# Logic Gates

Logic gates are electronic circuits that perform Boolean functions.

* Use the Atanua file ‘StarterGates.atanua’ to help you complete the table below.

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| **Logic gate symbol** | **Name** | **The output is TRUE when** | **The output is FALSE when** |
| AND.emf | AND | Both inputs are working | One or neither of the inputs are working |
| OR.emf | OR | One or both inputs are working | Neither of the inputs are working |
| XOR.emf | XOR | The inputs are not the same | The inputs are the same |
| NOT.emf | NOT | When input if not ‘on’ | When input is ‘on’ |
| NAND.emf | NAND | When one of the inputs is “off” | When both inputs are “on” |
| NOR.emf | NOR | When neither input is “on” | When at least one input is ‘on’ |

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| **NOT AND OR XOR NAND NOR** |

* Answer questions 6, 7, 8 & 9 from page 143 of AQA Computing AS (Bond & Langfield)

**Logic gate challenges:**

1. (a) Set up a circuit with two switches, two logic gates and two bulbs so that so that the number of bulbs that are on is the same as the number of switches that are on. In other words:

* when both switches are off both bulbs are off,
* when either switch is on one bulb is on,
* when both switches are on both bulbs are on.

1. Draw a diagram of the logic circuit.
2. Create a circuit for each of the following:
3. When both switches are on both bulbs are on, the rest of the time - both bulbs are off.
4. When both switches are off both bulbs are on, the rest of the time - both bulbs are off.
5. When both switches are off both bulbs are off, when one switch is on both bulbs are on, when both switches are on one bulb is on.
6. (a) Create a simple binary adding machine. There should be three binary input buttons (a, b and c) each of which can be 0 or 1 and two output lights to represent the units and twos in binary number. The number of buttons pressed should be represented by the output lights as a binary number.
7. Draw a diagram of the logic circuit.

