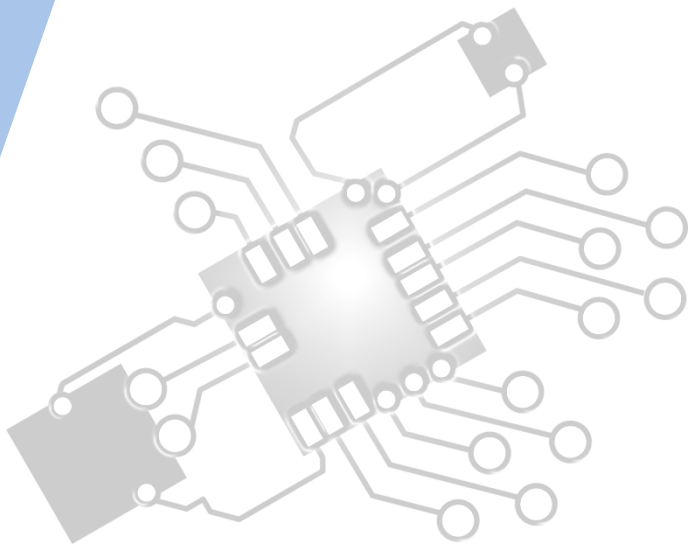
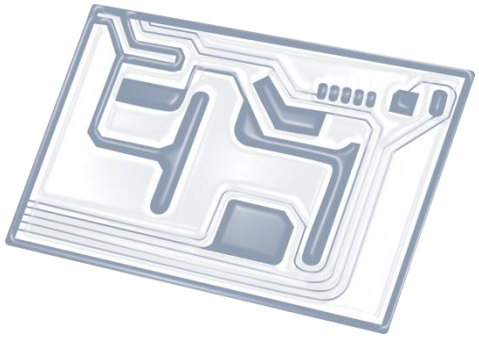
Computer Organisation

IB Computer Science



Content developed by
Dartford Grammar School
Computer Science Department

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

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

1: System design

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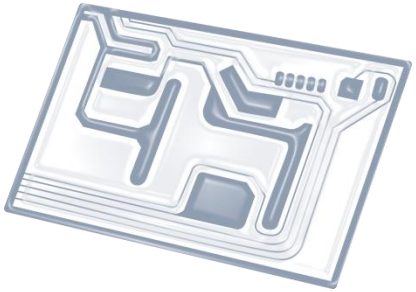
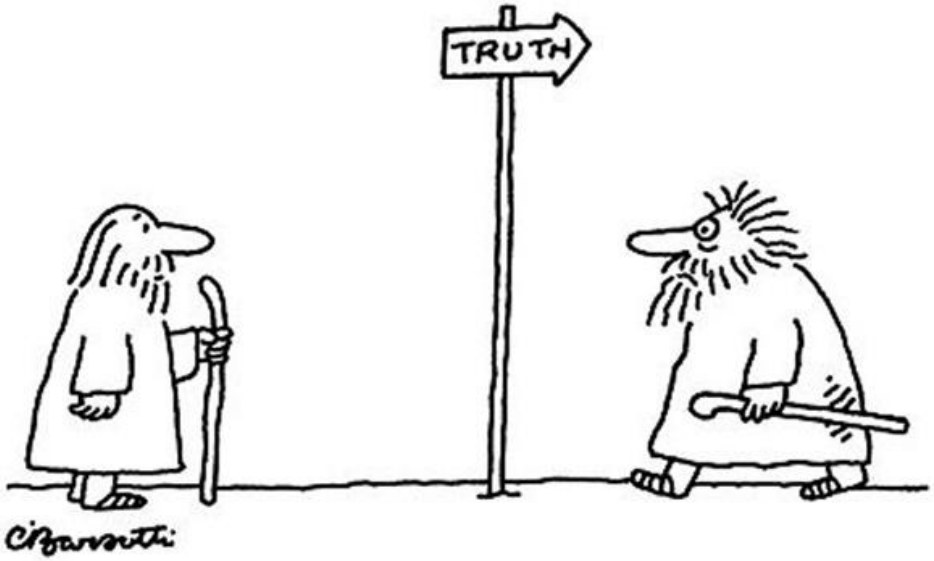


Topic 2.1.12

Construct **truth tables** using **AND**, **OR**, **NOT**, **NAND**, **NOR** and **XOR**



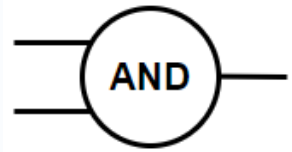
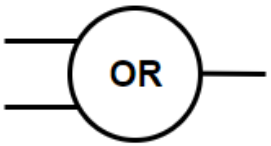
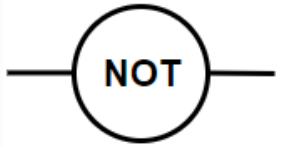
Truth table = All possible combinations

It is a mathematical table that shows **all possible outcomes** that would occur from all possible scenarios that are considered factual (i.e. **is true**), hence the name.

It contain values like **T/F** or **TRUE/FALSE** or **1/0**…

P	Q	P and Q
T	T	T
T	F	F
F	T	F
F	F	F

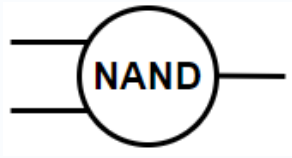
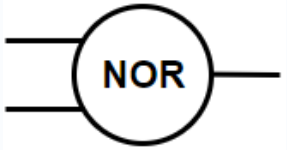
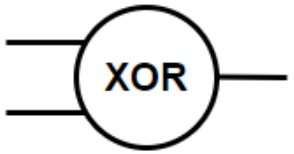
Inputs		Output
A	B	X
0	0	0
0	1	1
1	0	1
1	1	0

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

NAND	NOR	XOR
		

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

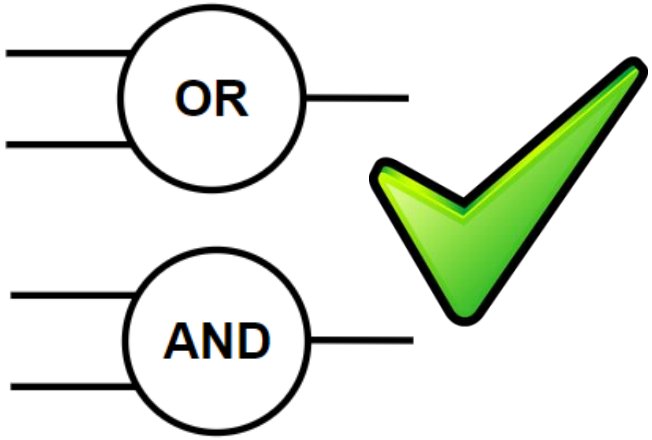
INPUT		OUTPUT
A	B	A NOR B
0	0	1
0	1	0
1	0	0
1	1	0

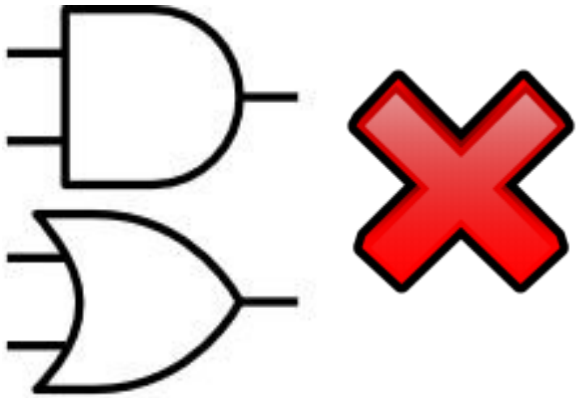
INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Exam note!

The IB uses their **own symbols** for logic gates, not the British Standard ones you'll find on the web.

All exams & mark schemes will only ever contain the ones highlighted in the official pseudo code guidance booklet





Know the 6 basic tables

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

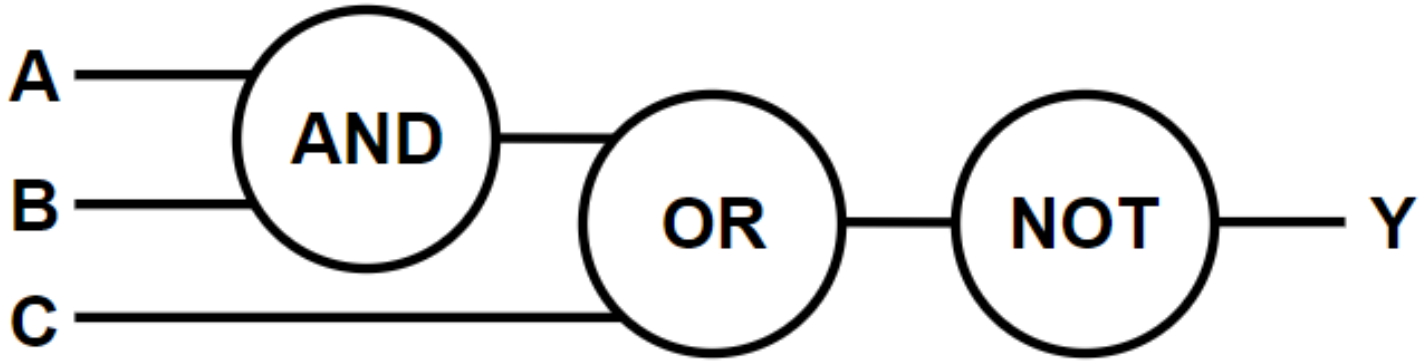
INPUT	OUTPUT
A	NOT A
0	1
1	0

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

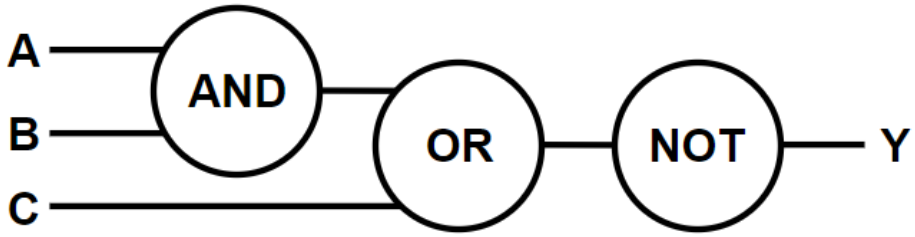
INPUT		OUTPUT
A	B	A XOR B
0	0	0
0	1	1
1	0	1
1	1	0

Multiple gate truth table



A	B	C	A and B	not C	A.B or C'	not (A.B or C')	Y

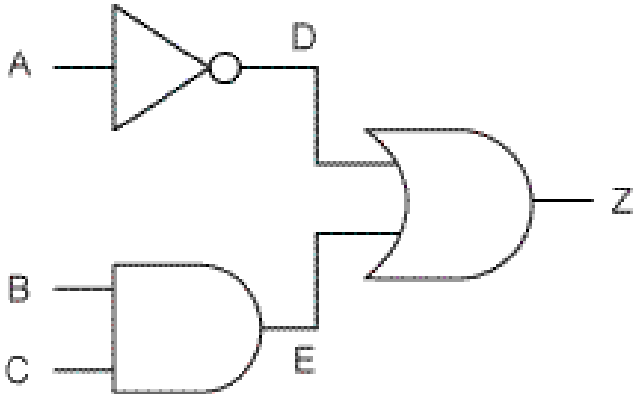
How many combinations do we ned to test in the table?

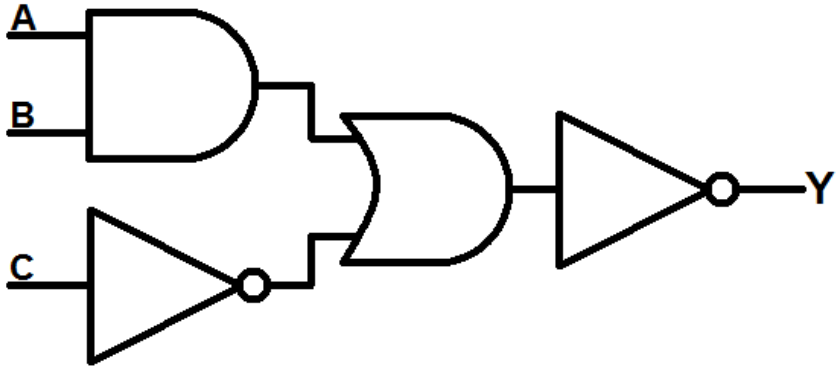


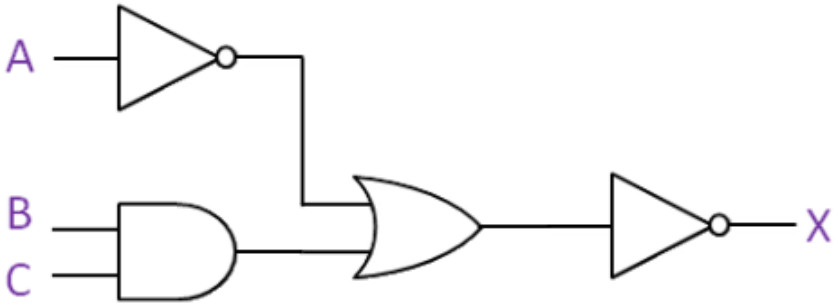
A	B	C	A and B	not C	A.B or C’	not (A.B or C’)	Y
0	0	0	0	1	1	0	0
0	0	1	0	0	0	1	1
0	1	0	0	1	1	0	0
0	1	1	0	0	0	1	1
1	0	0	0	1	1	0	0
1	0	1	0	0	0	1	1
1	1	0	1	1	1	0	0
1	1	1	1	0	1	0	0

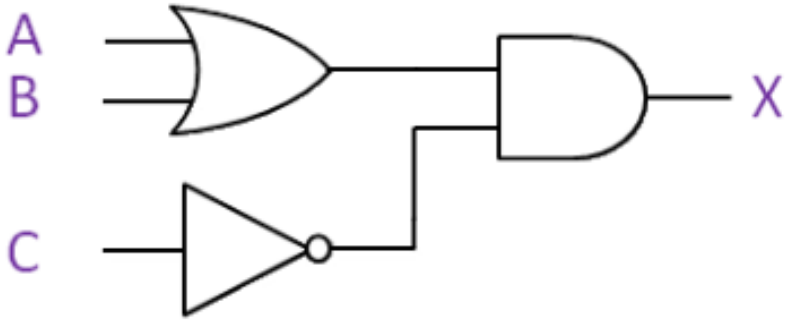
Practice on these*

*Look up the symbols if you need to



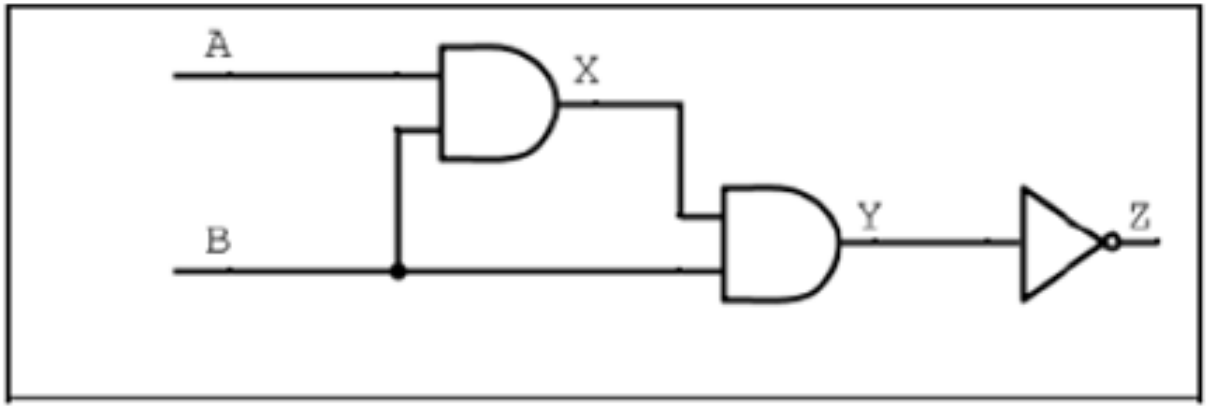






Very basic exam type question

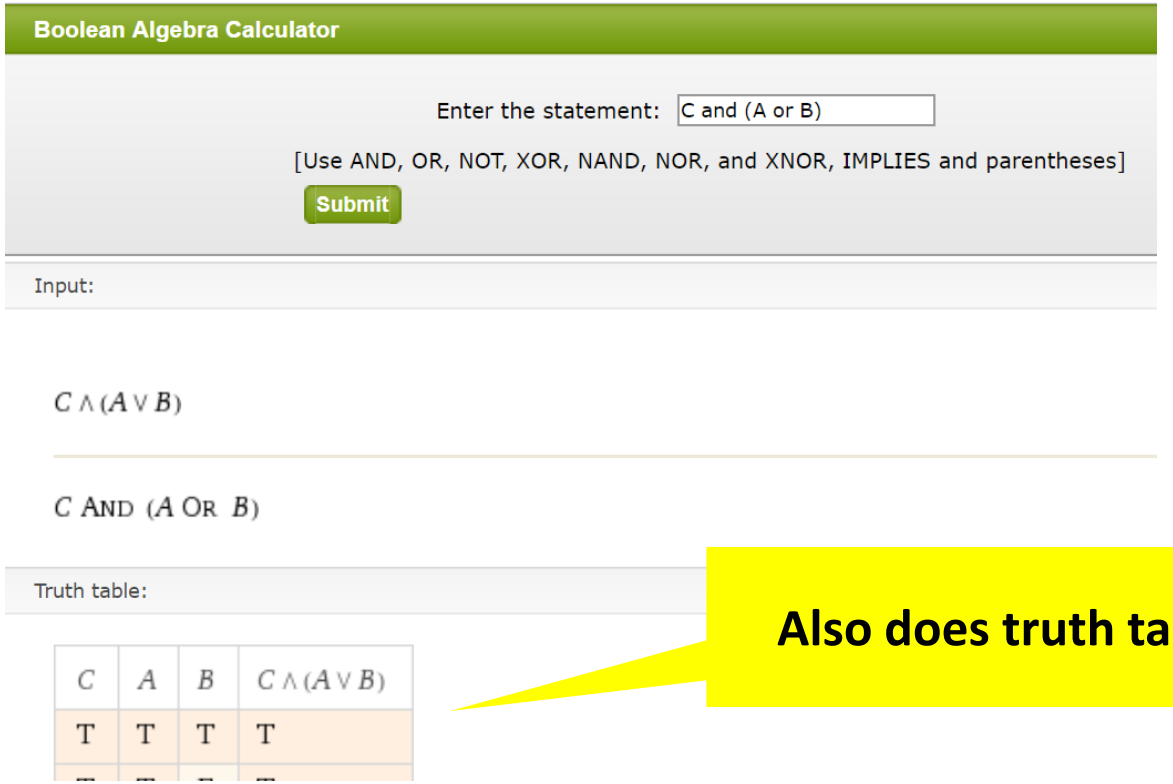
(b) Complete the truth table for the logic circuit shown in the figure below.



A	B	X	Y	Z
0	0			
0	1			
1	0			
1	1			

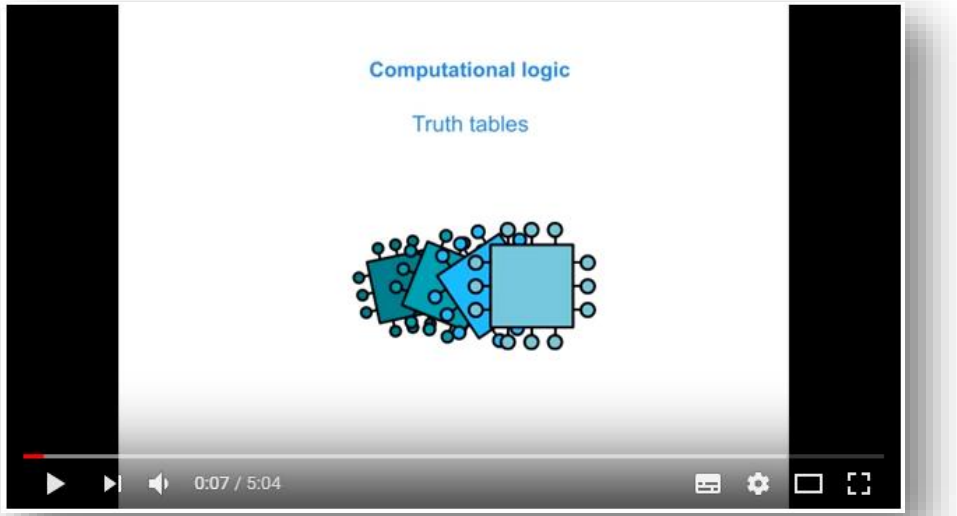
Useful tool: Wolfram Alpha

Wolfram Alpha Boolean Algebra Calculator



Also does truth tables!

Video link: Truth Tables



Here is a video that explains how to approach truth tables.

*Please note it **does not use** IB symbols!*

https://youtu.be/N5VBSWRRdUw