

1.1 (a) What is the start state?

q_1 is the start state in both DFAs

(b) What is the set of accept states?

$F_1 = \{q_2\}$ and $F_2 = \{q_1, q_4\}$

(c) What sequence of states does the machine go through on input aabb?

For M_1 , the machine goes through q_1, q_2, q_3, q_1, q_1 .

For M_2 , the machine goes through q_1, q_1, q_1, q_2, q_4 .

(d) Does the machine accept the string aabb?

M_1 does not accept the string aabb while M_2 accepts it because the end state is not the accept state in M_1 , while in M_2 , the end state is the accept state.

(e) Does the machine accept the string ϵ ?

M_1 doesn't accept the string ϵ but M_2 does since the start state of M_2 is also the accepting state.

1.2 Give the formal descriptions of the machine M_1 and M_2 pictured in Exercise 1.1.

$M_1 = (\{q_1, q_2, q_3\}, \{a, b\}, \delta, q_1, \{q_2\})$

where the transition function δ is given by the following table:

State	a	b
q_1	q_2	q_1
q_2	q_3	q_3
q_3	q_2	q_1

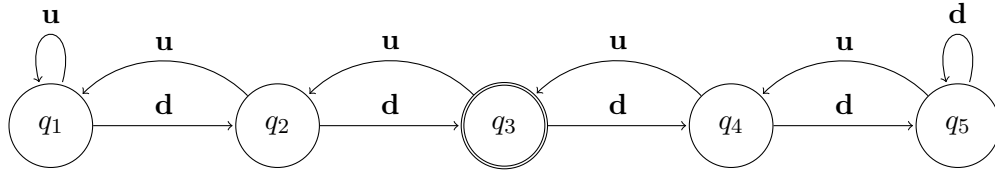
$M_2 = (\{q_1, q_2, q_3, q_4\}, \{a, b\}, \delta, q_1, \{q_1, q_4\})$

where the transition function δ is given by the following table:

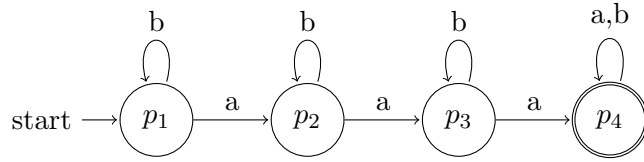
State	a	b
q_1	q_1	q_2
q_2	q_3	q_4
q_3	q_2	q_1
q_4	q_3	q_4

1.3 The formal description of a DFA M is $(\{q_1, q_2, q_3, q_4, q_5\}, \{u, d\}, \delta, q_3, \{q_3\})$ where δ is given by the following table. Give the state diagram of this machine:

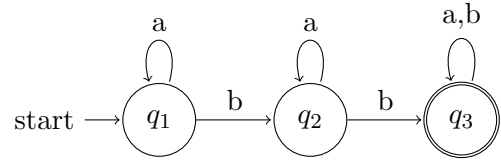
The state diagram of the machine is as follows:



1.4 (a) Here, the two DFAs are:



(a) $\{w|w \text{ has at least three a's}\}$



(b) $\{w|w \text{ has at least two b's}\}$

The combined DFA is as follows:

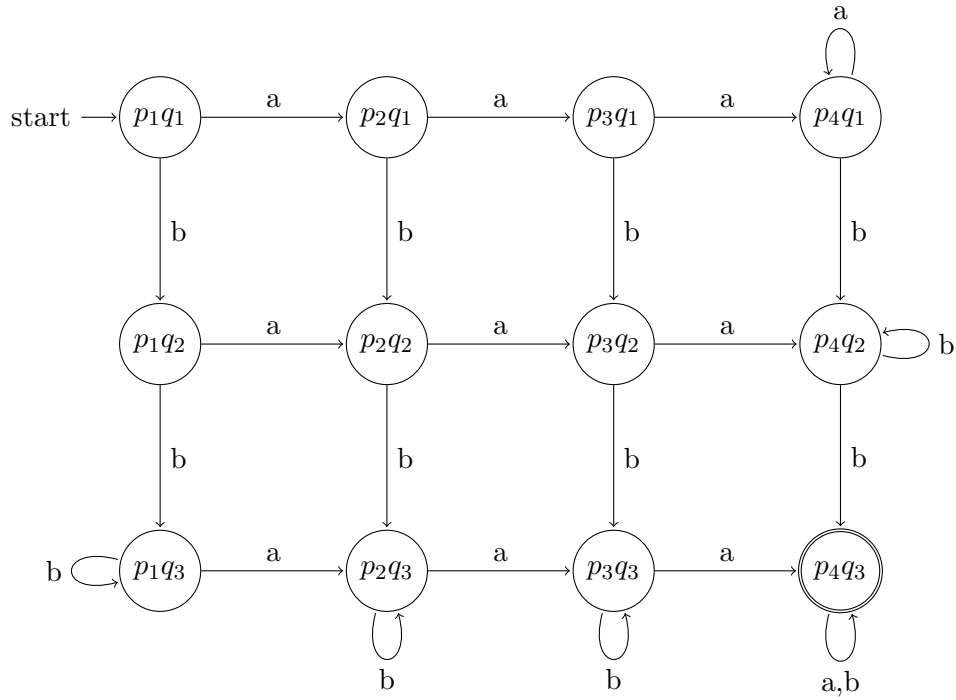
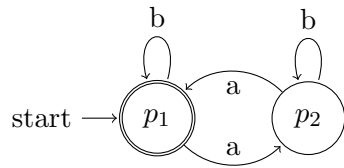
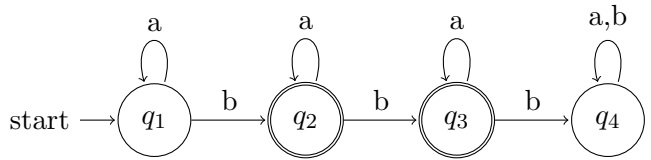


Figure 2: Combined DFA of the two Languages

(c) Here, the two DFAs are:



(a) $\{w \mid w \text{ has at least three a's}\}$



(b) $\{w \mid w \text{ has at one or two b's}\}$

The combined DFA is as follows:

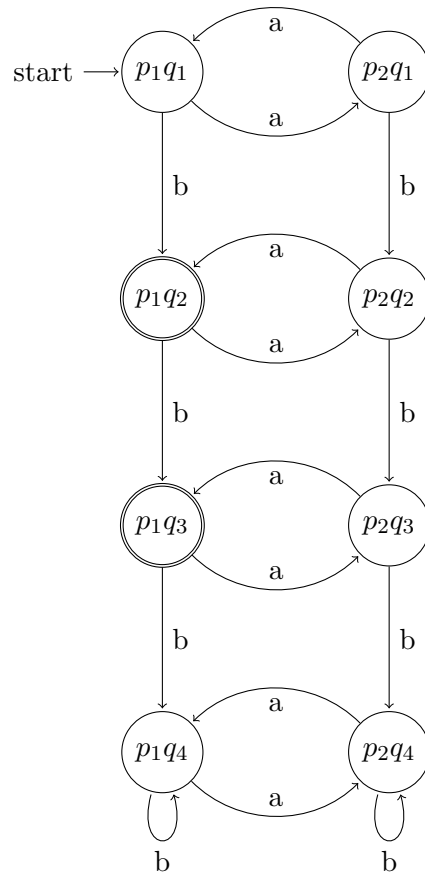


Figure 4: Combined DFA of the two Languages