Unit 1: Boolean algebra

Terminology

- TRUE will be represented by 1
- FALSE will be represented by 0
- Variables will be single letters e.g. A
- Logical operator OR will be + A+B represents A OR B
- Logical operator AND will be A.B represents A AND B
- Logical operator NOT will be an overbar Ā represents NOT A
- Logical operator XOR will be \oplus A⊕B represents A XOR B

Operation	Definition
OR	Takes two inputs and outputs 1 (true) if either is true
AND	Takes two inputs and outputs 1 (true) if both are true
NOT	Takes one input and outputs the opposite value
XOR	Takes two inputs and outputs 1 if only one of the inputs is true

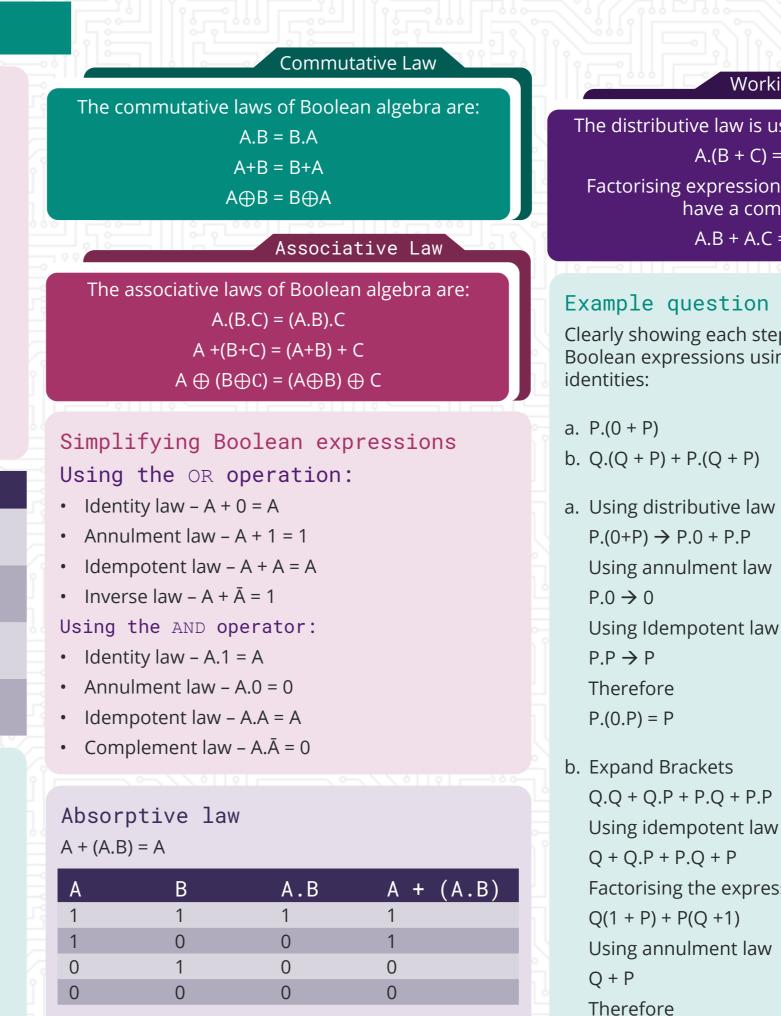
Order of precedence

There is an order of precedence for operations in Boolean algebra just like BIDMAS is used in mathematical algebra.

Order of precedence

The order of precedence is (highest first):

Brackets NOT XOR AND OR



The truth table shows that the final column is A Similarly, it can be shown that A.(A+B) = A

Working with brackets

The distributive law is used to expand brackets. A.(B + C) = A.B + A.CFactorising expressions can be done if terms

wjec cbac

have a common factor

A.B + A.C = A.(B + C)

Example question and solution

Clearly showing each step, simplify the following Boolean expressions using Boolean algebra and

[1] [4] Factorising the expression

Q.(Q + P) + P.(Q + P) = Q + P