ICT Innovators

Boolean Logic Creator Switching Circuit Creator

George Boole and Claude Shannon

George Boole
1815 - 1901

George Boole was born November 2, 1815 in Lincolnshire, England. He was a self-taught mathematician who sought to prove logical statements through equations and mathematics, rather than philosophy. He created a type of algebra known as Boolean Algebra, where the variables in an equation are the values TRUE and FALSE, usually denoted 1 and 0, and the operators include AND, OR and NOT. In electrical circuits, these states of True and False are also On and Off. Boolean Logic led to the design of digital computer circuits.

Claude Shannon
1916 - 2001

Claude Shannon, was an American Mathematician who in 1937 applied Boolean Logic to electronics to produce Logic Gates. The invention of the silicon transistor by Bell Labs in 1954 allowed for the implementation of Boolean Logic gates to modern, electrical computing. This in turn allowed for the development of digital circuits that would revolutionise electronics, and are still in use today.

> I see no limit to the capabilities of machines. As microchips get smaller and faster, I can see them getting better than we are. I can visualize a time in the future when we will be to robots as dogs are to humans.
>
> **Claude Shannon**

> Almost every problem that you come across is befuddled with all kinds of extraneous data... if you can bring this problem down into the main issues, you can see more clearly what you are trying to do.
>
> **Claude Shannon**

Fast facts

Logic gates, which use Boolean Logic, are a specific kind of transistor

Silicon Valley is named after the **silicon used to make transistors**

10101
10101

Shannon's papers contain the **first published** use of the term **'bit'** for a **single binary digit**

Shannon's Information Theory work contributed greatly to **modern natural language processing**

Encyclopædia Britannica. (2018). George Boole. Retrieved from https://www.britannica.com/biography/George-Boole Encyclopædia Britannica. (2019). Claude Shannon. Retrieved from https://upload.wikimedia.org/wikipedia/commons/9/99/ClaudeShannon_MFO3807.jpg Images: George Boole, 1815-1864 [Image] (n.d.). Retrieved from https://upload.wikimedia.org/wikipedia/commons/9/99/ClaudeShannon_MFO3807.jpg Claude E. Shannon [Image] (1963). Retrieved from https://www.newyorker.com/tech/annals-of-technology/claude-shannon-the-father-of-the-information-age-turns-1100100 Vectors from www.freepik.com

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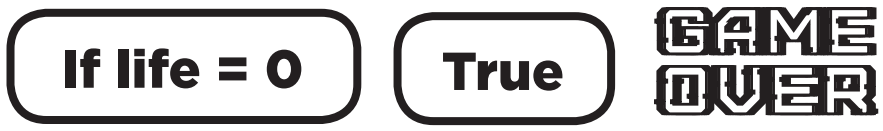
Boolean Logic Activity – Think like George Boole

Boolean Statements

Statements that are used to connect or define relationships between two parts in a program. When a Boolean statement is applied it will result in a TRUE or FALSE answer. This is known as a binary outcome.

Example



Boolean Operators

AND Links two parts together and answer must have both to be true.

OR Links two parts together and answer only needs one to be true.

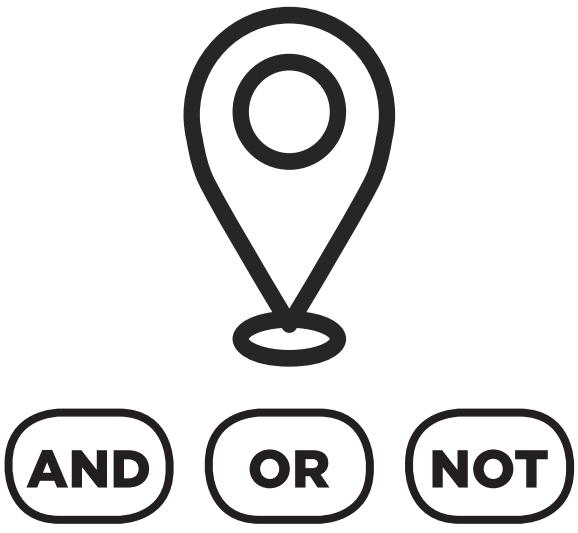
NOT Excludes one part from the others and answer must not have this part to be true.

Boolean School Yard

Think of a destination in your school yard.

Write **four** Boolean statements to direct a classmate to this location.

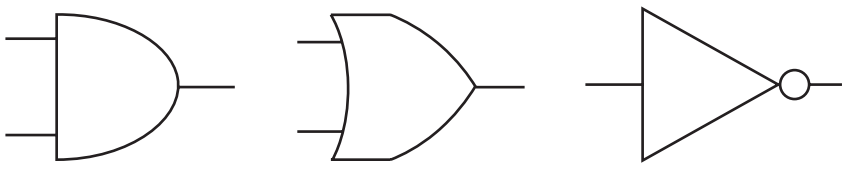
You must use only **one** of the Boolean operators for each statement.
You **must not** name the location anywhere in the instructions.



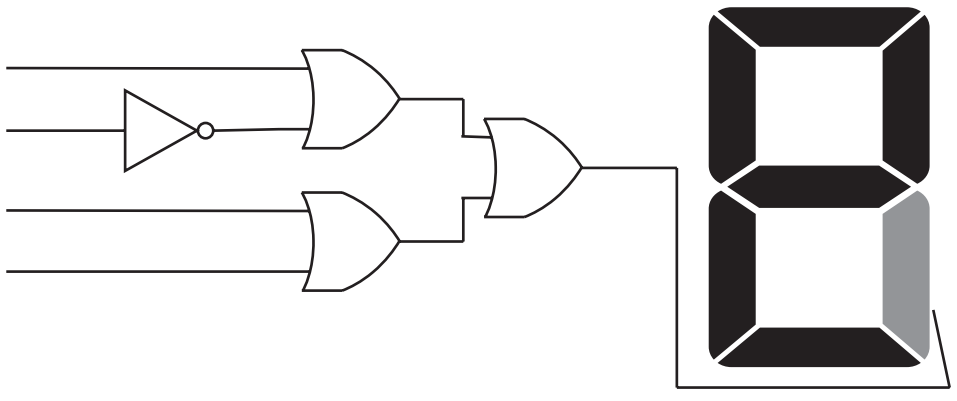
Logic Gate Symbols

Boolean operators are used in digital systems to control output signals and can be represented in a diagram with logic gates.

An example is the diagram of lights in a digital clock to the right.



And Or Not



Can you think of any other examples that might use logic gates?

Images: Vectors from www.freepik.com