Six common logic gates

NOT gate

The NOT gate is the simplest because it has only one input signal. The NOT gate takes that input signal and outputs a signal with the opposite binary state. If the input signal is "on," a NOT gate outputs an "off" signal. If the input signal is "off," a NOT gate outputs an "on" signal. All the logic gates can be defined using a schematic diagram and truth table. Here's how this logic rule is often represented:

The NOT Gate

Schematic

Truth Table

Input A	Output
Off	On
On	Off

AND gate

The AND gate involves two input signals rather than just one. Having two input signals means there will be four possible combinations of input values. The AND rule outputs an "on" signal only when both the inputs are "on." Otherwise, the output signal will be "off."

The AND Gate

Schematic

Truth Table

Input A	Input B	Output
Off	Off	Off
Off	On	Off
On	Off	Off
On	On	On

OR gate

The OR gate involves two input signals. The OR rule outputs an "off" signal only when both the inputs are "off." Otherwise, the output signal will be "on."

The OR Gate

Schematic

Truth Table

Input A	Input B	Output
Off	Off	Off
Off	On	On
On	Off	On
On	On	On

XOR Gate

The XOR gate also involves two input signals. The XOR rule outputs an "on" signal when *only one* (but *not both*) of the inputs are "on." Otherwise, the output signal will be "off."

The XOR Gate

Schematic

Truth Table

Input A	Input B	Output
Off	Off	Off
Off	On	On
On	Off	On
On	On	Off

The truth tables for XOR and OR gates are very similar. The only difference is that the XOR gate outputs an "off" when both inputs are "on" while the OR outputs an "on." Sometimes you may hear the XOR gate referred to as an "exclusive OR" gate.

NAND gate

The NAND gate involves two input signals. The NAND rule outputs an "off" signal only when both the inputs are "on." Otherwise, the output signal will be "on."

The NAND Gate

Schematic

Truth Table

Input A	Input B	Output
Off	Off	On
Off	On	On
On	Off	On
On	On	Off

If you compare the truth tables for the NAND and AND gates, you may notice that the NAND outputs are the opposite of the AND outputs. This is because the NAND rule is just a combination of the AND and NOT rules: it takes the AND output and runs it through the NOT rule! For this reason, you might hear the NAND referred to as a "not AND" gate.

XNOR gate

Finally, consider the XNOR gate. It also involves two input signals. The XNOR rule outputs an "on" signal only when both the inputs are the same (both "On" or both "Off"). Otherwise, the output signal will be "off."

The XNOR Gate

Schematic

Truth Table

Input A	Input B	Output
Off	Off	On
Off	On	Off
On	Off	Off
On	On	On

The XNOR rule is another combination of two earlier rules: it takes the XOR output and runs it through the NOT rule. For this reason, you might hear the XNOR referred to as a "not XOR" gate.