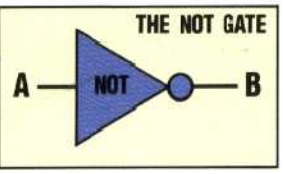
The OR gate can be described by the following statement: 'The output will be 1 if either or both of the inputs are 1'. The Boolean expression for the output from an OR gate is A+B.

Unlike AND and OR, the NOT gate has only one input and one output. The truth table is the simplest of the three:

A	B
0	1
1	0

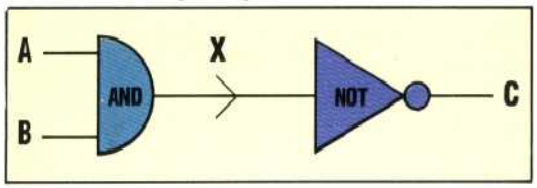
THE NOT GATE



In words, the NOT gate is expressed as: 'the output will be the opposite of the input'. The Boolean expression for the output from a NOT gate is $\overline{A}$.

COMBINING LOGIC GATES

Just as several logical statements can be linked together, we can link together logic gates to make combinational and sequential logic circuits. These are in turn combined to produce the computer architecture. Any logic circuit can be represented by a truth table that describes what output can be expected for any possible combination of inputs. Look at this simple logic circuit:

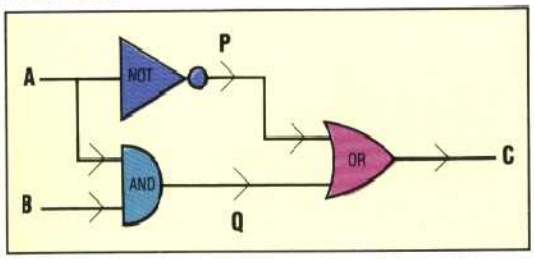


In this circuit there are two inputs, A and B, and one output, C. To help to construct the truth table for the circuit the output from the first gate has been labelled X. As there are two inputs to the circuit this means that there are four possible combinations of input.

A	B	X	C
0	0	0	1
0	1	0	1
1	0	0	1
1	1	1	0

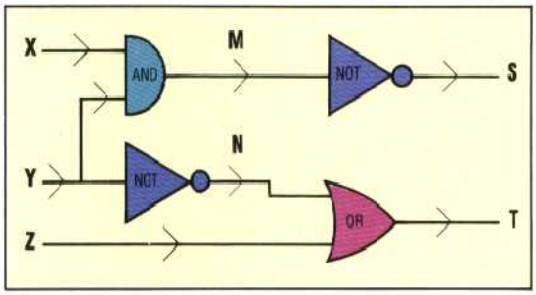
The output from the AND gate, X, is put through the NOT gate to produce the final output, C.

Here is a more complicated circuit and its truth table. Notice that, as there are only two inputs, the number of possible input combinations is still four. The second half of this truth table (columns P, Q and C) is a rearrangement of part of an OR gate truth table.



A	B	P	Q	C
0	0	1	0	1
0	1	1	0	1
1	0	0	0	0
1	1	0	1	1

The use of truth tables is not limited to two input and one output circuits but can be extended to any circuit. Here is an example of a three input, two output circuit.



As there are three inputs to this circuit we must consider eight possible combinations:

X	Y	Z	M	N	S	T
0	0	0	0	1	1	1
0	0	1	0	1	1	1
0	1	0	0	0	1	0
0	1	1	0	0	1	1
1	0	0	0	1	1	1
1	0	1	0	1	1	1
1	1	0	1	0	0	0
1	1	1	1	0	0	1

EXERCISE 1

1) Construct a truth table for the following situation: 'James may drive a car if he has passed his driving test OR he is accompanied by a qualified driver'.

2) Construct a truth table for this situation: 'A program can be loaded into a computer if there is a cassette player OR a disk drive available AND the program is NOT written to run on a different computer'.

3) Construct a truth table for this logic circuit: