

## George Boole, and His “Boolean Algebra”

English Mathematician and Logician

Born: Lincoln, England, Nov 2, 1815; Died: Cork, Ireland, Dec 8, 1864

Boole was the son of a shoemaker. He first of all thought of joining the church, but by 16 was teaching mathematics at a private school and in 1835 he established a school of his own. In 1849, at the age of 34, he was appointed professor of mathematics at Queen’s College in Cork, Ireland, despite not having a degree. Here he remained for the rest of his life.

Boole’s great contribution was inventing an “algebra” of logic that could allow the truth value of some logical arguments to be worked out algebraically. He published a small book in 1847 and then followed it up with his ground breaking book *An Investigation of the Laws of Thought* in 1854. This book founded what we now call symbolic logic.

His new ideas were not really received very well and it wasn’t until after his death that his Boolean Logic found it essential in understanding the philosophy of mathematics. Such mathematicians as Frege, Whitehead and Russell used Boolean Algebra for this purpose. Later on, Johnny von Neuman used Boolean Algebra in designing the first computers in around 1940 – 1960. I always like the story of George Boole, in that he did some ground breaking work in mathematics that had NO USE, at that time. Then, many years later, it proved to be critical to breakthroughs in future years.

Boole died on pneumonia when he insisted in still lecturing while wet after walking two miles through a cold November rain. He was only 49 years old.

The above information came from *Isaac Asimov’s Biographical Encyclopedia of Science and Technology*.

Here is an example of how he used his logic:

### **Below is an arithmetic table:**

Addition	0	1		Multiplication	0	1
0	0	1		0	0	0
1	1	2		1	0	1

### **Below is a truth table in logic**

OR	FALSE	TRUE		AND	FALSE	TRUE
FALSE	FALSE	TRUE		FALSE	FALSE	FALSE
TRUE	TRUE	TRUE		TRUE	FALSE	TRUE

As you can see, these two tables are very similar, in fact if you can say 0 = FALSE and 1 = TRUE and then adjust it slightly so that 1 + 1 = 1 (and not 2), because you cannot get more “TRUE” than “TRUE”, then the first table becomes the one below and the two tables are virtually identical.

### **Below is an “adjusted” arithmetic table:**

Addition	0	1		Multiplication	0	1
0	0	1		0	0	0
1	1	1		1	0	1

We will use these tables on puzzle day, Sunday, August 2, 2009