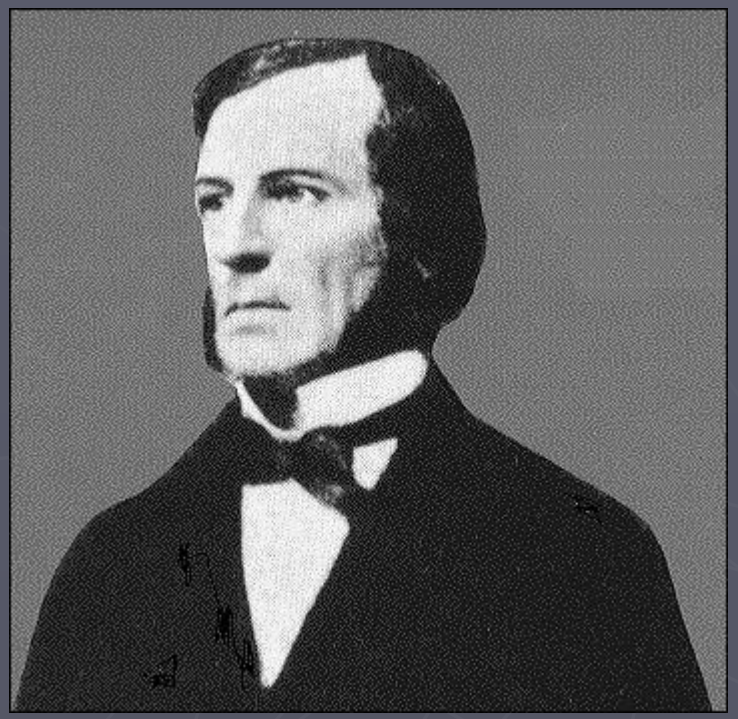
George Boole



The father of computer science

Born: 2 Nov 1815 in Lincoln, England

Died:8 Dec 1864 in

Ballintemple,Ireland

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George Boole

- George Boole is the English mathematician and philosopher who invented Boolean Algebra that constitutes the basic principles of computer science.
- Boole first learned mathematics from his father who was a shoemaker who worked with optical instruments on the side.Except for a few years at elemantary schools,George did not go to school at all.Instead he taught himself mathematics.
- He began to write papers about mathematics and submitted his first paper in 1839,which was on differential equations and the algebraic problem of linear transformation.In 1844,he submitted another paper that discussed the combination of algebra and calculus.
- He was awarded a medal by the Royal Society for his contributions to analysis.At this time,he began to think that algebra could also be applied to LOGIC.
- In 1847,he published a pamphlet on the mathematical analysis of logic in which he argued that logic should be tied to mathematics rather than philosophy,as it was at that time.

George Boole

- In 1849,as a result of his publications he was appointed professor of mathematics at Quenn's College,Ireland.He did this even though he did not have a university degree!
- In 1854,he published his work entitled 'An Investigation into The Laws of Thought', on which are founded the mathematical theories of logic and probabilities.From this document,comes the Boolean Logical Operators that we use to search the web today.
- In 1859 his paper entitled 'Treatise on Differential Equations' was published.He published 'Treatise on the Calculus on Finite Differences' in 1860.Both of these expanded on his previous papers on logic and mathematics.

*George Boole died of apical pneumonia in 1864.

Boolean Logic

- **The internet is a vast computer database.As such,its contents must be searched according to the rules of computer searching.Database searching is based on the principles of Boolean Logic.Boolean Logic refers to the logical relationships**

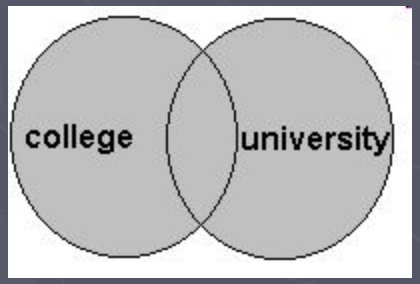
among search terms.Boole used words that he called logical operators to define searches.Boolean Logic consists of 3 logical operators AND , NOT , OR. Near can also used to make searches more specific.

Logical Operators

OR

Query: I would like information about college.

In this search, we will retrieve records in which AT LEAST ONE of the search terms is present. We are searching on the terms **college** and also **university** since documents containing either of these words might be relevant.



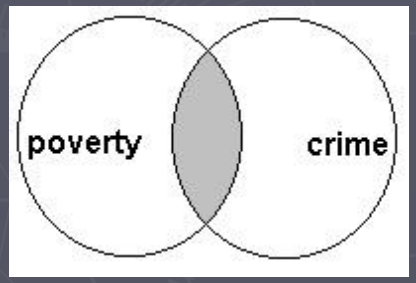
Search terms	results
College	396,482
University	590,791
College OR University	819,214

Logical Operators

AND

Query: I'm interested in the relationship between poverty and crime.

- In this search, we retrieve records in which BOTH of the search terms are present.
- This is illustrated by the shaded area overlapping the two circles representing all the records that contain both the word "poverty" and the word "crime" .
- Notice how we do not retrieve any records with only "poverty" or only "crime"

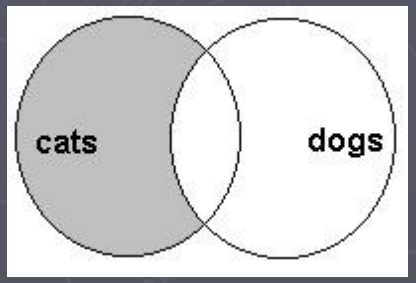


Search terms	results
Poverty	76,342
Crime	348,252
Poverty AND crime	12,998

Logical Operators

NOT **Query: I want information about cats, but I want to avoid anything about dogs.**

- In this search, we retrieve records in which ONLY ONE of the terms is present.
- This is illustrated by the shaded area with the word **cats** representing all the records containing the word "cats" .
- No records are retrieved in which the word "dogs" appears, even if the word "cats" appears there too.



Search terms	results
cats	86,747
dogs	130,424
Cats NOT dogs	65,223

Most multi-term search statements will resolve to AND logic at search engines,
That use AND as default. Nowadays most search engines default to AND. Always play it safe, however, and consult the Help files at each site to find out which logic is the default.

Where to Search: A Selected List

Feature	Search Engine
Boolean operators	Dogpile | Google [**OR only**] | **xquick**
Full boolean logic with parenthesis,e.g Behaviour and (cats or felines)	All the web advanced search|Alta vista advanced Web search Xquick |Live search
Implied Boolean +/-	Most search engines offers this option
Boolean Logic using search from terminology	Most advanced search options offer this ,including; Alta vista advanced web search AOL Advanced web search, Yahoo advanced Web search, Ask.com advanced web search
Proximity Operators	Exalead | Google (by default) | xquick

Boolean Algebra

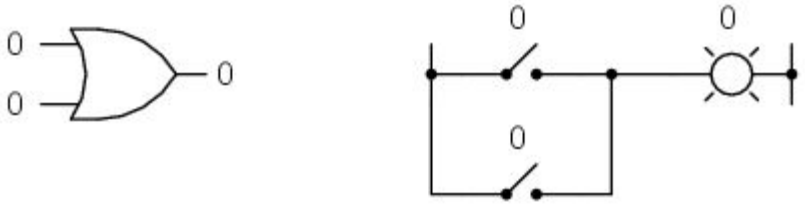
- Boolean Algebra is a deductive mathematical system closed over the values zero and one(respectively false and true).It is defined meet and join operators (and, or, not) instead of addition and multiplications operators(+,*)
- In 1938, Shannon proved that a two-valued Boolean algebra (whose members are most commonly denoted 0 and 1, or false and true) can describe the operation of two-valued electrical switching circuits. In modern times, Boolean algebra and Boolean functions are therefore indispensable in the design of computer chips and integrated circuits.

Boolean Algebra and its application on electric circuits

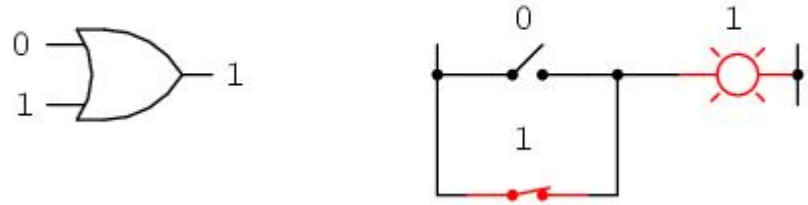
0	+	0	=	0
0	+	1	=	1
1	+	0	=	1
1	+	1	=	1

The first three equations are the same as modern algebratic
operations.However, The last one does not seem logical.
In Boolean algebra,there is no number except 1 and 0,
1+1
Can not be equal to 0,so the result is 1 by elimination.

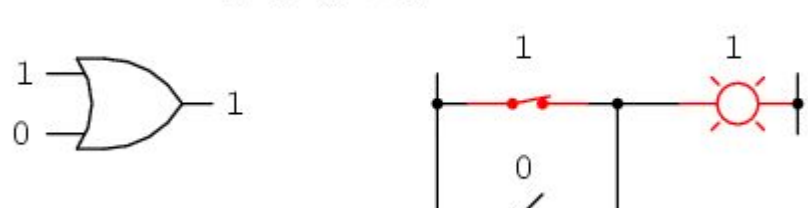
0 + 0 = 0



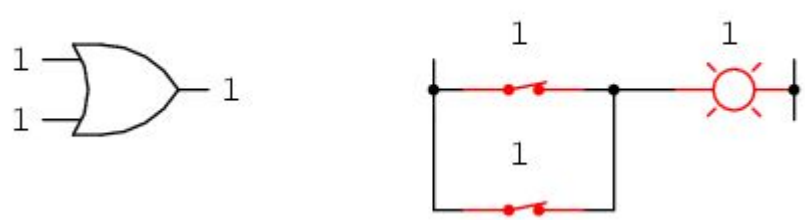
0 + 1 = 1

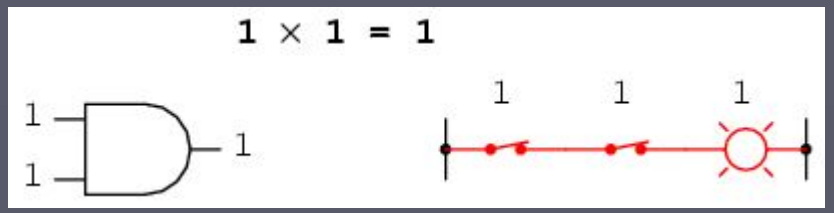


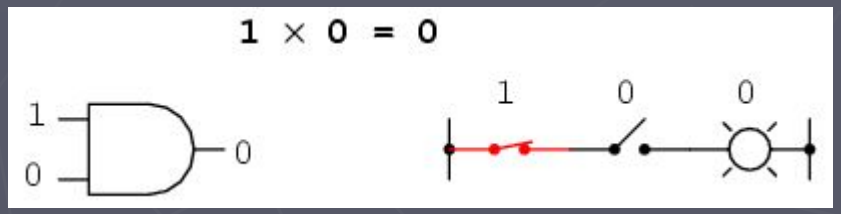
1 + 0 = 1

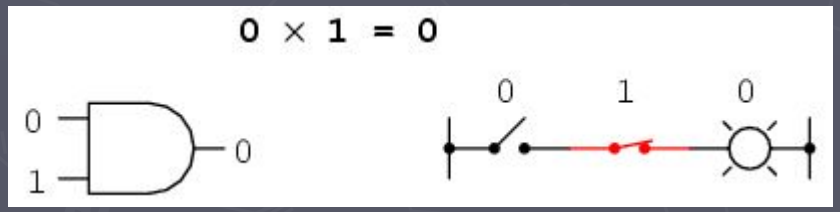


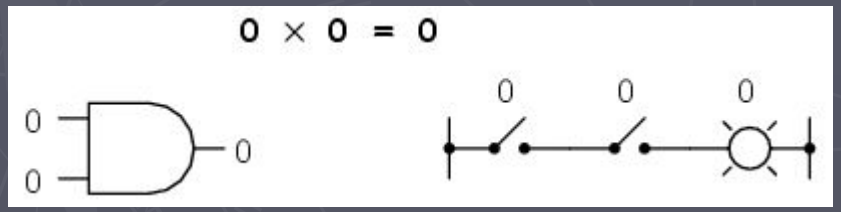
1 + 1 = 1











0 × 0 = 0

0 × 1 = 0

1 × 0 = 0

1 × 1 = 1

*Boole toplaması *paralel* anahtar kontağındaki gibi *OR* mantık fonksiyonuna eşdeğerdir.

*Boole çarpımı *seri* anahtar kontağındaki gibi *AND* mantık fonksiyonuna eşdeğerdir.

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Thank you