

COE 202: Digital Logic Design
Combinational Logic
Part 1

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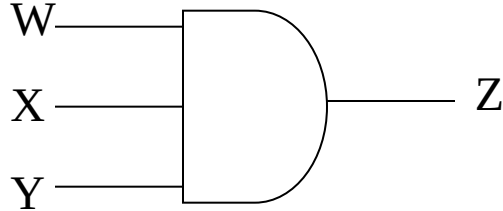
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3-input AND gate

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Truth Table for a 3 input AND gate



Note: For an n -input logic gate, the size of the truth table is 2^n

W	X	Y	Z
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Boolean Expression

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$$F(X, Y) = XY + Y'$$

variable operator literals

- A Boolean expression is made of Boolean variables and constants combined with logical operators: AND, OR and NOT
- A literal is each instance of a variable or constant.
- Boolean expressions are fully defined by their truth tables
- A Boolean expression can be represented using interconnected logic gates
 - Literals correspond to the input signals to the gates
 - Constants (1 or 0) can also be input signals
 - Operators of the expression are converted to logic gates
- Example: $a'bd + bcd + ac' + a'd'$ (4 variables, 10 literals, ?? gates)

Example

$$F = X \cdot (Y' + Z)$$

This function has three inputs X, Y, Z and the output is given by F

As can be seen, the gates needed to construct this circuit are: 2 input AND, 2 input OR and NOT

