Boolean Laws:

**Complement Law:**

A + A’ = ?

A . A’ = ?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | A’ | A + A’ | A . A’ |
| 1 | 0 | 1 | 1 | 0 |
| 2 | 1 | 0 | 1 | 0 |

A + A’ = 1, A . A’ = 0

**Idempotent Law:**

A + A = A

A . A = A

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | A | A | A + A | A . A |
| 1 | 0 | 0 | 0 | 0 |
| 2 | 1 | 1 | 1 | 1 |

**Identity Law & Dominance Law:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | 0 | 1 | A + 0 | A . 0 | A + 1 | A . 1 |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| 2 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
|  |  |  | Final Outcome | A | 0 | 1 | A |

**Commutative Law:**

A + B = B + A

A . B = B . A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A + B | B + A | A . B | B . A |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 1 | 1 | 1 | 0 | 0 |
| 3 | 1 | 0 | 1 | 1 | 0 | 0 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 |

**Associative Law:**

Homework

**Absorption Law:**

A . ( A + B ) = A

A + ( A . B ) = A

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A + B | A . ( A + B ) | A . B | A + ( A . B ) |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 | 0 | 1 | 1 | 0 | 0 | 0 |
| 3 | 1 | 0 | 1 | 1 | 0 | 1 |
| 4 | 1 | 1 | 1 | 1 | 1 | 1 |
|  |  |  | Outcome | A |  | A |

A . ( B + A ) = A

B + ( B . A ) = B

Simplification Law:

A . ( A’ + B ) = A . B

A + ( A’ . B ) = A + B

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A’ | A’ + B | A . ( A’ + B ) | A . B |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 2 | 0 | 1 | 1 | 1 | 0 | 0 |
| 3 | 1 | 0 | 0 | 0 | 0 | 0 |
| 4 | 1 | 1 | 0 | 1 | 1 | 1 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A’ | A’ . B | A + ( A’ . B ) | A + B |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 2 | 0 | 1 | 1 | 1 | 1 | 1 |
| 3 | 1 | 0 | 0 | 0 | 1 | 1 |
| 4 | 1 | 1 | 0 | 0 | 1 | 1 |

Distributive Law:

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

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

**Homework**

De-Morgan's Law

A, NOT( A ) = A’

B, NOT( B ) = B’

+, NOT( + ) = .

., NOT( . ) = +

( A . B ) ‘ = A’ + B’

( A + B )’ = A’ . B’

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A . B | ( A . B )’ | A’ | B’ | A’ + B’ |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 2 | 0 | 1 | 0 | 1 | 1 | 0 | 1 |
| 3 | 1 | 0 | 0 | 1 | 0 | 1 | 1 |
| 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | A | B | A + B | ( A + B )’ | A’ | B’ | A’ . B’ |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 |
| 2 | 0 | 1 | 1 | 0 | 1 | 0 | 0 |
| 3 | 1 | 0 | 1 | 0 | 0 | 1 | 0 |
| 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |