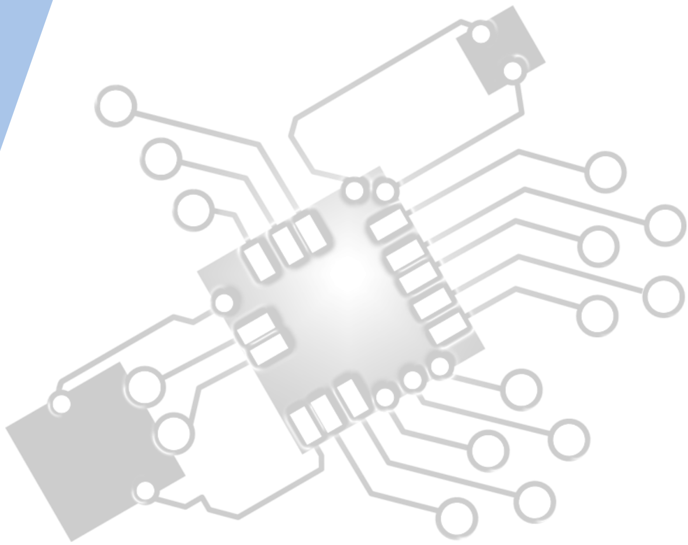
Computer Organisation

IB Computer Science



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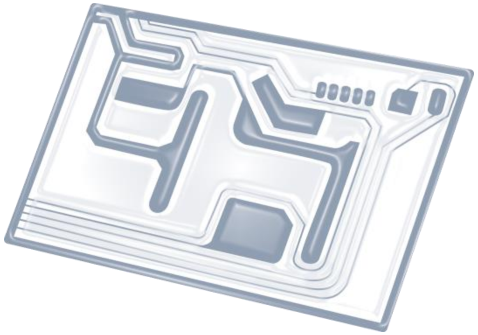
HL Topics 1-7, D1-4



1: System design

2: Computer Organisation

3: Networks

4: Computational thinking

5: Abstract data structures

6: Resource management

7: Control

D: OOP

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HL & SL 2 Overview

Computer architecture

2.1.1 Outline the architecture of the central processing unit (CPU) and the functions of the arithmetic logic unit (ALU) and the control unit (CU) and the registers within the CPU

2.1.2 Describe primary memory. 2 Distinguish between random access memory (RAM) and read-only memory (ROM), and their use in primary memory

2.1.3 Explain the use of cache memory

2.1.4 Explain the machine instruction cycle

Secondary memory

2.1.5 Identify the need for persistent storage

Operating systems and application systems

2.1.6 Describe the main functions of an operating system

2.1.7 Outline the use of a range of application software

2.1.8 Identify common features of applications

Binary representation

2.1.9 Define the terms: bit, byte, binary, denary/decimal, hexadecimal

2.1.10 Outline the way in which data is represented in the computer

Simple logic gates

2.1.11 Define the Boolean operators: AND, OR, NOT, NAND, NOR and XOR

2.1.12 Construct truth tables using the above operators

2.1.13 Construct a logic diagram using AND, OR, NOT, NAND, NOR and XOR gates

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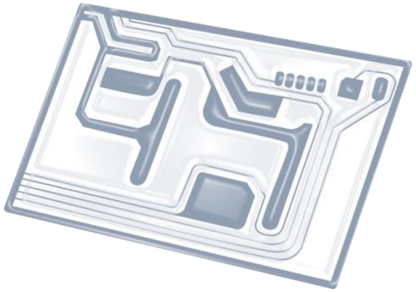
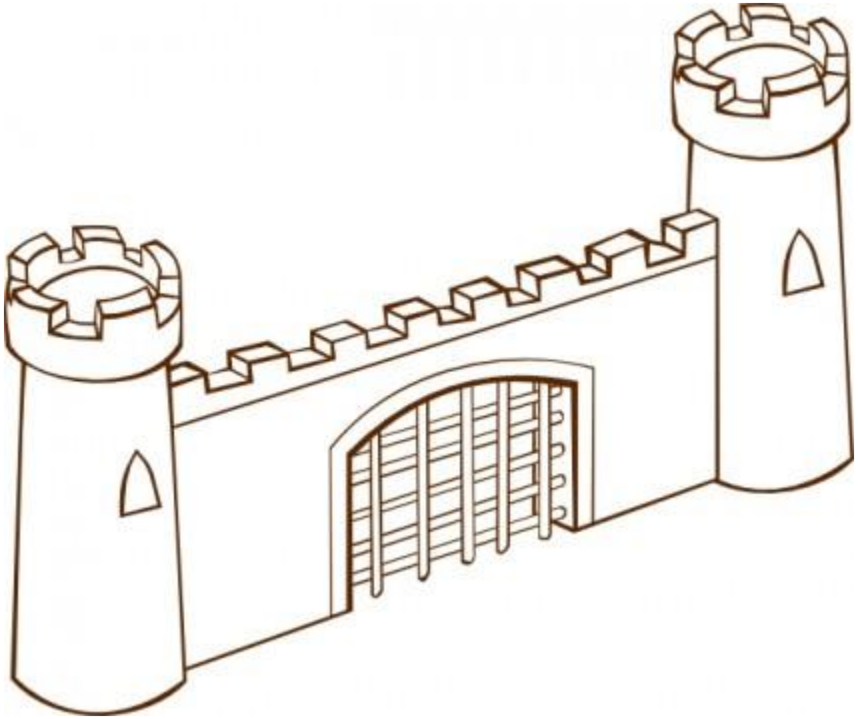
Topic 2.1.11

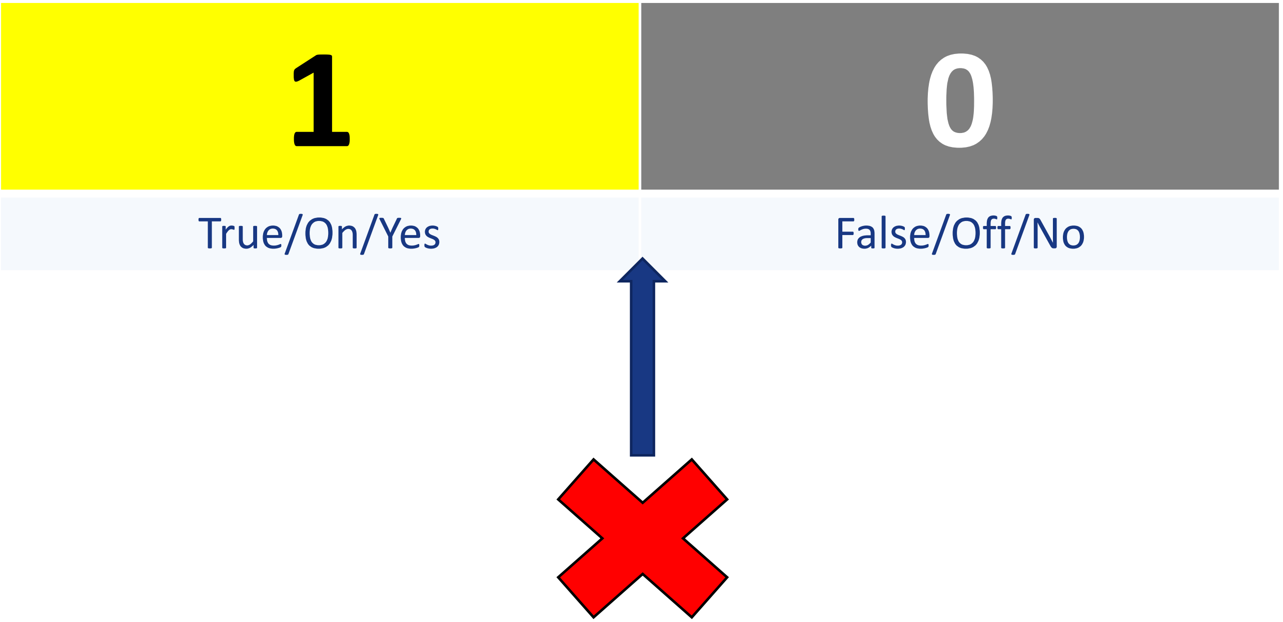
Define the Boolean operators: **AND**, **OR**, **NOT**, **NAND**, **NOR** and **XOR**





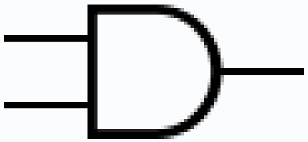
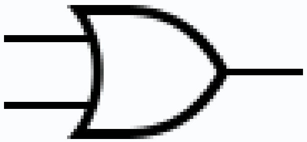
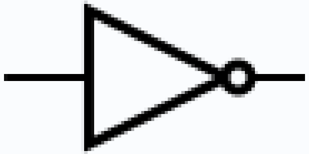
What is logic?

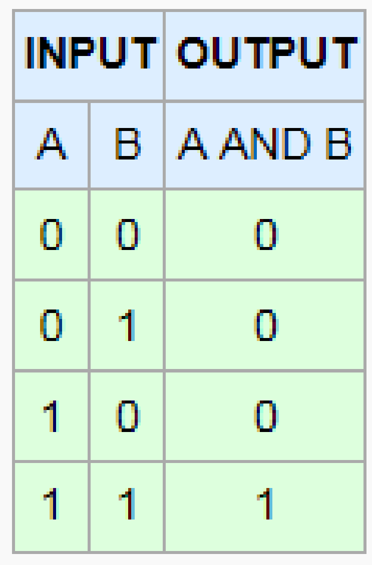
- Its how a machine will solve problems.
- Machines (at basic level) do not understand semantics like humans – no grey areas.



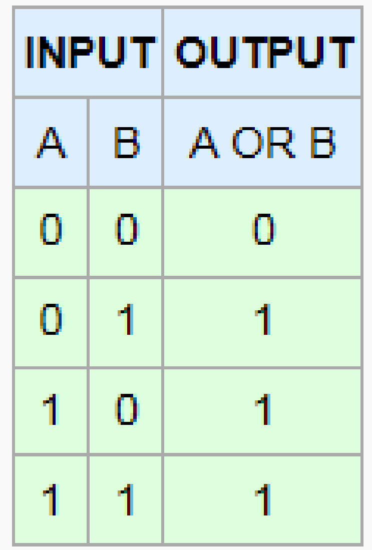
1	0
True/On/Yes	False/Off/No

The Basic 3 gates

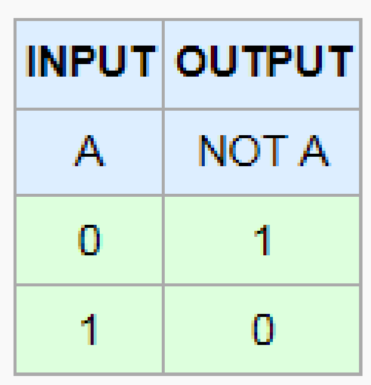
AND	OR	NOT
		



INPUT		OUTPUT
A	B	A AND B
0	0	0
0	1	0
1	0	0
1	1	1

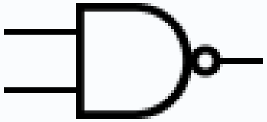
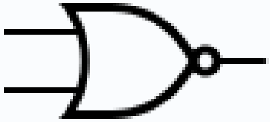
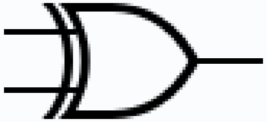


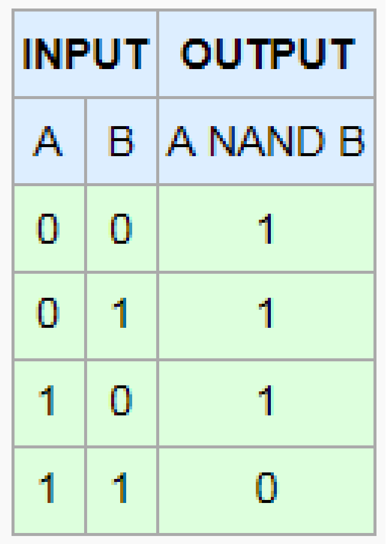
INPUT		OUTPUT
A	B	A OR B
0	0	0
0	1	1
1	0	1
1	1	1



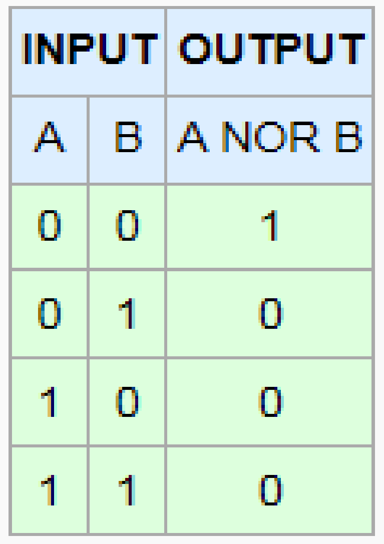
INPUT	OUTPUT
A	NOT A
0	1
1	0

The Further 3 gates

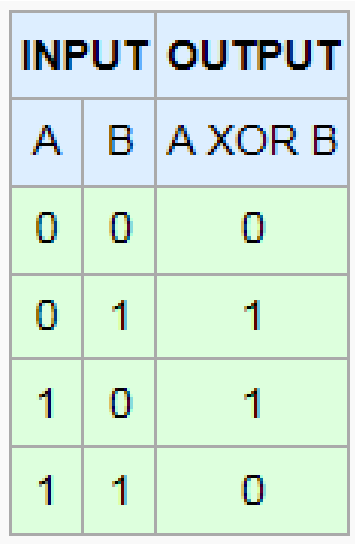
NAND	NOR	XOR
		



INPUT		OUTPUT
A	B	A NAND B
0	0	1
0	1	1
1	0	1
1	1	0

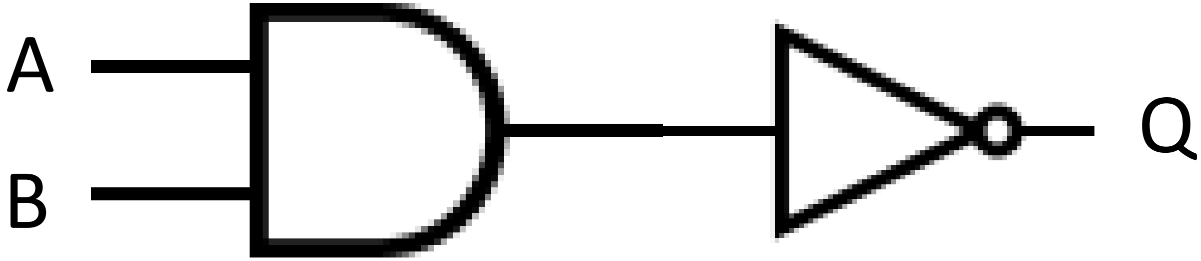


INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0



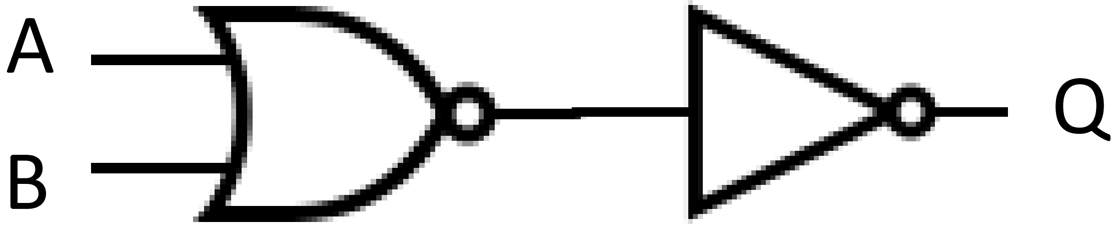
INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Combining gates



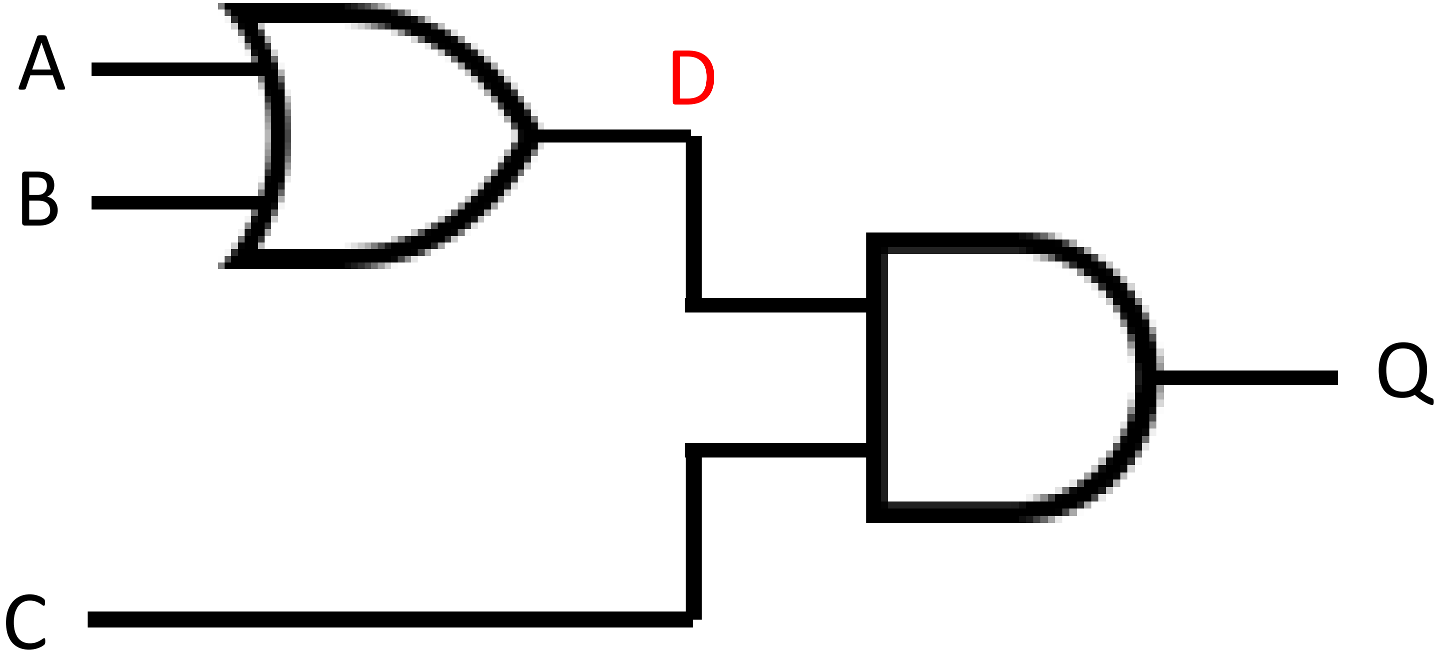
Q = NOT (A AND B)

Combining gates



Q = NOT (A NOR B)

Combining gates

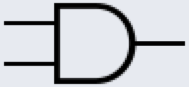
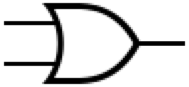
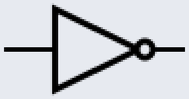
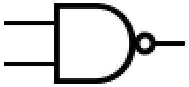
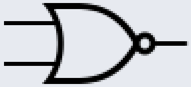
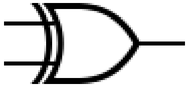


Q = C AND (A OR B)

In Reality?

Where can we find these gates in reality?

Common uses:

Gate	Example
	Fire alarm: Smoke (1) AND heat (1)
	Internal car light: Either door open (1)
	Microwave will stop (0) if the door is open (1). Vice versa….
	Security system is engaged up until both the correct code and ID are scanned, then it disengages.
	Air conditioning: AC will only come on (1) if BOTH windows A and B are closed. (0)
	2 light switches in one corridor