1806ICT
Programming Fundamentals

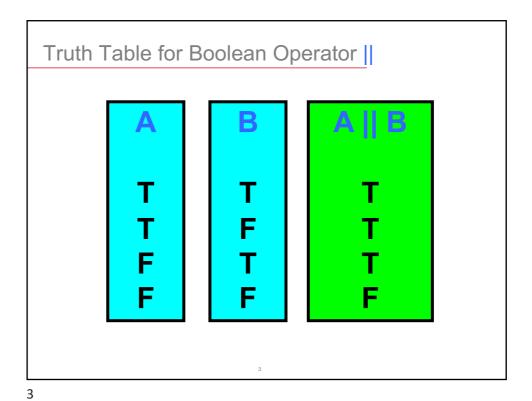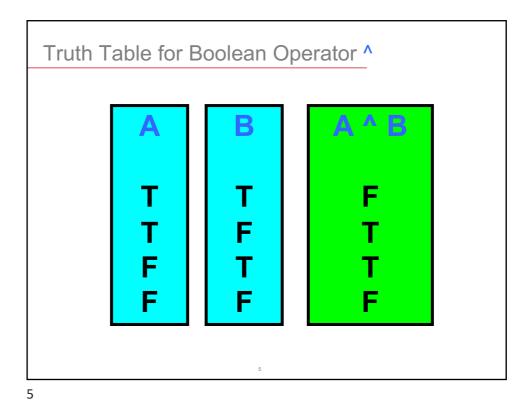# Boolean Expressions: Truth Tables and De Morgan's Laws

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Truth Tables

In the following slides, the letters A, B and C represent any C boolean expression. For example, A, B or C could represent any of the following (given integers x and y):

x == y
x >= y
y != x

A	B
T	T
T	F
F	T
F	F

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Truth Table for Boolean Operator ||

A	B	A || B
T	T	T
T	F	T
F	T	T
F	F	F

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Truth Table for Boolean Operator &&

A	B	A && B
T	T	T
T	F	F
F	T	F
F	F	F

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Truth Table for Boolean Operator ^

A	B	A ^ B
T	T	F
T	F	T
F	T	T
F	F	F

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Truth Table for Boolean Operator !

A	!A
T	F
F	T

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Truth Table for A && (A || B)

A	B	A || B	A && (A || B)
T	T	T	T
T	F	T	T
F	T	T	F
F	F	F	F

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Truth Table for (A && B) || C

A	B	C	A && B	(A && B) || C
T	T	T	T	T
T	T	F	T	T
T	F	T	F	T
T	F	F	F	F
F	T	T	F	T
F	T	F	F	F
F	F	T	F	T
F	F	F	F	F

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Truth Table for (A || B) && C

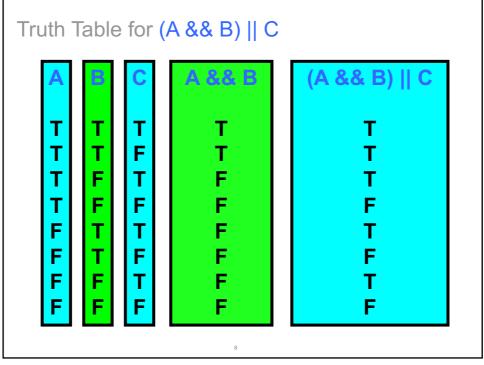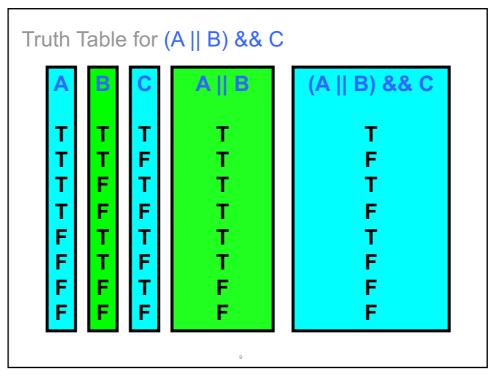| A	B	C	A || B	(A || B) && C
T	T	T	T	T
T	T	F	T	F
T	F	T	T	T
T	F	F	T	F
F	T	T	T	T
F	T	F	T	F
F	F	T	F	F
F	F	F	F	F

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Truth Table Fact

The truth tables of *equivalent* Boolean expressions are identical.

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Truth Table : Is: !(A || B) equivalent to !A || !B ?

A	B	A || B	!(A || B)	!A	!B	!A || !B
T	T	T	F	F	F	F
T	F	T	F	F	T	T
F	T	T	F	T	F	T
F	F	F	T	T	T	T

^ NO ^

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Truth Table : Is: !(A || B) equivalent to !A && !B ?

A	B	A || B	!(A || B)	!A	!B	!A && !B
T	T	T	F	F	F	F
T	F	T	F	F	T	F
F	T	T	F	T	F	F
F	F	F	T	T	T	T

^ YES ^

De Morgan's Laws

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Truth Tables : Is: !(A && B) equivalent to !A || !B ?

A	B	A && B	!(A && B)	!A	!B	!A || !B
T	T	T	F	F	F	F
T	F	F	T	F	T	T
F	T	F	T	T	F	T
F	F	F	T	T	T	T

^ YES ^

De Morgan's Laws

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