

# Component 1: Logical Operations

Term	Definition
Propositional logic	<ul style="list-style-type: none"> <li>A proposition is a simply a statement.</li> <li>Propositional statements when evaluated will result in either true or false.</li> <li>Propositional logic considers the way statements interact with each other.</li> <li>Propositional logic follows mathematical rules.</li> </ul>

**Connection (AND)**  
 "I am hungry and I have a sandwich"  
 For this logical statement to be true both propositions would have to be TRUE. The key word is AND.  
 If one proposition was false, then the whole statement would be false. Let's use A to represent "I am hungry" and B to represent "I have a sandwich".  
 A truth table for this can show all the possibilities using 1 for TRUE and 0 for FALSE.

A	B	A AND B
1	1	1
1	0	0
0	1	0
0	0	0

A AND B can be written using a symbol as  $A \cdot B$

**Negation (NOT)**  
 "I am 16 years old"  
 To negate this proposition, "I am not 16 years old" we can use the negation operator. A truth table can show this:

A	$\bar{A}$
1	0
0	1

NOT A can be written using a symbol as  $\bar{A}$ .

**Logic statements**  
 Most rules to simplify a logic statement are not dependent on the contents of the statement but on the structure of the statement.  
 Propositional logic uses symbols to represent logical links between propositions. A logic statement includes propositions linked connected by logical links.

**Exclusive separation (XOR)**  
 "She has blue eyes or she has brown eyes"  
 For exclusive separation only one proposition of a logical statement can be correct.  
 A truth table can show this:

A	B	A XOR B
1	1	0
1	0	1
0	1	1
0	0	0

A XOR B can be written using a symbol as  $A \oplus B$

Term	Definition
Propositional logic symbols	Propositional logic uses symbols to represent logical links
Symbol	Formal term      Informal term
.	Connection      AND
+	Separation      OR
$\bar{A}$	Negation      NOT
$\oplus$	Exclusive separation      XOR

**Separation (OR)**  
 "She has blue eyes or she has brown eyes"  
 Sometimes one proposition or another proposition of a logical statement is correct. The key word here is OR.  
 This time the logical statement will be true if at least one proposition is TRUE.

A	B	A OR B
1	1	1
1	0	1
0	1	1
0	0	0

A OR B can be written using a symbol as  $A + B$

Term	Definition
Truth table	A truth table is a mathematical table used to analyse a set of local statements.

Zebra's are black and white.  
 Panda's are black and white.  
 Therefore, some zebra's are panda's