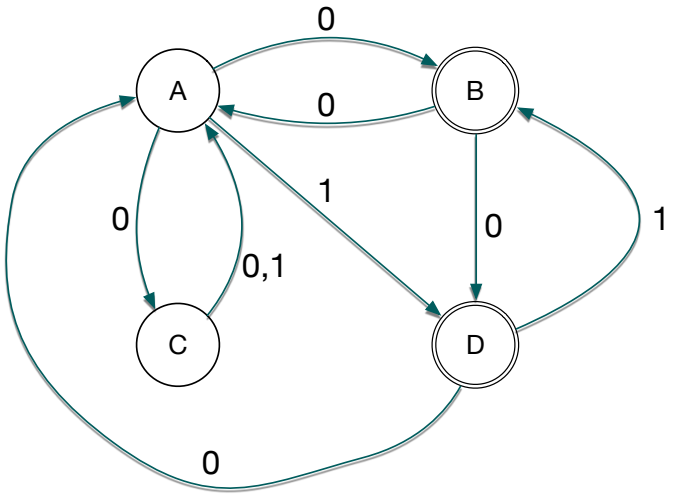
Worksheet 1

Create a DFA from the following NFA. The starting state is *A.*



Step 1: Create the transition function δ of the finite automaton. We create a table where we start with a set consisting only of the initial state. The first line gives the set of states reachable by A processing either a “0” or a “1”. On a “0”, we can transition from A to B or to C, giving us $\delta(\{A\},0) = \{B, C\}$.

δ	0	1
{A}	{B, C}	{D}

We then create two more rows for the new states {B, C} and {D} of the DFA. To calculate $\delta(\{B, C\},0)$, we look at possible transitions from B. There are two, leading to states D and A. In C, there is only one, namely a transition to A. Therefore, $\delta(\{B, C\},0) = \{A, D\}$. To calculate $\delta(\{B, C\},1)$, we see that there is no transition from B on 1, but there is a transition from C to A on 1. This gives us $\delta(\{B, C\}) = \{A\}$. We do the same to calculate the third row.

δ	0	1
{A}	{B, C}	{D}
{B, C}	{A, D}	{A}
{D}	{A}	{B}

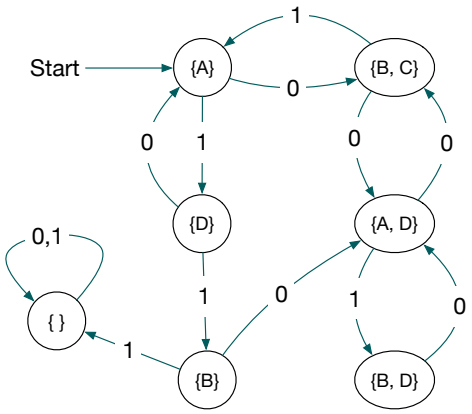
We now see that we have new states {A,D} and {B}. We add them to the table.

δ	0	1
{A}	{B, C}	{D}
{B, C}	{A, D}	{A}
{D}	{A}	{B}
{A,D}	{B, C}	{B,D}
{B}	{A, D}	{ }
{B,D}		
{ }		

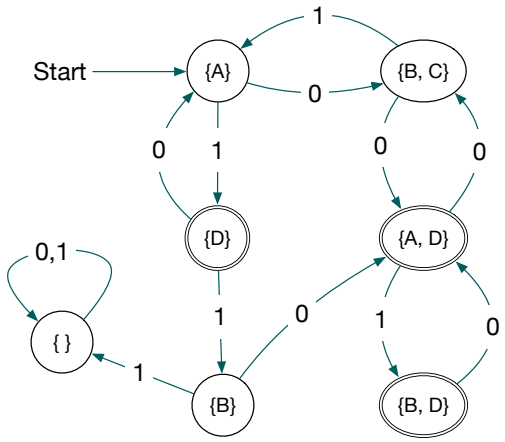
This gives us two more possible states for the DFA. We also add them to the table and calculate.

δ	0	1
{A}	{B, C}	{D}
{B, C}	{A, D}	{A}
{D}	{A}	{B}
{A,D}	{B, C}	{B,D}
{B}	{A, D}	{ }
{B,D}	{A, D}	{B}
{ }	{ }	{ }

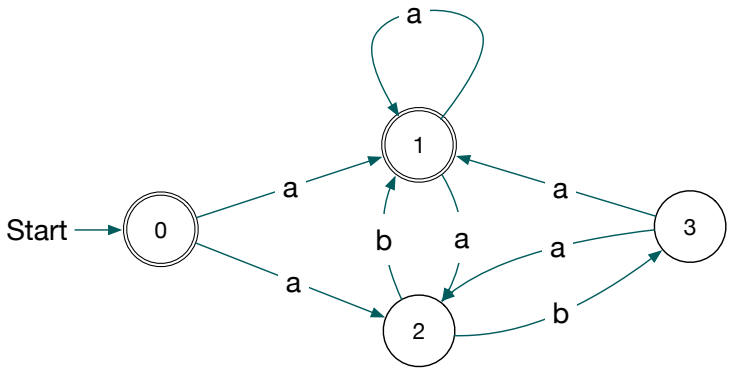
Since no more states are being generated, we can now generate the transition diagram.



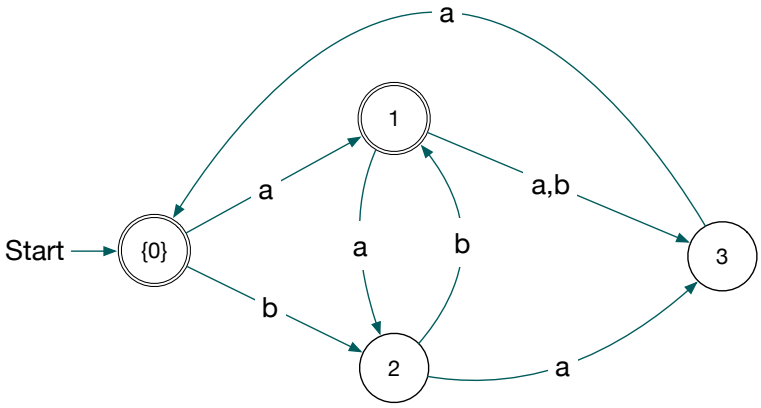
The final / accepting states are the ones that contain the one and only accepting state of the NFA, namely D. We put this into the transition diagram and are done.



Task 1: Convert the NFA below into a DFA.



Task 2: Convert the NFA below into a DFA



Solution for first task: