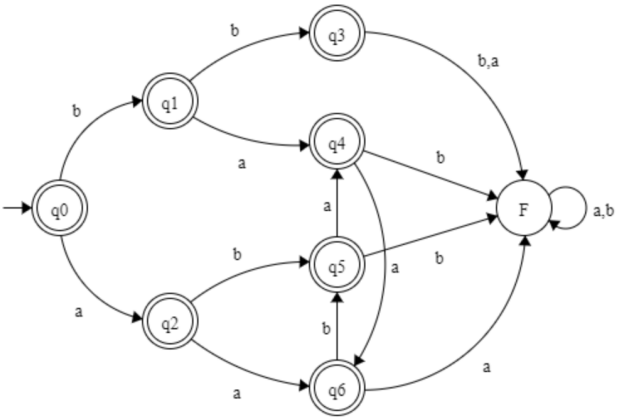
Describe the minimum DFA that recognizes the words over {0,1} such that interpreted in binary represent a natural number multiple of 5 (in particular, the empty word represents 0, which is multiple of 5).



	0	1	
q0	q0	q1	+
q1	q2	q3	
q2	q4	q0	
q3	q1	q2	
q4	q3	q4	

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y,z : ((w = xyz \wedge |y| = 3) \Rightarrow |y|_a = 2)\}$

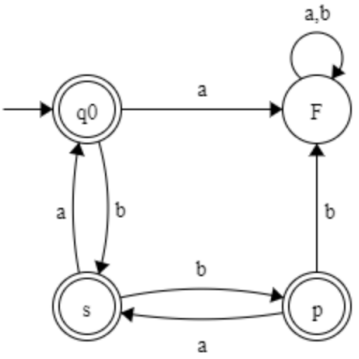
Describe the minimum DFA that recognizes the words over {a,b} such that every subword with length 3 has exactly two a's.



	a	b	
q0	q2	q1	+
F	F	F	
q1	q4	q3	+
q2	q6	q5	+
q3	F	F	+
q4	q6	F	+
q5	q4	F	+
q6	F	q5	+

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : ((w = xy \wedge |x| \notin \dot{2}) \Rightarrow |x|_b = 1 + |x|_a)\}$

Describe the minimum DFA that recognizes the words over {a,b} whose prefixes of odd length have the propierty that their number of b's equals their number of a's plus 1.

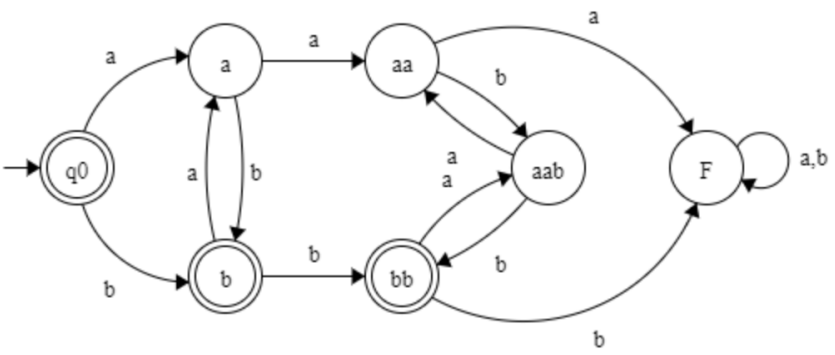


	a	b	
q0	F	s	+
F	F	F	
p	s	F	+
s	q0	p	+

Minimum DFA for $\{w \in \{a,b\}^* \mid \forall x,y : ((w = xy \wedge |y| \notin \dot{2}) \Rightarrow |y|_b = 1 + |y|_a)\}$

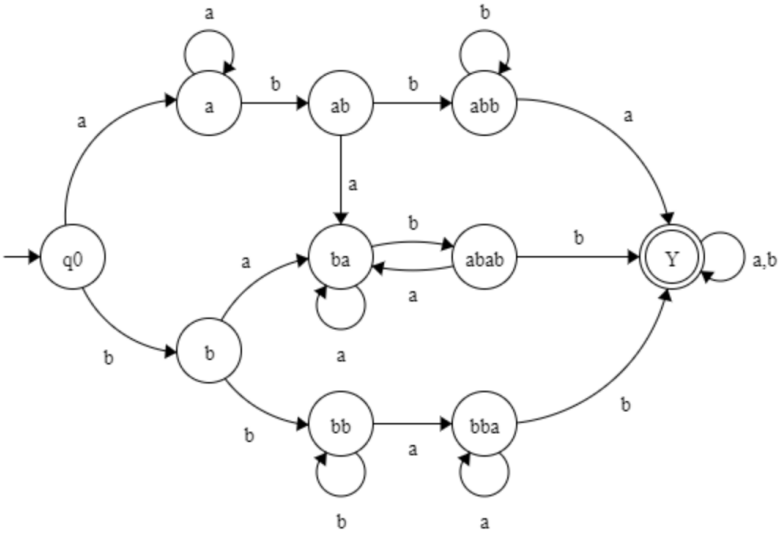
Describe the minimum DFA that recognizes the words over {a,b} whose suffixes of odd length have the propierty that their number of b's equals their number of a's plus 1.

	a	b	
q0	a	b	+
F	F	F	
a	aa	b	
aa	F	aab	
aab	aa	bb	
b	a	bb	+
bb	aab	F	+



Minimum DFA for $\{w \in \{a,b\}^* \mid \forall y : ((|y| = 2 \wedge |y|_b > 0) \Rightarrow |w|_y > 0)\}$

Describe the minimum DFA that recognizes the words over {a,b} that contain all possible subword of length 2 with at least one b. Note that there are only three of such subwords (ab, ba, bb), but they might be overlapped.

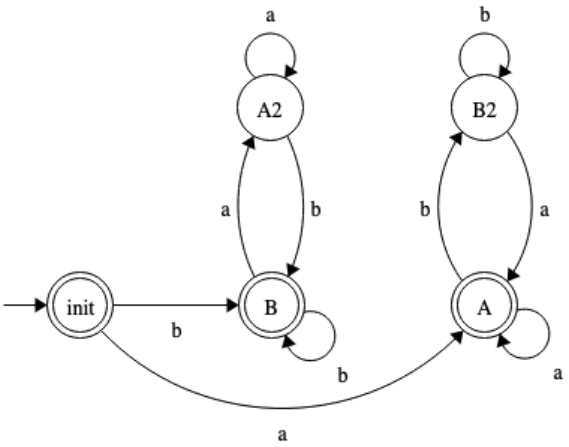


	a	b	
q0	a	b	
Y	Y	Y	+
a	a	ab	
ab	ba	abb	
abab	ba	Y	
abb	Y	abb	
b	ba	bb	
ba	ba	abab	
bb	bba	bb	
bba	bba	Y	

Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{ab} = |w|_{ba}\}$

Describe the minimum DFA that recognizes the words over {a,b} which have the same number of occurrences of ab as occurrences of ba.

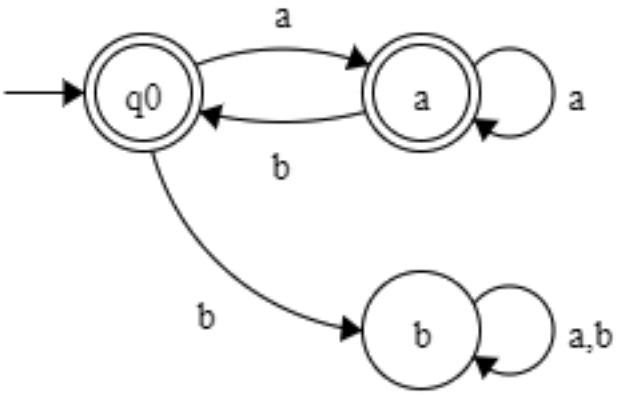
	a	b	
init	A	B	+
A	A	B2	+
A2	A2	B	
B	A2	B	+
B2	A	B2	



Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{ab} = |w|_{b}\}$

Describe the minimum DFA that recognizes the words over {a,b} which have the same number of occurrences of ab as occurrences of b.

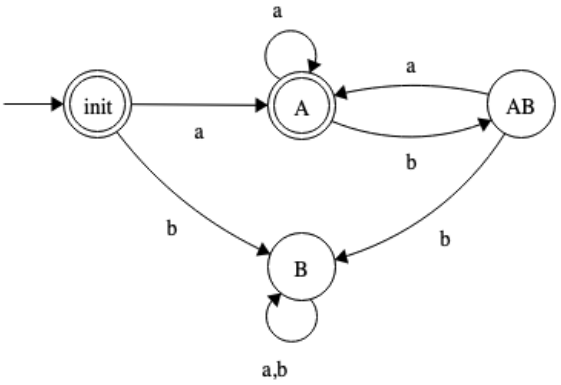
	a	b	
q0	a	b	+
a	a	q0	+
b	b	b	



Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{aba} = |w|_{b}\}$

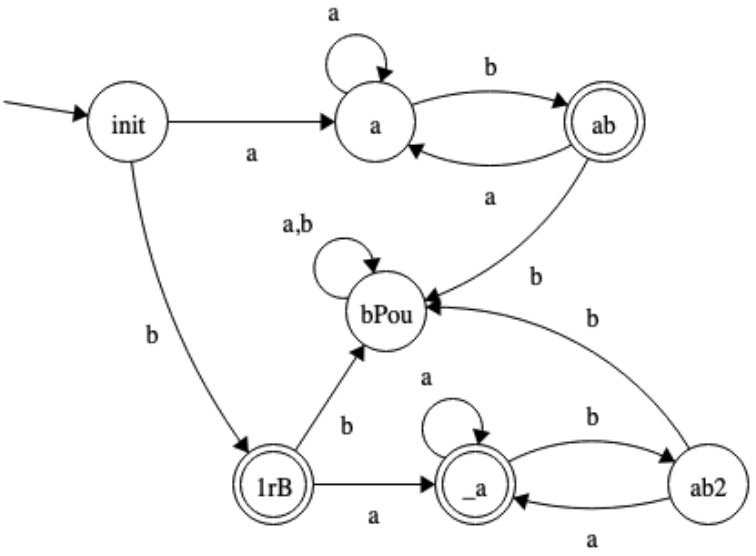
Describe the minimum DFA that recognizes the words over {a,b} which have the same number of occurrences of aba as occurrences of b.

	a	b	
init	A	B	+
A	A	AB	+
AB	A	B	
B	B	B	



Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{aba} + 1 = |w|_b\}$

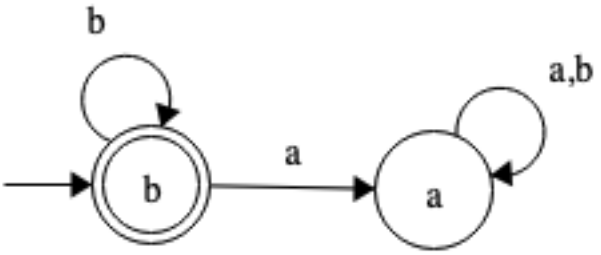
Describe the minimum DFA that recognizes the words over {a,b} such that the number of occurrences of aba is one less than the number of occurrences of b.



	a	b	
init	a	1rB	
1rB	_a	bPou	+
_a	_a	ab2	+
a	a	ab	
ab	a	bPou	+
ab2	_a	bPou	
bPou	bPou	bPou	

Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{aba} = |w|_a\}$

Describe the minimum DFA that recognizes the words over {a,b} which have the same number of occurrences of aba as occurrences of a.

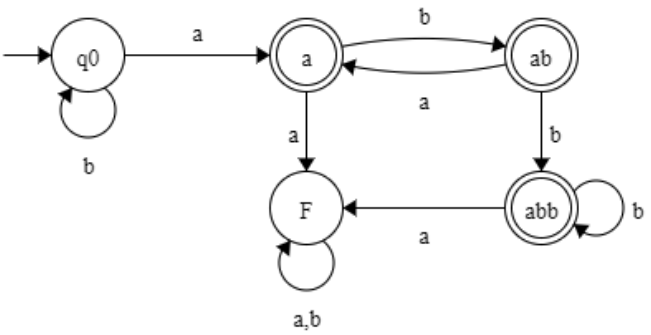


	a	b	
b	a	b	+

Minimum DFA for $\{w \in \{a,b\}^* \mid |w|_{aba} + 1 = |w|_a\}$

a a a

Describe the minimum DFA that recognizes the words over {a,b} such that the number of occurrences of aba is one less than the number of occurrences of a.

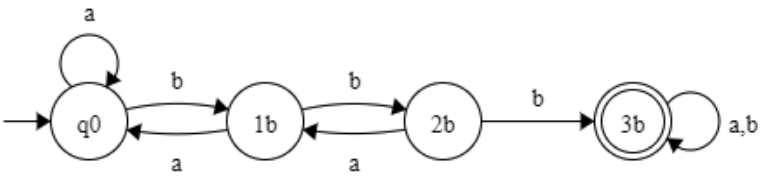


	a	b	
q0	a	q0	
F	F	F	
a	F	ab	+
ab	a	abb	+
abb	F	abb	+

Minimum DFA for $\{w \in \{a,b\}^* \mid \exists x,y,z : (w = xyz \wedge |y|_b = 3 + |y|_a)\}$

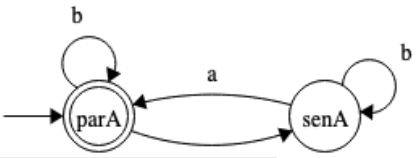
Describe the minimum DFA that recognizes the set of words over {a,b} that have some subword with three more b's than a's.

	a	b
q0	q0	1b
1b	q0	2b
2b	1b	3b
3b	3b	3b +



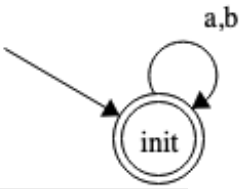
Minimum DFA for $\{xy \in \{a,b\}^* \mid |x|_a = |y|_a\}$

Describe the minimum DFA that recognizes the words over {a,b} that can be divided into two parts that contain the same amount of a's.



Minimum DFA for $\{xy \in \{a,b\}^* \mid |x|_a = |y|_b\}$

Describe the minimum DFA that recognizes the words over {a,b} that can be divided into two parts such that the number of a's of the first part coincides with the number of b's of the second part.



Minimum DFA for $\{xy \in \{a,b\}^* \mid |x|_{aa} = |y|_b\}$

Describe the minimum DFA that recognizes the words over {a,b} that can be divided into two parts such that the number of subwords aa of the first part equals to the number of b's of the second part.