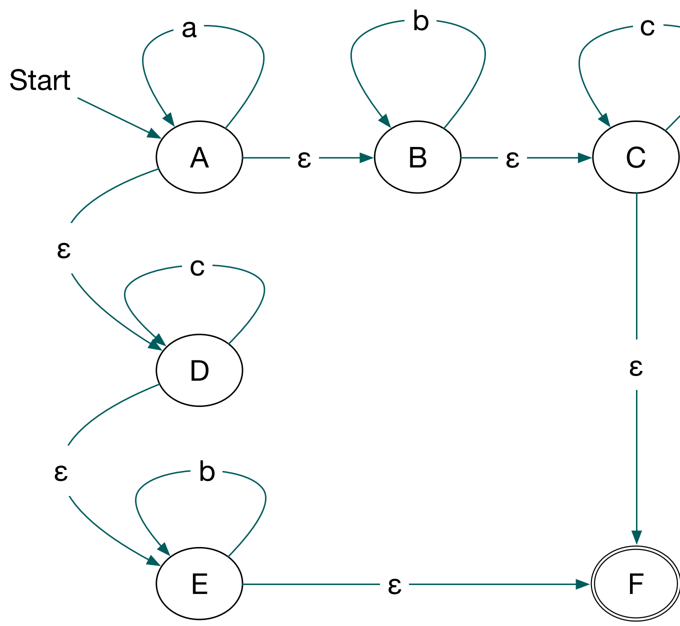
Worksheet — January 16, 2018

NFA with ε-transition

We use the following NFA with ε-transitions over the alphabet $\{a, b, c\}$.



1. Show that the strings *"aaabbbcc", "aaaaaccbbbb",* and *"aaacc"* are accepted by this automaton.
2. Argue that the string *"bbbaa"* is not accepted by the automaton.
3. Find the set of all states that can be obtained by starting in A by either processing "a", "b", or "c".
4. Calculate an equivalent DFA. Create a table whose rows are labelled by set of states obtained by calculating transitions and whose columns are labelled by the alphabet {a, b, c}. Calculate the states that are accessible from a state in the set by processing the character.
5. Draw the corresponding DFA.

Regular Expressions:

Decide whether the following strings are elements in the set defined by the regular expression $(001 + 100)^* + 0^*1$.

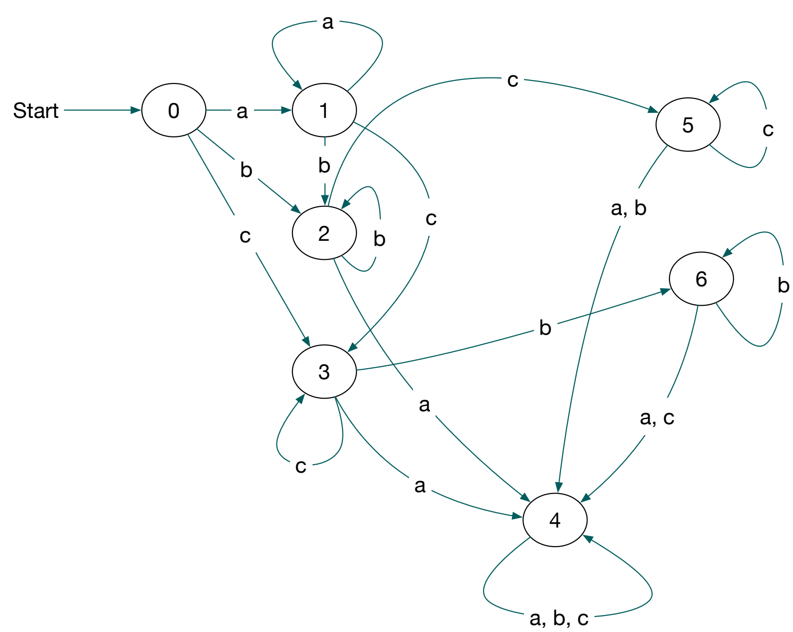
1. 001100
2. ϵ
3. 00001

4. 100000
5. 0001100

6. Create the DFA that corresponds to this regular expression.

Solutions — NFA

	a	b	c
{A} = 0	{A,B,C,D,E,F} = 1	{B,C,E,F} = 2	{C,D,E,F} = 3
{A,B,C,D,E,F} = 1	{A,B,C,D,E,F} = 1	{B,C,E,F} = 2	{C,D,E,F} = 3
{B,C,E,F} = 2	{ } = 4	{B,C,E,F} = 2	{C,F} = 5
{C,D,E,F} = 3	{ } = 4	{E,F} =6	{C,D,E,F} = 3
{C,F} =5	{ } = 4	{ } = 4	{C, F} = 5
{E, F} = 6	{ } = 4	{E, F} = 6	{ } = 4
{ } = 4	{ } = 4	{ } = 4	{ } = 4



Solutions — Regular Expressions

1. 001100 = 001 · 100 is part of the Kleene closure of $(001 + 100)^*$.

2. ϵ is also part of the Kleene closure of $(001 + 100)^*$.

3. 00001 is part of the Kleene closure of 0^*1.

4. 100000 cannot be part of the Kleene closure of 0^*1 because the string does not end with 1. If it is part of the Kleene closure of $(001 + 100)^*$, then the string needs to consist of the concatenation of strings of length 3, which is possible since it has length 6. But then $000 \in (\mathbf{100} + \mathbf{001})^*$, which cannot be because the string does not have a character 1 and the elements in the set all have one. Therefore, this string is not part of $(\mathbf{001} + \mathbf{100})^* + \mathbf{0}^*\mathbf{1}$.

5. 0001100 has length 7 and cannot therefore be in $(\mathbf{100} + \mathbf{001})^*$. It cannot be in $\mathbf{0}^*\mathbf{1}$ because the string has two characters 1.