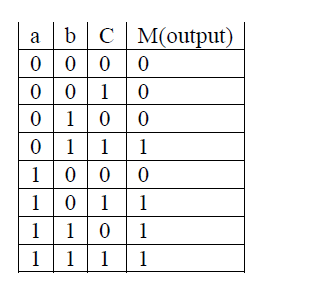
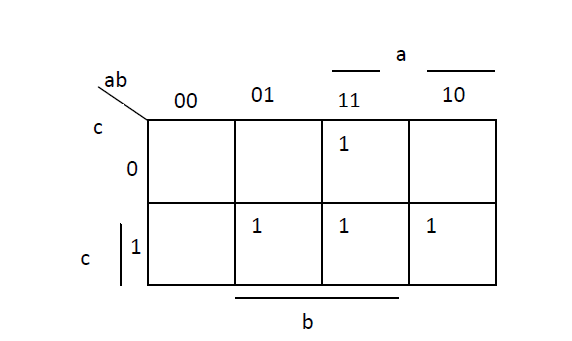
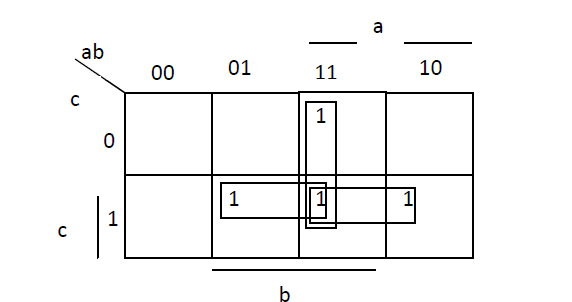
**Minimization of Boolean expressions using Karnaugh maps.**

Given the following truth table for the majority function.

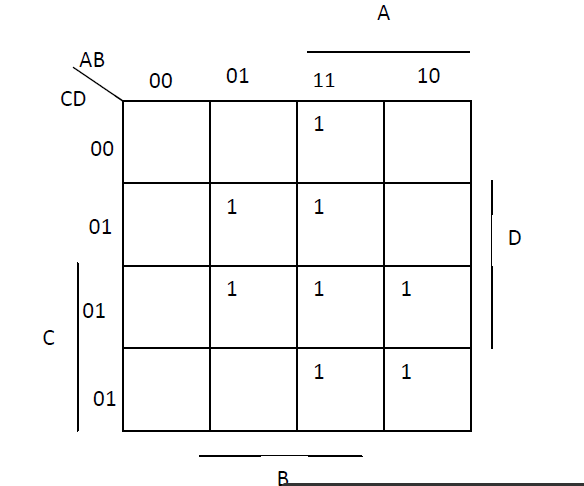


To use a Karnaugh map we draw the following map which has a position (square) corresponding to each of the 8 possible combinations of the 3 Boolean variables. The upper left position corresponds to the 000 row of the truth table, the lower right position corresponds to 101.

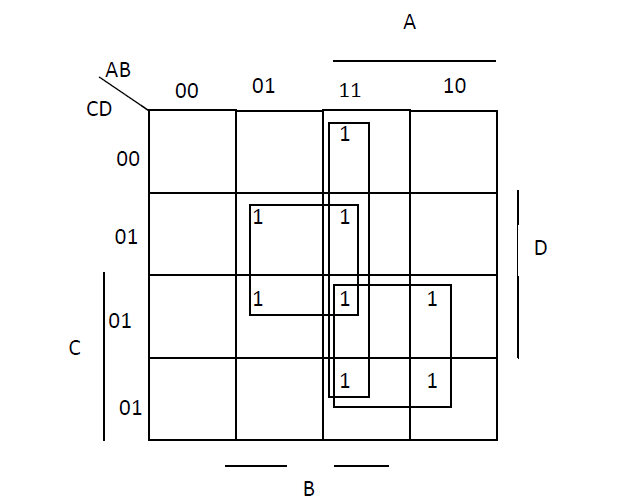




Now for 4 Boolean variables. The Karnaugh map is drawn as shown below.

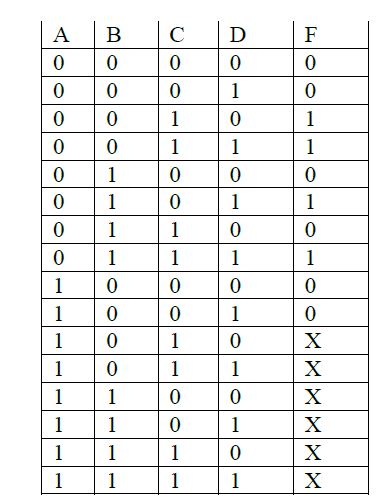


Grouping the 1s together results in the following.



**Don't Care condition**

Sometimes we do not care whether a 1 or 0 occurs for a certain set of inputs. It may be that those inputs will never occur so it makes no difference what the output is. For example, we might have a BCD (binary coded decimal) code which consists of 4 bits to encode the digits 0 (0000) through 9 (1001). The remaining codes (1010 through 1111) are not used. If we had a truth table for the prime numbers 0 through 9, it would be



F=A′B′CD′+A′B′CD+A′BC′D+A′BCD

The X in the above stand for "don’t care", we don't care whether a 1 or 0 is the value for that combination of inputs because (in this case) the inputs will never occur.

