

Make Your Own Logical Operators

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The SAS base language provides just three logical operators: "not," "and" and "[inclusive] or." Many SAS users feel that this is a deficient set, as it lacks other possible logical comparisons, notably Exclusive Or. However, it is easily possible to program an Exclusive Or and all the other possible comparisons.

At the Victoria PNWSUG last year, I mentioned a method for programming an exclusive-or. Others of these shortcuts could be useful in various applications. This list can be created by using standard truth-table techniques from undergraduate computer science. The idea is to find a numerical comparison of zero (false) and one (true) that produces the result of the corresponding logical comparison.

Because missing and zero are both false but are not numerically equal to each other, and because all values other than missing or zero are true, these comparisons may only be correct when the only possible values for A and B are zero and one. This is always the case if A and B are themselves the results of logical expressions. If in doubt, substitute "A&1" for A, and "B&1" for B. Alternatively, you could substitute "^^A" for A, and "^^B" for B.

Each of the "logical comparisons" in Table 1 has a name in the philosophy of logic, which I

never studied. I think that $A=B$, for instance, is called "A is equivalent to B", and $A>B$ is called "A does not imply B".

EXAMPLES.

If you need to program "if A or B, but not both"—that is, "A exclusive-or B"—then by my method you should use:

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if a^=b;
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Suppose you need to code a subsetting IF to examine this condition: "Either both P and Q are less than R, or neither of them is." One could code this as:

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if p<r & q<r | p>=r & q>=r;
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However, I think it's more legible and will run better to use:

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if (p<r)=(q<r);
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This might be even more useful if any of P, Q or R are expressions instead of simple variables.

Table 1.

logical comparison	shortcut	longer equivalent
A exclusive-or B	$A \neq B$	(A or B) and not (A and B)
A and B are either both true or both false	$A=B$	(A and B) or (not A and not B)
A is true and B is false	$A>B$	A and not B
A is false and B is true	$A<B$	B and not A
A is true or B is false	$A \geq B$	A or not B
B is true or A is false	$A \leq B$	B or not A

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