NOTES: Connecting Boolean Statements in Java with Mathematical Models

Mathematical Model	Java Model
$-2 \leq x < 3$	`x >= -2 && x < 3`
$x < -2$ or $x \geq 3$	`x < -2 || x >= 3`
$x \neq -2$	`x != -2`
if $a/b = 3$ then...	`if (a/b == 3) { //do something }`
if $a/b = 3$, $b \neq 0$	`if (a/b == 3 && b != 0)`

$f(x) = \begin{cases} -1, & x < 3 \\ 0, & 3 \leq x \leq 5 \\ 2, & x \geq 5 \end{cases}$	`public int f(double x)`
	`{`
	`  if (x < 3)`
	`  return -1;`
	`  else if (x < 5 && x >= 3)`
	`  return 0;`
	`  else`
	`  return 2;`

De'Morgan's Law Notes and Examples

Warm-Up Problems:

$!(y == 8) \rightarrow y != 8$

$!!(y == 9) \rightarrow y == 9$

$!(x != 2) \rightarrow x == 2$

$!(x > 7) \rightarrow x <= 7$

$!(x <= 7) \rightarrow x > 7$

$!!(x < 2) \rightarrow x < 2$

De'Morgan's Law:

$!(a \;\&\&\; b) \rightarrow !a \;||\; !b$

$!(a \;||\; b) \rightarrow !a \;\&\&\; !b$

1. Simplify the following expressions using De'Morgan's Laws:

a. `!((!x || !y) && (a || b))`

b. `(!)(x==7) && (!)(x > 7))` $\rightarrow$ $!(x != 7 \;||\; x >= 7)$

b. $x != 7 \;\&\&\; x <= 7$

$\hookrightarrow$ $\boxed{x < 7}$

a. $!(!x \;||\; !y) \;||\; !(a \;||\; b)$

$x \;\&\&\; y \;||\; !a \;\&\&\; !b$

$!(a \;\&\&\; b) \rightarrow !a \;||\; !b$

2. The expression `!((x<= y) && (y > 5))` is equivalent to which of the following?

a. `(x <= y) && (y > 5)`
b. `(x <= y) || (y > 5)`
c. `(x >= y) || (y < 5)`
d. `(x > y) || (y <= 5)`
e. `(x < y) && (y <= 5)`

$!(x <= y) \;||\; !(y > 5)$

$x > y \;||\; y <= 5$