Meet Boolean Algebra

<table>
<thead>
<tr>
<th>Name</th>
<th>Variables</th>
<th>“True/False”</th>
<th>“And”</th>
<th>“Or”</th>
<th>“Not”</th>
<th>Implication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java Code</td>
<td>boolean b</td>
<td>true,false</td>
<td>&amp;&amp;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propositional Logic</td>
<td>&quot;p,q,r&quot;</td>
<td>T, F</td>
<td>∧</td>
<td>∨</td>
<td>¬</td>
<td>→</td>
</tr>
<tr>
<td>Circuits</td>
<td>Wires</td>
<td>1, 0</td>
<td>And</td>
<td></td>
<td></td>
<td>No special symbol</td>
</tr>
<tr>
<td>Boolean Algebra</td>
<td>a,b,c</td>
<td>1,0</td>
<td></td>
<td>+</td>
<td></td>
<td>No special symbol</td>
</tr>
</tbody>
</table>

Propositional logic

(p ∧ q ∧ r) ∨ s ∨ ¬t

Boolean Algebra

pqr + s + t'

Predicates

A function that outputs true or false.

Cat(x):= “x is a cat”
Prime(x):= “x is prime”
LessThan(x, y):= “x<y”
Sum(x, y, z):= “x+y=z”
HasNChars(s, n):= “string s has length n”

Numbers and types of inputs can change. Only requirement is output is Boolean.
Try it...

What's a possible domain of discourse for these lists of predicates?

1. "\(x\) is a cat", "\(x\) barks", "\(x\) likes to take walks"

2. "\(x\) is prime", "\(x=5\)" "\(x < 20\)" "\(x\) is a power of two"

3. "\(x\) is enrolled in course \(y\)", "\(y\) is a pre-req for \(z\)"

Translations

“For every \(x\), if \(x\) is even, then \(x = 2\).”

“There are \(x, y\) such that \(x < y\).”

\[\exists x \ (\text{Odd}(x) \land \text{LessThan}(x, 5))\]

\[\forall y \ (\text{Even}(y) \land \text{Odd}(y))\]

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Help me adjust my explanation!