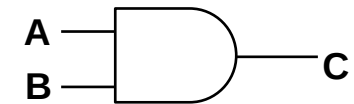


A New Kind of Algebra

	Regular Algebra	Boolean Algebra
Values	Numbers Integers Real Numbers Complex Numbers	Zero (0) One (1)
Operators	Add, Subtract Multiply, Divide Logarithm, etc.	AND OR Complement

• denotes AND



This is the definition of logical and:

$$0 \cdot 0 = 0$$

$$0 \cdot 1 = 0$$

$$1 \cdot 0 = 0$$

$$1 \cdot 1 = 1$$

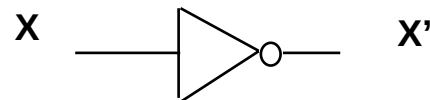
Looks like multiplication, but it is not

Prime (') denotes Complement or Invert

This is the definition of complement:

$$0' = 1$$

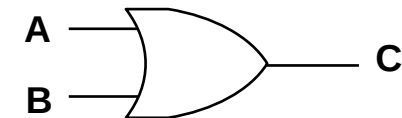
$$1' = 0$$



If $X = 1$ then $X' = 0$

If $X = 0$ then $X' = 1$

+ denotes OR



This is the definition of logical or:

$$0 + 0 = 0$$

$$0 + 1 = 1$$

$$1 + 0 = 1$$

$$1 + 1 = 1$$

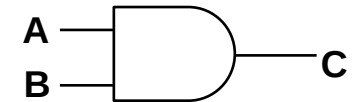
Looks like addition, but it is not

Truth Tables

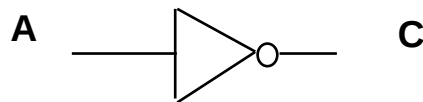
- A truth table provides a complete enumeration of the inputs and the corresponding output for a function.

If there are n inputs,
There will be 2^n rows
In the table.

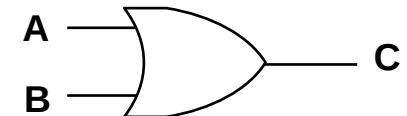
A	B	$C = A \cdot B$
0	0	0
0	1	0
1	0	0
1	1	1



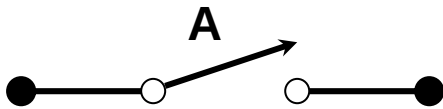
A	$C = A'$
0	1
1	0



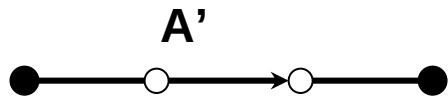
A	B	$C = A + B$
0	0	0
0	1	1
1	0	1
1	1	1



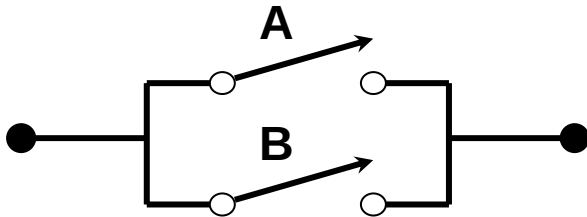
Digital Logic Using Switches



■ Connectivity if $A = 1$



■ Connectivity if $A = 0$



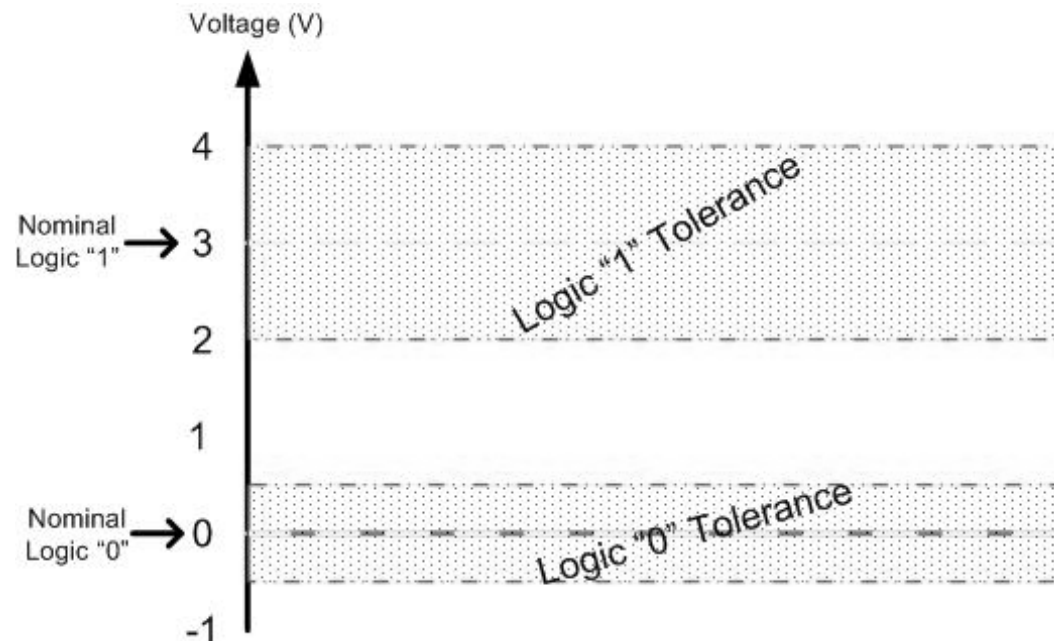
■ Connectivity if A or $B = 1$



■ Connectivity if A and $B = 1$

Binary Signals

- Electrical signals are used to change the state of electronic switches between the two states of conduction and nonconduction.
- An example is that the logical states of 1 and 0 can be represented by electrical voltages of +3 V and 0 V respectively, as shown in the binary signal representation below. Possible tolerance regions (noise margins) are indicated.



Binary Signals (cont.)

- Input output signals for logic gates may be represented in a signal waveform as shown.

