Logic Functions:

Rule #1:

For the time being, set aside the Mil-Spec gate symbols. Leter, they will be much easier to understand, and will necessary to pass government tests.

Instead, use the Logic Symbols, with the Boolean Logic descriptions. The "dot" represents the "AND Function" (notice, I did not say And Gate), and the "plus" represents the"OR Function", which is the "Inclusive OR Function". There is a special reason for this, as there is a Boolean Algbraic process that can actujally be used for computer ananlysis, or even design of circuits.

Look at the AND Gate as an "ONLY" gate, and the OR Gate as an "ANY" gate. With either one, with only two inputs there are 4 possibilities, and every time we add a signal line, the possibilities double 2x, 2^2, 2^3, 2^4, 2^5) Therefore 5 inputs would have 32 possibilities, but with the AND Gate, there is still "ONLY" one (1) that would make the Gate Active

Rule #2:

Understand exactly what is required to make the gate to go "ACTIVE", to accomplish it's output "Functional" output. Most College Courses only deal with these with "Truth-Table-Analysis", which is to me like doing math, by counting on your fingers and toes.

When the gate does go "Active", does it drive the output High or drive the output Low. Secondly, when the Gate is NOT Active, does the output rest Low, or rest High, as this is an equally important consideration.

Rule #3:

The triangle you see here is **not** the Invertor. The triangle is an Amplifieer, and where-ever there is a"Bubble" (think "LOW"), that is an Inverter, whether it is either behind the Amplifier or in front of the Amplifier.

The same rule applies for any Gate that may have a "Bubble" at the output, or any Gate that may have one or more "Bubbles" at the Signal Inputs of the Gate.

The proper Boolean Description of an Inversion Process is a "BAR" over the respecive term, indicating the Boolean "NOT Function".

This is why an "AND" Gate with a Bubble output is called a "NAND" ("NOT-AND").

A Bubble on any of the Inputs indicates an "Boolean Inverted Data Input", again indicated by a Bar over the Data Description.

A Gate with both Inverted Inputs and an Inverted Output would have a "Double Bar" over the Output description.

Rule #4: "Forced vs Maybe Conditions"

Consider that with the "AND Gate", if only one input is True (High), nothing is declared yet to cause the Gate to become Active, therefore we call this input a "Maybe" condition, because "Only" when all the other Input(s) are also High, the Gate will become Active.

However, if any one of the Inputs are Low (False), it will Disable (Kill) the Gate, so that no matter what you do with the other Input(s), the Gtae will never become Active.

Now with the "OR Gate", if "Any" Input is True (High), it will cause the Gate to become Active, and no matter whether any other Inputs are set High or Low will have no impact on the Gate going active. However, if any one Input is set LOW, it will have no impact on anything else, therefore it would be a "Maybe" Condition.

Note that the "Operational Inputs" of AND vs OR are totally complimentary with each other in alll aspects.

Rule #5: "De-Morgan's Rule" "Gate-Transforms"

The books only deal with this issue with one paragraph. However, I spent one or two 6 hr days emphasizing the importance of this concept in the classroom, and more as time progressed.

Notice that with the OR Gate, that there is an interesting and revealing consideration: No matter how many inputs there are, when all the Outputs are evaluated, ***all but one*** become active. Therefore, observe that ONLY ONE is unique from the others (the ONLY ONE that was not Active).

Further investigation will reveal that a "Reverse-Process" will allow a "Fundamental Conversion" from one Gate Configuration (as a particular "Function") to be converted to another variety of a Gate Configuration to process as the identical "Function".

I.e. A "Bubbled Input NAND" is exactly the same "Function" as a "Basic OR".
A "Bubbled Input NOR" is exactly the same "Function" as a "Basic AND".

"Funk's Rule": "If you change everything, you haven't changed anything".

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