2.4 BOOLEAN LOGIC

2.4.1 BOOLEAN LOGIC

Simple logic diagrams using the operators "AND", "OR" AND "NOT"
Truth tables
Combining Boolean operators using "AND", "OR" and "NOT"
Applying logical operators in truth tables to solve problems

Computers are made up of circuits containing millions of switches. As electrical switches have two possible values (**ON** or **OFF**) , these values can be represented using binary values **1** or **0**.

Each circuit contains logic gates and **BOOLEAN LOGIC** is used to evaluate the results of different combinations of 1's and 0's.

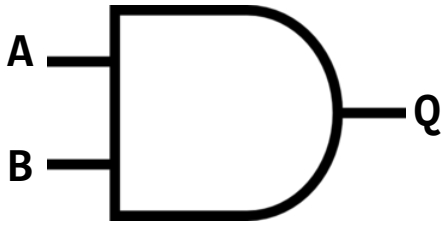
There are a number of different logic gates which produce different results when they receive inputs (1's and 0's.)

The possible values for each gate can be represented using a **TRUTH TABLE.**

An **AND** gate has two possible inputs - **'A'** and '**B'**

'Q' are the possible outputs

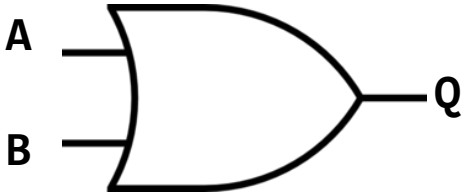
AND gate



A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

An **OR** gate has two possible inputs – **'A'** and **'B'**

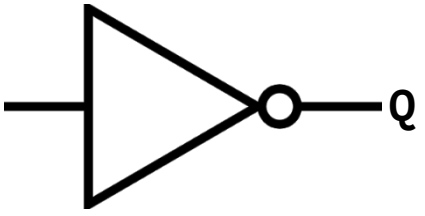
OR gate



A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

A **NOT** gate has a single input – **'A'**

NOT gate

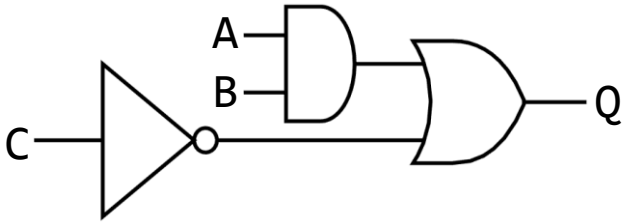


A	Q
0	1
1	0

REVISION NOTE

There are a number of additional gates used in Boolean logic, but only knowledge of AND, OR and NOT is required at GCSE level.

Logic gates can be combined to create complete circuits. These can also be represented using truth tables. The circuit below is made up of three gates:



This an also be represented as a Boolean expression:

(A AND B) OR (NOT C)

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

REVISION NOTE

You need to be able draw a truth table for a given circuit. You also need to be able to represent a circuit as a Boolean expression