An Alternate Way of Arranging Truth Table Calculations

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Epp, as do many other authors, presents examples of computation with truth tables as a table in which each column is headed by a partial formula – a part of the final result. Many students tend to make lots of calculation errors using that arrangement. Here, I'll show you an alternative way of arranging the calculation that some students find more systematic, and therefore, less error-prone. You may, of course, use whatever works best for you.

I'll illustrate this arrangement with an example, namely analysis of $(\sim p \wedge q) \wedge (p \vee \sim q)$

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
p	q	(~	p	∧	q)	∧	(p	∨	~	q)
T	T	F	T	F	T	F	T	T	F	T
T	F	F	T	F	F	F	T	T	T	F
F	T	T	F	T	T	F	F	F	F	T
F	F	T	F	F	F	F	F	T	T	F

The columns of the table are laid out as follows. On the left (in white), there is one column for each variable that appears in the expression. Under the variables, list systematically all possible combinations of truth values of the variables. If you have two variables, there will be $2^2 = 4$ rows; if there are three variables, there will be $2^3 = 8$ rows; etc.

The remainder of the table will contain one column for each variable and one column for each operator in the expression.

The first step is to copy the truth values for the variables from the white columns to the columns in the colored region where the variables occur. So the "p" column was copied to columns (2) and (6), and the "q" column was copied to columns (4) and (9).

Now we compute, paying close attention to operator precedence and the positions of parentheses:

- Compute column (1) by negating column (2).
- Compute column (8) by negating column (9).
- Compute column (3) by taking the AND of columns (1) and (4)
- Compute column (7) by taking the OR of columns (6) and (8)
- Finally, compute column (5) by taking the AND of columns (3) and (7). This is the final result.