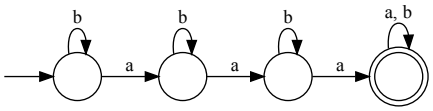
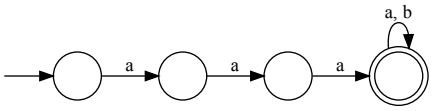
Gianna Julio

CMPT440 - Formal Languages and Computability
Assignment 4 - DFAs and NFAs

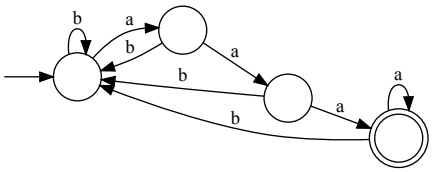
1. **Webber Chap. 5 Exercise 4**
   Draw the diagram for an NFA for each of the following languages. Use as few states and as few transitions as possible. Don't just give a DFA, unless you are convinced it is necessary.



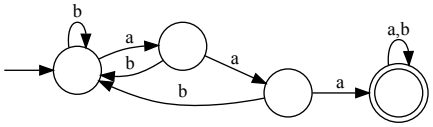
(a)



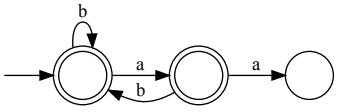
(b)



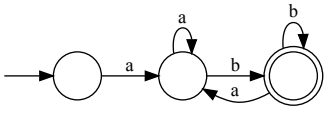
(c)



(d)

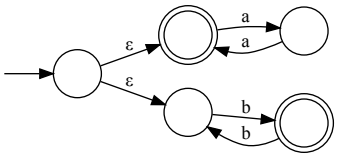


(e)

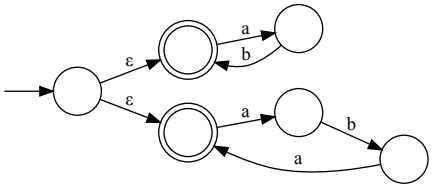


(f)

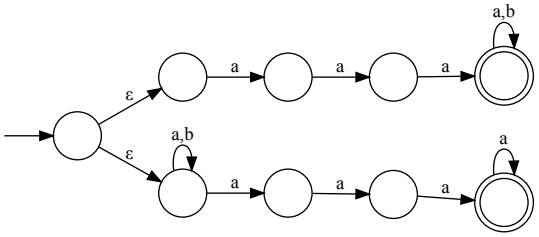
2. **Webber Chap. 5 Exercise 5**
Draw an NFA for each of the following languages. Hint: Try combining smaller NFAs using ϵ-transitions.



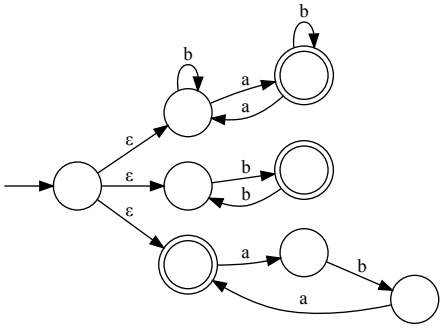
(a)



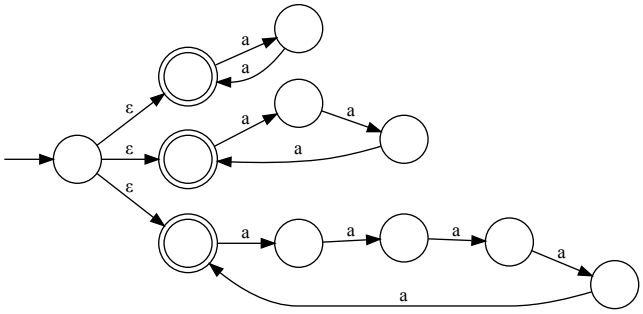
(b)



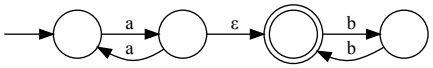
(c)



(d)

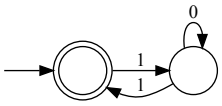


(e)

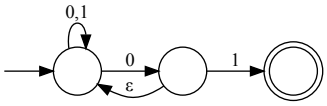


(f)

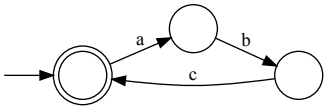
3. **Webber Chap. 5 Exercise 7**
   Draw the diagram for each of the following NFAs



(a)



(b)



(c)

4. **Webber Chap. 5 Exercise 8**
State each of the following NFAs formally, as a 5-tuple. The alphabet in each case should be {a,b}.

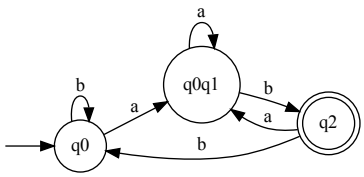
(a) ({q0, q1}, {a, b}, {δ}, q0, {q1}) where the transition function δ is
δ(q0, a) = {q0, q1}
δ(q0, b) ={}
δ(q0, ϵ) = {}
δ(q1, a) = {q1}
δ(q1, b) = {q1}
δ(q1, ϵ) = {}

(b) ({q0, q1}, {a, b}, {δ}, q0, {q1}) where the transition function δ is
δ(q0, a) = {q0, q1}
δ(q0, b) ={}
δ(q0, ϵ) = {}
δ(q1, a) = {}
δ(q1, b) = {}
δ(q1, ϵ) = {}

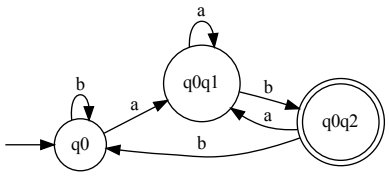
(c) ({q0}, {a, b}, {δ}, q0, {q0}) where the transition function δ is
δ(q0, a) = {q0}
δ(q0, b) ={q0}
δ(q0, ϵ) = {}

(d) ({q0}, {a, b}, {δ}, q0, {q0}) where the transition function δ is
δ(q0, a) = {}
δ(q0, b) ={}
δ(q0, ϵ) = {}

5. **Webber Chap. 6 Exercise 3**
   Convert this NFA into a DFA using the subset construction. Draw the DFA and label each state with the corresponding subset of states from the NFA. You do not have to show unreachable states, if any



6. **Webber Chap. 6 Exercise 4**
   Convert this NFA into a DFA using the subset construction. Draw the DFA and label each state with the corresponding subset of states from the NFA. You do not have to show unreachable states, if any



7. **Webber Chap. 6 Exercise 5**
   Convert this NFA into a DFA using the subset construction. Draw the DFA and label each state with the corresponding subset of states from the NFA. You do not have to show unreachable states, if any