

AP COMPUTER SCIENCE A – SHORT-CIRCUIT EVALUATION AND DE MORGAN’S RULE

Consider the truth table for “and”:

a	b	a && b
T	T	T
T	F	F
F	T	F*
F	F	F*

- * If a is F, then we know that a && b is F, so we do not even need to look at b. This is what java does, and this is called *short-circuit evaluation*.

Consider the truth table for “or”:

a	b	a b
T	T	T*
T	F	T*
F	T	T
F	F	F

- * Similarly, if a is T, then we know that a || b is T, so we do not even need to look at b. Again, this is what java does (*short-circuit evaluation*).

1) Fill out the truth table.

a	b	!a	!b	a b	!a && !b	!(a b)
T	T	F	F	T	F	F
T	F	F	T	T	F	F
F	T	T	F	T	F	F
F	F	T	T	F	T	T

2) What can you say about !a && !b and !(a || b)? *They are equivalent.*

3) Fill out the truth table.

a	b	!a	!b	a && b	!a !b	!(a && b)
T	T	F	F	T	F	F
T	F	F	T	F	T	T
F	T	T	F	F	T	T
F	F	T	T	F	T	T

4) What can you say about !a || !b and !(a && b)? *They are equivalent.*

Note: the results of problems 2 and 4 are called *De Morgan’s Rule*, which states:

- i) Given !a && !b, move the “not” out front and change the “and” to “or”, i.e., !(a || b) .
- ii) Given !a || !b, move the “not” out front and change the “or” to “and”, i.e., !(a && b) .