ACSL Preparation: Boolean Algebra

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ACSL Problem Set: Boolean Algebra

1 Introduction:

Boolean algebra is the branch of algebra in which the variables store truth value. All variables are true(1) or false(0). There are 3 main operations that create the base for boolean algebra: **AND(conjunction)**, **OR(disjunction)**, and **NOT(negation)**.

2 Basic Operations:

AND, denoted x $\wedge$ y or x AND y, satisfies x $\wedge$ y = 1 if x = y = 1 , else x $\wedge$ y = 0
OR, denoted x $\vee$ y or x OR y, satisfies x $\vee$ y = 0 if x = y = 0 , else x $\vee$ y = 1
NOT, denoted $\neg$x or NOT x, satisfies $\neg$x = 0 if x = 1 and $\neg$x = 1 if x = 0

x	y	x$\wedge$y	x$\vee$y
0	0	0	0
1	0	0	1
0	1	0	1
1	1	1	1

x	$\neg$x
0	1
1	0

3 Secondary Operations

Material Implication, denoted x $\rightarrow$ y = $\neg$x$\vee$y, if x = 1, then x $\rightarrow$ y = y, if x = 0, then x $\rightarrow$ y = 1
Exclusive Or, denoted x $\oplus$ y or x XOR y, x $\oplus$ y = 1 if x = 1 & y = 0 or x = 0 & y = 1, else x $\oplus$ y = 0, true when values are different
Equivalence, denoted x $\equiv$ y, x $\equiv$ y = 1 if x =1 & y =1, or if x = 0 & y = 0, complement of XOR, true when values are the same

With these basic rules memorized, all boolean algebra problems should be simple to work through