

Keywords

Logic Gate, Transistor, Bit (Binary Digit), Logic Circuit,
AND, OR, NOT (Inverter), $A \wedge B$, $A \vee B$, $\neg A$

Computational Logic

Binary and Logic Gates

Task



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Objectives

BEGINNER:
Explain why data needs to be in binary form.

ADVANCED:
Draw diagrams and create truth tables for the AND, OR and NOT gates.

EXPERT:
Draw Logic Circuits and Truth Tables for 2nd Level Logic Circuits.

Q1

What is binary?

Binary is the representation of the 'presence' of electricity.

If present or 'on' we use a: 1

If absent or 'off' we use a: 0

We can use this idea to change 1 and 0 states through the use of logic gates. Logic Gates take inputs and convert them to an output.

Used to change bits and perform calculations within a computer.

Created by using transistors.

There are 3 basic logic gates are AND, OR, NOT.

Every logic circuit can be made up from these 3 logic gates.

Q2

Can you explain the AND, OR, NOT logic gates?



AND Gate



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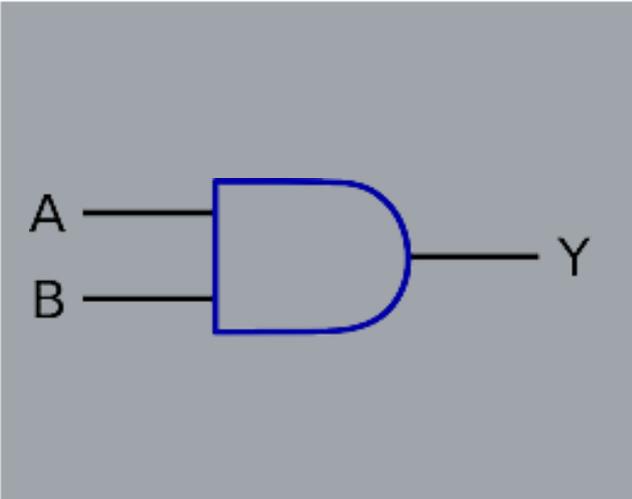
Objectives

BEGINNER:
Define the term
key stakeholder.

ADVANCED:
Understand how
key stakeholders
are affected by
technology.

EXPERT:
Recognise and
discuss issues
related to
Environmental,
Cultural, Morals
& Ethics.

Only has an output of 1 if both A AND B are 1.
We write this as: $A \wedge B$

	A	B	$A \wedge B$ or Y
	0	0	0
	0	1	0
	1	0	0
	1	1	1

C O M P U T E R

S C I E N C E

OR Gate

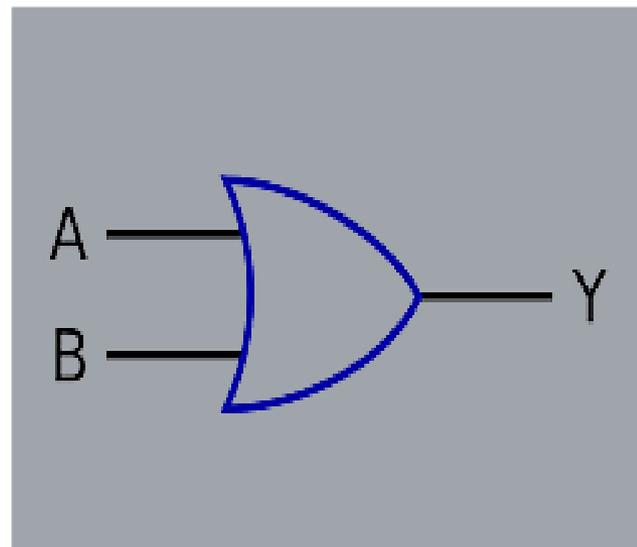
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Has an output of 1 if either of A OR B are 1
We write this as: $A \vee B$



A	B	$A \vee B$ or Y
0	0	0
0	1	1
1	0	1
1	1	1

NOT Gate

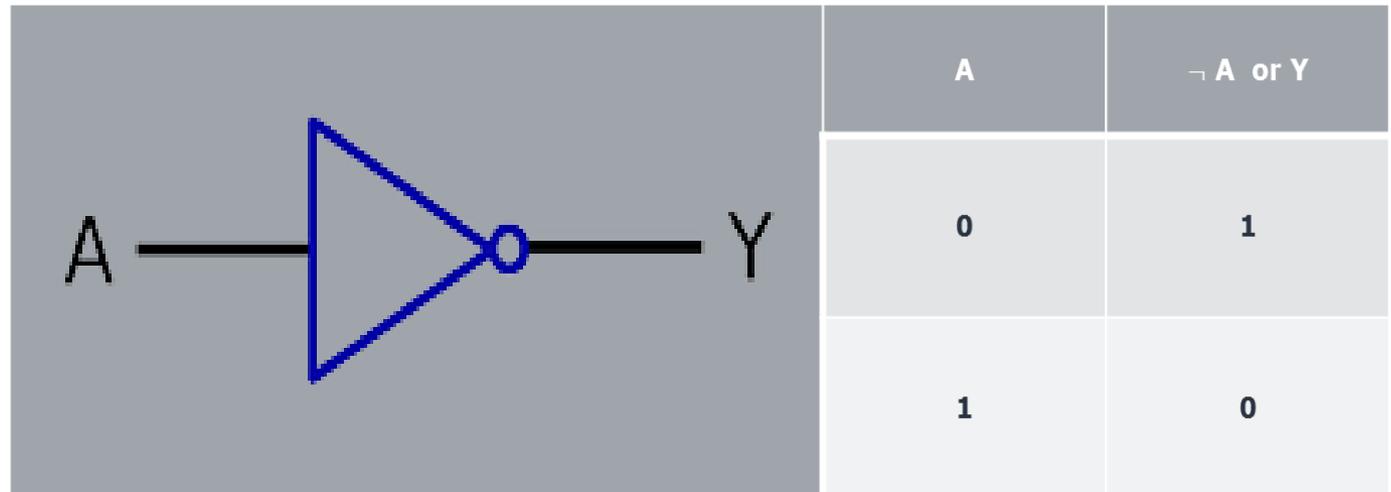
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Has an 1 input only
It **INVERTS** or swaps the input
We write this as: $\neg A$



**What
are truth
tables?**

The output of Logic Gates can be shown through a Truth Table. The Truth Table shows what an output will be, based on the inputs. You will need to know the basic truth tables. You will need to be able to construct a truth table from a logic statement.



Creating a Truth Table

Objectives

BEGINNER:

Define the term key stakeholder.

ADVANCED:

Understand how key stakeholders are affected by technology.

EXPERT:

Recognise and discuss issues related to Environmental, Cultural, Morals & Ethics.

1. Work out number of rows needed
Number of Rows = $2^{(\text{number of inputs})}$

For complex statements you may need 8 or 16 rows.

2. Set up 1 and 0s in columns
Do this simply by counting up in binary.

3. Complete the table.

TASK

Create the Truth Table for the following:

$A \wedge (B \vee C)$



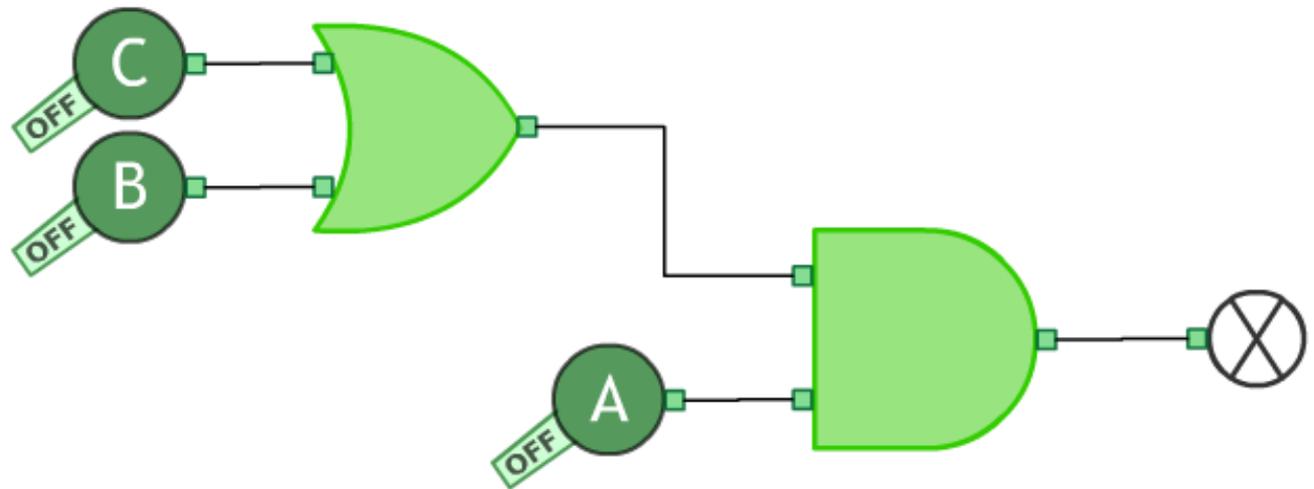
The Diagram

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The Empty Truth Table

Objectives

BEGINNER:
Define the term
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ADVANCED:
Understand how
key stakeholders
are affected by
technology.

EXPERT:
Recognise and
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A	B	C	$B \vee C$	$A \wedge (B \vee C)$



The Completed Truth Table

Objectives

BEGINNER:
Define the term
key stakeholder.

ADVANCED:
Understand how
key stakeholders
are affected by
technology.

EXPERT:
Recognise and
discuss issues
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& Ethics.

A	B	C	$B \vee C$	$A \wedge (B \vee C)$
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	1	0
1	0	0	0	0
1	0	1	1	1
1	1	0	1	1
1	1	1	1	1

CHALLENGE

ASSESSMENT



Complete the multi choice logic gate and truth table worksheet.

