

Computer Structure - Spring 2004

Axioms of Boolean Algebra

Course site: http://hyde.eng.tau.ac.il/Computer_Structure04

A Boolean Algebra is a triple $\langle B, +, \cdot \rangle$, where:

- B is a set.
- $+$ and \cdot are dyadic functions over B .

The functions $+$ and \cdot satisfy the following axioms:

1. **Commutativity:** For any two elements $a, b \in B$ the following holds:

- $a + b = b + a$
- $a \cdot b = b \cdot a$.

2. **Distributivity:** For any three elements $a, b, c \in B$ the following holds:

- $a + (b \cdot c) = (a + b) \cdot (a + c)$.
- $a \cdot (b + c) = a \cdot b + a \cdot c$.

3. **Existence of unity:**

- There exists an element in B denoted by 0 such that $\forall a \quad a + 0 = 0 + a = a$.
- There exists an element denoted by 1 such that $\forall a \quad a \cdot 1 = 1 \cdot a = a$.

4. **Inverse element:** $\forall a$ exists an element a' such that:

- $a + a' = 1$.
- $a \cdot a' = 0$.