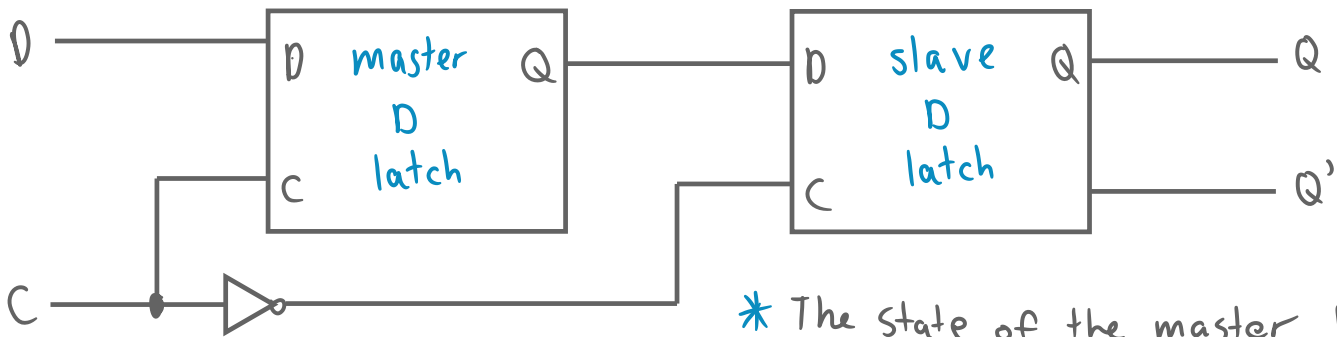


flip flop A

flip flop B

Each f/f must change state instantly at the same time, otherwise we might end up at the wrong state

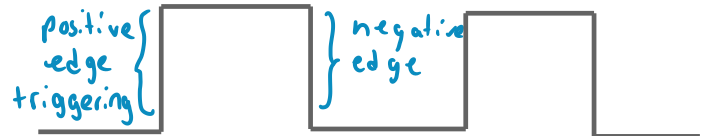
We can use a master-slave approach to make sure that changes propagate instantly.



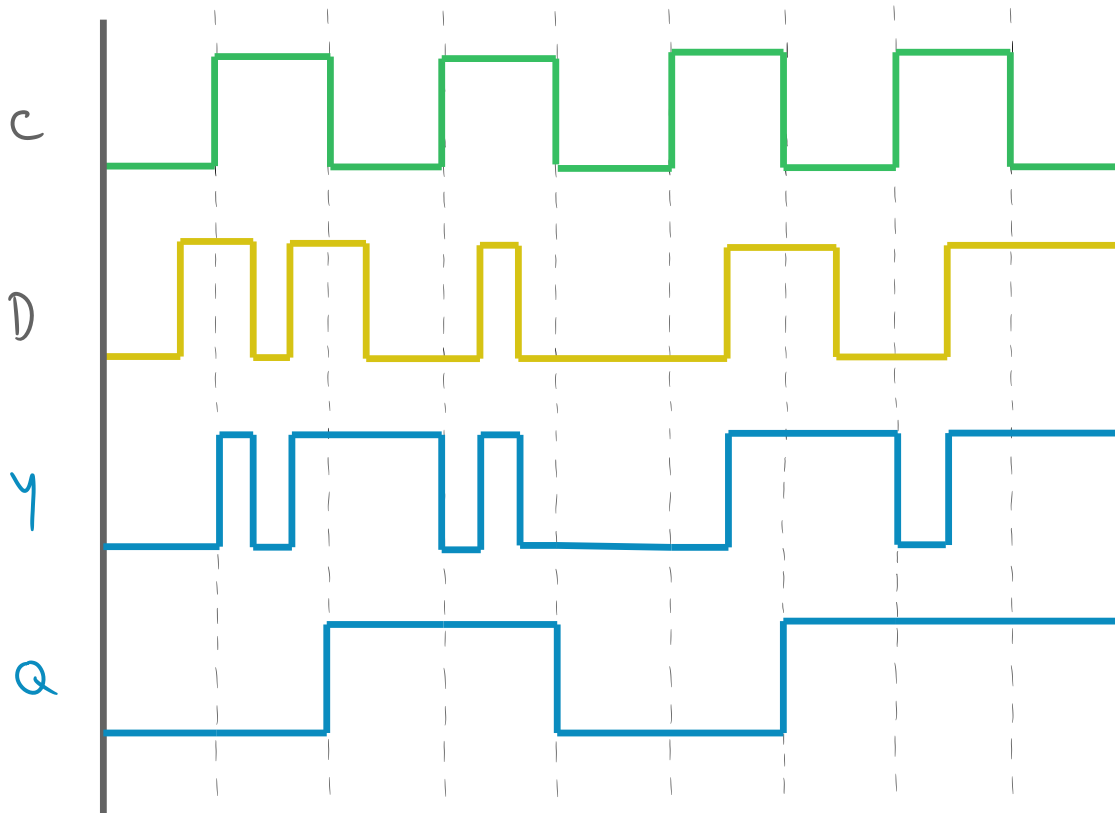
* The state of the master becomes the input of the slave

The clock behaves as such:

clock = 1	clock = 0
if D is 0,1,1,0,1,0,1	0,1,1,0,1,0,1
y becomes 0,1,1,0,1,0,1	1,1,1,1,1,1,1
Q: 0,1,1,0,1,0,1	1...
(no change)	



When D and C are 1 the state of the master becomes 1. The only way to change the value of the circuit (master) is for C to change from 1 to 0 (negative edge)



Given C and D, we can determine Y and Q by considering the following:

Y: output of the master f/f

Q: output of the slave f/f

Behavior of Y:

- When clock is 1, Y is a copy of D
- When clock is 0, Y doesn't change

Behavior of Q:

- When clock is 0, Q is a copy of Y
- When clock is 1, Q doesn't change

Design the clocked sequential circuit for the below specification using JK flip flops.

$0 \rightarrow 1$ by a 1
 $1 \rightarrow 2$ by a 0
 $2 \rightarrow 3$ by a 1
 $3 \rightarrow 0$ by a 1

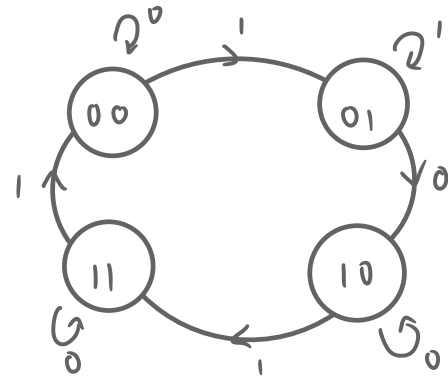
JK Excitation Table

$Q(t)$	$Q(t+1)$	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

(b) JK

Present State $Q(t)$		Input X	Next State $Q(t+1)$		f/f inputs			
A	B		A	B	J_A	K_A	J_B	K_B
0	0	0	0	0	0	X		
0	0	1	0	1	0	X		
0	1	0	1	0	1	X		
0	1	1	0	1	0	X		
1	0	0	1	0	X	0		
1	0	1	1	1	X	0		
1	1	0	1	1	X	0		
1	1	1	0	0	X	1		

K maps



J_A

$A \backslash B$	00	01	11	10
0				1
1	X	X	X	X

$J_A = BX'$

K_A

$A \backslash B$	00	01	11	10
0	X	X	X	X
1			1	

$K_A = BX$

J_B

$A \backslash B$	00	01	11	10
0				
1				

K_B

$A \backslash B$	00	01	11	10
0				
1				

$$J_A = Bx' \quad K_A = Bx$$

