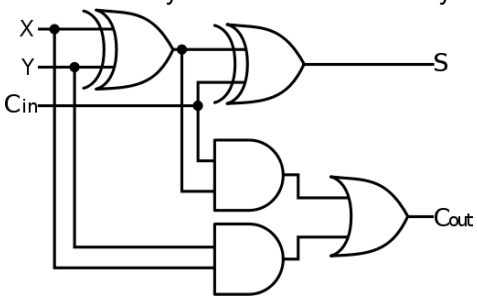
Low-Level Digital Components

Flip-Flop

- Has two stable states
- Can store information
- Also called a "Latch"

Full-Adder

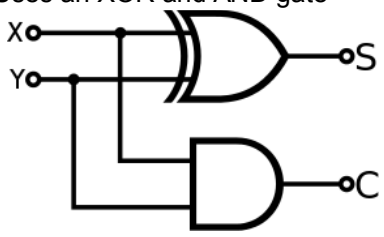
- Adds binary numbers and the carry



Inputs			Outputs	
X	**Y**	**C_{in}**	**C_{out}**	**S**
0	0	0	0	0
1	0	0	0	1
0	1	0	0	1
1	1	0	1	0
0	0	1	0	1
1	0	1	1	0
0	1	1	1	0
1	1	1	1	1

Half-Adder

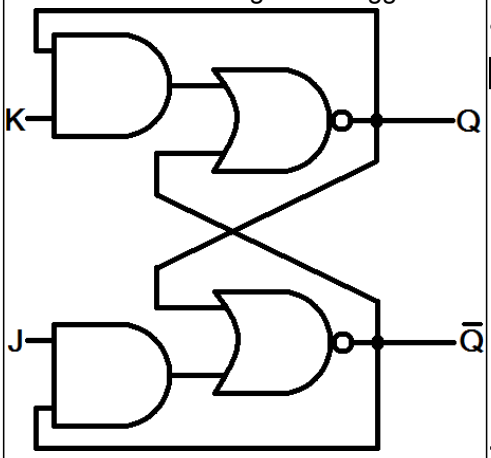
- Adds two single-digit binary numbers
- Outputs the sum and carry
- Uses an XOR and AND gate



Inputs		Outputs	
X	**Y**	**C**	**S**
0	0	0	0
1	0	0	1
0	1	0	1
1	1	1	0

JK Latch

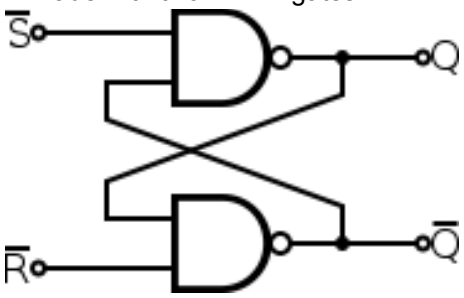
- An SR Latch designed to toggle



J	K	Result
0	0	No Change
0	1	Reset
1	0	Set
1	1	Toggle

$\overline{SR}$ NAND Latch

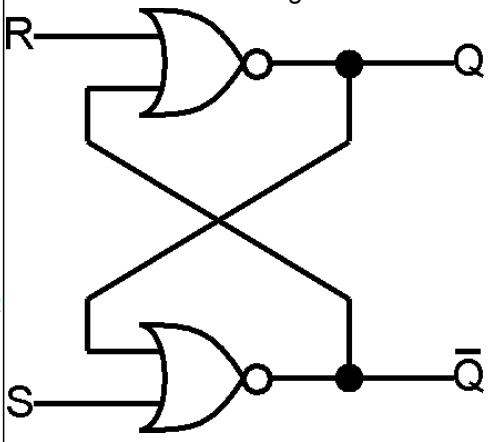
- Made with two NAND gates



$\bar{S}$	$\bar{R}$	Result
0	0	Not Permitted
0	1	Q=1
1	0	Q=0
1	1	Not Permitted

SR NOR Latch

- Most fundamental latch
- Made with two NOR gates



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