

### Boolean Algebra Rules

$$A + 0 = A$$

$$A + 1 = 1$$

$$A \times 0 = 0$$

$$A \times 1 = A$$

$$A + A = A$$

$$A + A' = 1$$

$$A \times A = A$$

$$A \times A' = 0$$

$$A'' = A$$

$$A + A'B = A + B$$

$$A + AB = A(1+B) = A(1) = A$$

$$(A+B)(A+C) = A+BC$$

$$A + B = B + A$$

$$AB = BA$$

$$A+B+C = A+(B+C)$$

$$A(B+C) = AB+AC$$

### Laws

Commutative Law  $A \times B = B \times A$

$$A + B = B + A$$

Associative Law  $A \times (B \times C) = (A \times B) \times C$

$$A + (B + C) = (A + B) + C$$

Distributive Law  $A \times (B + C) = A \times B + A \times C$

$$A + B \times C = (A+B)(A+C)$$

### DeMorgan Rules

$$(AB)' = A' + B'$$

$$(A+B)' = A'B'$$

$$Y' = A' \times B \times C$$

$$Y = (A' \times B \times C)'$$

$$Y = A \times B' \times C'$$

$$(A \times B \times C)' = A' + B' + C'$$

$$(A + B + C)' = A' \times B' \times C'$$

### Theorems

Theorem 1  $X + X \cdot Y = X$

Theorem 2  $X + X' \cdot Y = X + Y$

Theorem 3  $X \cdot Y + X' \cdot Z + Y \cdot Z = X \cdot Y + X' \cdot Z$

Theorem 4  $X(X + Y) = X$

Theorem 5  $X(X' + Y) = X \cdot Y$

Theorem 6  $(X + Y)(X + Y') = X$

Theorem 7  $(X + Y)(X' + Z) = X \cdot Z + X' \cdot Y$

Theorem 8  $(X + Y)(X' + Z)(Y + Z) = (X + Y)(X' + Z)$

### Binary & Gray Code

| Decimal numbers | Binary code | Gray code |
|-----------------|-------------|-----------|
| 0               | 0000        | 0000      |
| 1               | 0001        | 0001      |
| 2               | 0010        | 0011      |
| 3               | 0011        | 0010      |
| 4               | 0100        | 0110      |
| 5               | 0101        | 0111      |
| 6               | 0110        | 0101      |
| 7               | 0111        | 0100      |
| 8               | 1000        | 1100      |
| 9               | 1001        | 1101      |
| 10              | 1010        | 1111      |
| 11              | 1011        | 1110      |
| 12              | 1100        | 1010      |
| 13              | 1101        | 1011      |
| 14              | 1110        | 1001      |
| 15              | 1111        | 1000      |



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