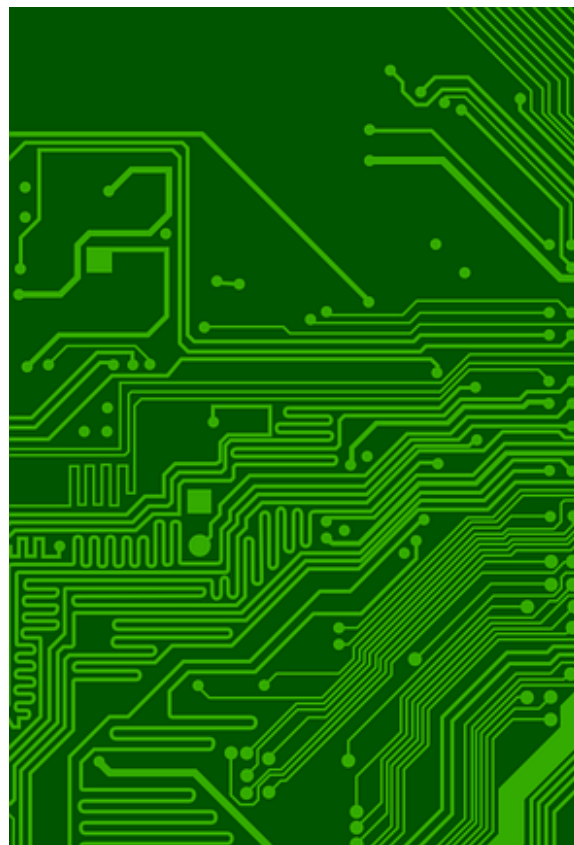


Some Background

- A computer's CPU is made up of millions of tiny switches called transistors.
- These switches can be either on or off.
- We therefore use binary to represent these switches, since a binary digit can be either 0 or 1.
- 0 represents a transistor which is off, 1 represents one which is on.

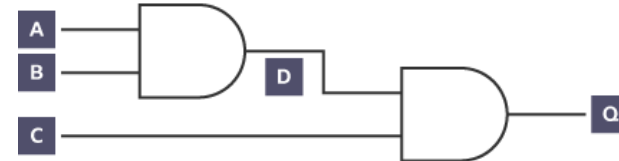
Truth Tables

- Used to show the output of logic gates or logic circuits.
- To create a truth table:
 - Calculate how many rows are needed (2^{number of inputs})
 - So 4 inputs would need 2⁴ = 16 rows
 - List the values for each input
 - Work through the diagram to complete the output for each possible input



Bringing It All Together

- Two or more logic gates are often used one after the other.
- This could be several of the same gate, or several different gates.
- This is known as a Logic Circuit.
- It is important to consider the order in which the gates are used.
- We can use diagrams and truth tables to represent these as shown below.



A	B	C	D	Q
0	0	0	0	0
0	0	1	0	0
0	1	0	0	0
0	1	1	1	0
1	0	0	0	0
1	0	1	0	0
1	1	0	0	0
1	1	1	1	1

2.4 – Boolean logic

The AND Gate

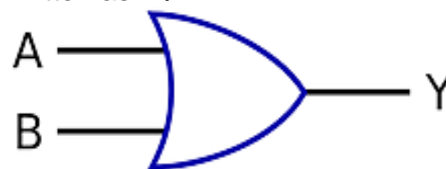
- Will output 1 if both A and B are 1.
- Will output 0 if either A or B is 0.
- Written as $A \wedge B$



A	B	$A \wedge B$
0	0	0
0	1	0
1	0	0
1	1	1

The OR Gate

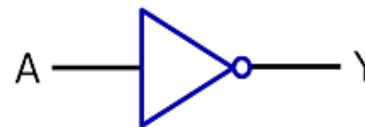
- Will output 1 if either A or B are 1
- Will output 0 if both A and B are 0
- Written as $A \vee B$



A	B	$A \vee B$
0	0	0
0	1	1
1	0	1
1	1	1

The NOT Gate

- Has a single input
- Inverts the input (1 becomes 0 and 0 becomes 1)
- Written as NOT A



A	NOT A
0	1
1	0

Key Terms

- **Logic Gate** – components which compare one or more inputs based on a logical function to provide a single output.
- **Logic Diagram** – a diagram showing one or more logic gates.
- **Transistor** – components contained in the CPU which can be either on or off.
- **Truth Table** – a table representing the possible outputs of a logic gate or diagram
- **Logic Circuit** – two or more logic gates used together one after the other
- **Binary** – a number system containing two symbols, 0 and 1. Also known as Base 2