



## WHAT'S A "BOOLEAN"?

Boolean logic takes its name from British mathematician George Boole (1815-1864), who wrote about a system of logic designed to produce better search results by formulating precise queries. He called it the "calculus of thought." From his writings, we have derived Boolean logic and its operators: AND, OR, and NOT, which we use to link words and phrases for more precise queries.

### BOOLEAN "AND"

The Boolean AND actually narrows your search by retrieving only documents that contain every one of the keywords you enter. The more terms you enter, the narrower your search becomes.

**EXAMPLE:** truth AND justice

**EXAMPLE:** truth AND justice AND ethics AND congress

### BOOLEAN "OR"

The Boolean OR expands your search by returning documents in which either or both keywords appear. Since the OR operator is usually used for keywords that are similar or synonymous, the more keywords you enter, the more documents you will retrieve.

**EXAMPLE:** college OR university

**EXAMPLE:** college OR university OR institution OR campus

### BOOLEAN "NOT" / "AND NOT"

The Boolean NOT or AND NOT (sometimes typed as ANDNOT) limits your search by returning only your first keyword but not the second, even if the first word appears in that document, too.

**EXAMPLE:** saturn AND NOT car

**EXAMPLE:** pepsi AND NOT coke

### NESTING -- WITH BOOLEAN OPERATORS

Nesting, i.e., using parentheses, is an effective way to combine several search statements into one search statement. Use parentheses to separate keywords when you are using more than one operator and three or more keywords.

**EXAMPLE:** (hybrid OR electric) AND (Toyota OR Honda)

(For best results, always enclose OR statements in parentheses.)

### BOOLEAN LOGIC REDUX

Boolean logic is not always simple or easy. Different search engines handle Boolean operators differently. For example, some accept NOT, while one accepts ANDNOT as one word, others AND NOT as two words. Some require the operators to be typed in capital letters while others do not.



Some search engines use drop-down menu options to spell out the Boolean logic in short phrases. For example, "All of the words" or "Must contain" equates to AND; "Any of the words" or "Should contain" equates to OR; and "Must not contain" equates to NOT.

## **IMPLIED BOOLEAN OPERATORS**

Implied Boolean operators use the plus (+) and minus (-) symbols in place of the full Boolean operators, AND and NOT. Typing a (+) or (-) sign in front of a word will force the inclusion or exclusion of that word in the search statement.

**EXAMPLE: +dementia -alzheimers**

Similarly, putting double quotation marks (" ") around two or more words will force them to be searched as a phrase in that exact order.

**EXAMPLE: "green tea"**

While full Boolean operators are usually accepted only in the advanced search option of search engines, implied Boolean operators are accepted in the basic search options of most search engines.

## **PROXIMITY OPERATORS**

Proximity, or positional, operators (NEAR, ADJ, SAME, FBY) are not really part of Boolean logic, but they serve a similar function in formulating search statements.

Not all search engines accept proximity operators, but a few accept NEAR in their advanced search option. The NEAR operator allows you to search for terms situated within a specified distance of each other in any order. The closer they are, the higher the document appears in the results list. Using NEAR, when possible, in place of the Boolean AND usually returns more relevant results.

**EXAMPLE:** phylogeny NEAR ontogeny

**EXAMPLE:** de Vere NEAR Shakespeare

Even fewer search engines accept ADJ (adjacent to). ADJ works as a phrase except that the two terms, which must appear adjacent to each other in the webpage, can appear in any order.

**EXAMPLE:** Ernest ADJ Hemingway

**EXAMPLE:** endangered ADJ species

returns both Ernest Hemingway and Hemingway Ernest; endangered species and species endangered.

Other proximity operators, such as SAME (keywords found in the same field) and FBY (followed by), are used as advanced searching techniques in library and other specialized databases that contain bibliographic citations or references to journal articles, but are not yet employed by search engines



## Wildcard Symbols

Wildcard symbols can expand the scope of your search.

Use	For
*	<b>Truncation.</b> This expands a search term to include all forms of a root word, e.g., <b>patent*</b> retrieves <b>patent, patents, patentable, patented,</b> etc.
*	<b>Multi-character wildcard for finding alternative spellings.</b> Use to indicate an unlimited number of characters within a word, e.g., <b>behavi*r</b> retrieves <b>behaviour</b> or <b>behavior</b> .
?	<b>Single-character wildcard for finding alternative spellings.</b> The ? represents a single character; two ?? represent two characters; three ??? represent three characters, and so on. Use within or at the end of a word, e.g., <b>wom?n</b> finds <b>woman</b> as well as <b>women</b> , and <b>carbon fib??</b> finds <b>carbon fiber</b> or <b>carbon fibre</b> .

**Note:** Only words with characters equal to the number of ?'s present are retrieved, e.g., **cell?** retrieves **cells** and **cello** but not **cell**. Three characters are required before truncation, therefore **h\*ophilia** will not function in our database.

**Tip:** When looking for singular and plural forms of short words that have a common root, such as **cell**, the truncation symbol may retrieve too many irrelevant words, while the wildcard symbol may retrieve too few words. In such a case, do not use wildcards and instead OR together the forms of the word you want, e.g., **cell** or **cells**.