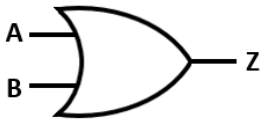
Computational Logic

AND

Both inputs must by positive to get a positive result

A	B	Z
0	0	0
0	1	0
1	0	0
1	1	1

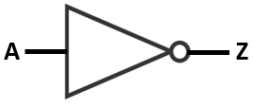
OR



At least one input must by positive to get a positive result

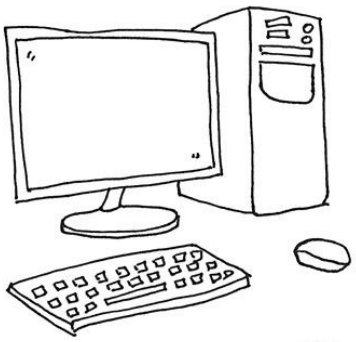
A	B	Z
0	0	0
0	1	1
1	0	1
1	1	1

NOT



The output is the opposite of the input

A	Z
0	1
1	0

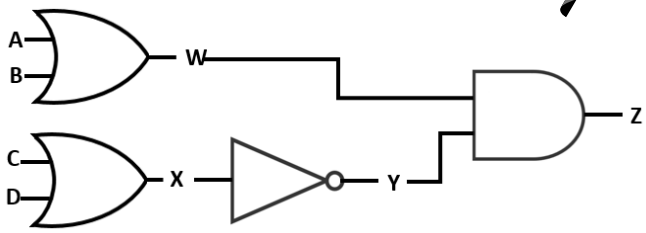


TRUTH TABLES

Create a column for each input needed and use binary counting to populate it with data (i.e. if there are 4 inputs you need 4 input columns). In this example we will use binary counting with 4 bits to fill the table, 0000, 0001, 0010, 0011 etc. Create a column for each output (i.e. if there are 4 logic gates used, there will be 4 outputs) and label each input and output column with a different letter of the alphabet.

Work out each output column using the correct input columns, in this example W (an OR gate) would only be using inputs A and B. Continue until all columns have been populated.

COMBINING LOGIC GATES



Shorthand

When writing logic problems, shorthand is often used to represent AND, OR and NOT.

A AND B = A ^ B

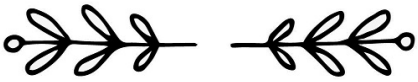
A OR B = A ˅ B

NOT A = ¬ A

Inputs				Outputs			
A	B	C	D	W	X	Y	Z
0	0	0	0	0	0	1	0
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	0
0	0	1	1	0	1	0	0
0	1	0	0	1	0	1	1
0	1	0	1	1	1	0	0
0	1	1	0	1	1	0	0
0	1	1	1	1	1	0	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	0
1	1	0	0	1	0	1	1
1	1	0	1	1	1	0	0
1	1	1	0	1	1	0	0
1	1	1	1	1	1	0	0

Computing-related Mathematics

Addition **+** (3 + 4 = 7)
Subtraction **-** (12 - 3 = 9)
Multiplication ***** (3 * 4 = 13)
Division / (100 / 4 = 25)
Exponentiation (to the power of) **^** (10 ^ 3 = 1000)
Whole number division **DIV** (13 DIV 5 = 2)
Remainder after whole number division **MOD** (13 MOD 5 = 3)



Computational Logic

Revise it

Read through the handout and then select a revision technique from those described in this section, you can even do more than one if you want!

Highlight

Highlight key words (maximum of 2 per sentence) and then cover the page and try to write down all the key words you can remember. Go back and fill in all the ones you have missed.

Mind map

Using the handout, draw a mind map and include as many colours, images and diagrams as you can to illustrate it

Post-it notes

Write a key word and the definition on a post-it note and stick them around your study area as a reminder of the terminology.

Record your notes

Re-write the handout in your own words and record yourself using your phone as you read your notes aloud.

Bullet Points

Write the main headings (leaving space between each) and then write bullet points of the main key points you need to remember under each heading. Re-read the handout and add any missed points to your list.

TEST YOURSELF

Cover your notes and the answer before you attempt to answer this practice exam question.

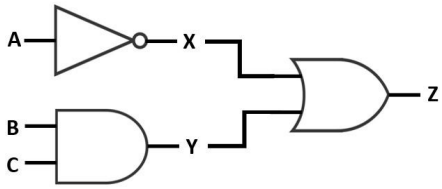
Draw the logic circuit and a truth table for (¬ A) v (B ^ C) [8 marks]

Mark your answer

Give a maximum of three points for the logic circuit and a maximum of 5 points for the truth table using the points below as a guide

Logic circuit:

- Input a going into a NOT gate
- Inputs B and C going into an AND gate
- The output of the two other gates going into an OR gate



Truth table:

- Three input columns created and correctly labelled
- Input data filled in (ideally using binary counting)
- An output column showing correct data for NOT A
- An output column showing correct data for B AND C
- And output column showing the final results of the two output columns using OR logic.

A	B	C	X (NOT A)	Y (B AND C)	Z (X OR Y)
0	0	0	1	0	1
0	0	1	1	0	1
0	1	0	1	0	1
0	1	1	1	1	1
1	0	0	0	0	0
1	0	1	0	0	0
1	1	0	0	0	0
1	1	1	0	1	1