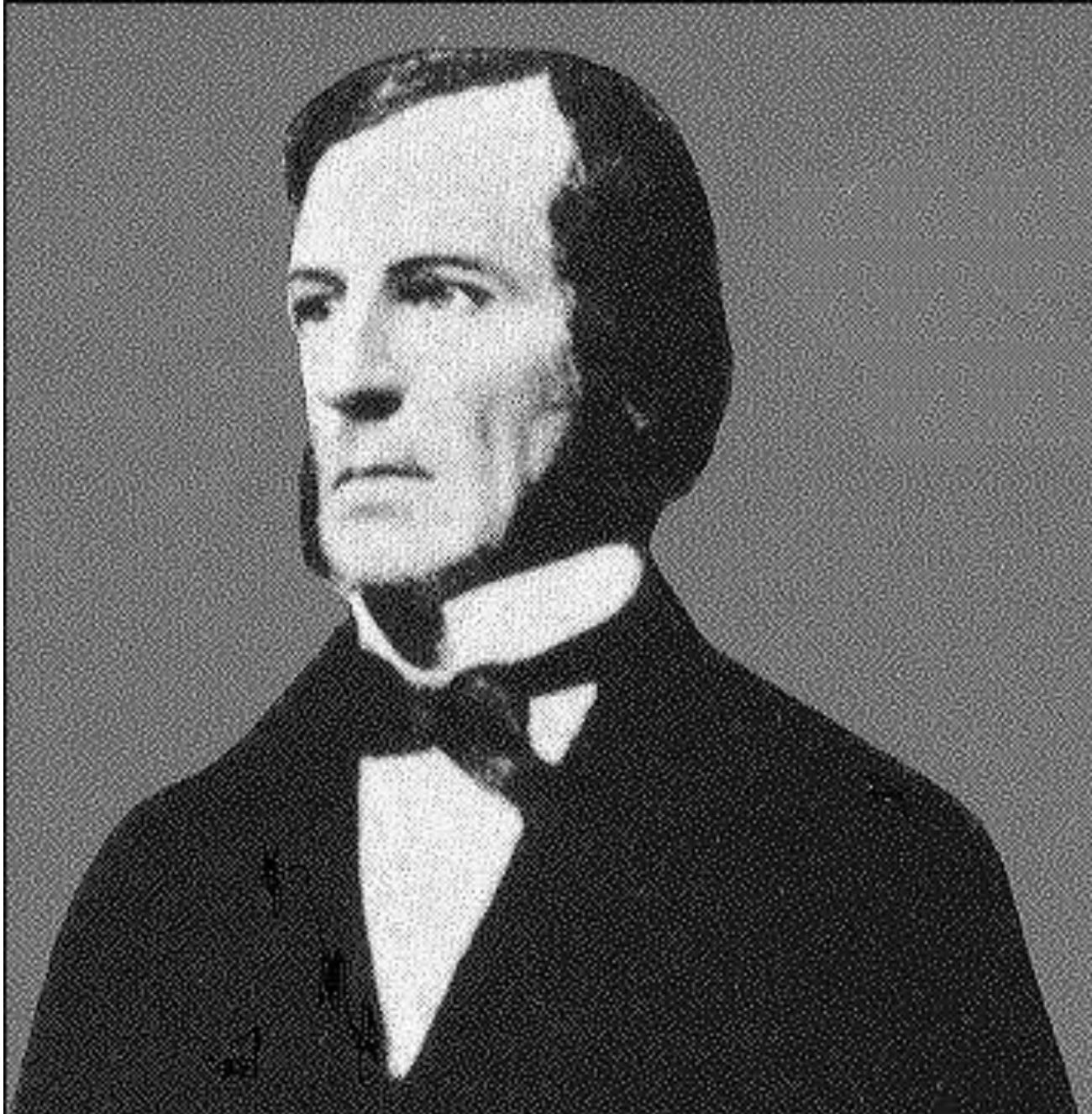


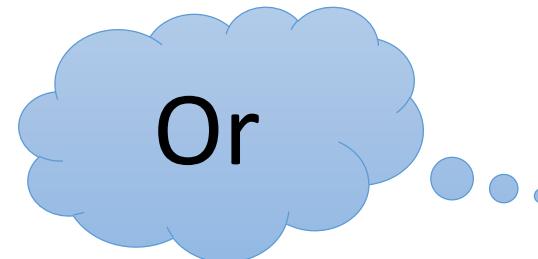
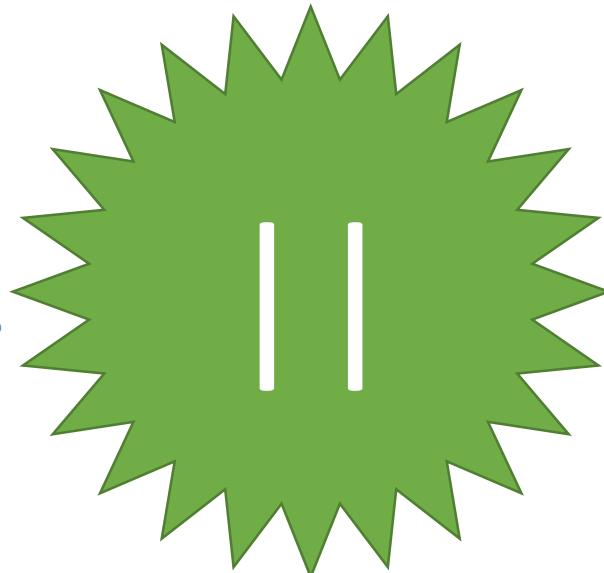
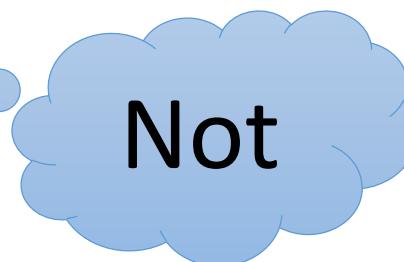
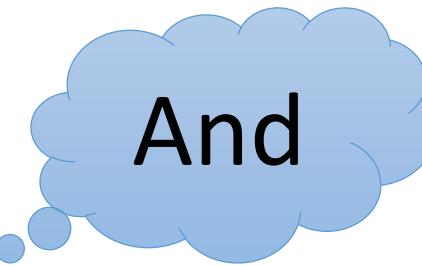
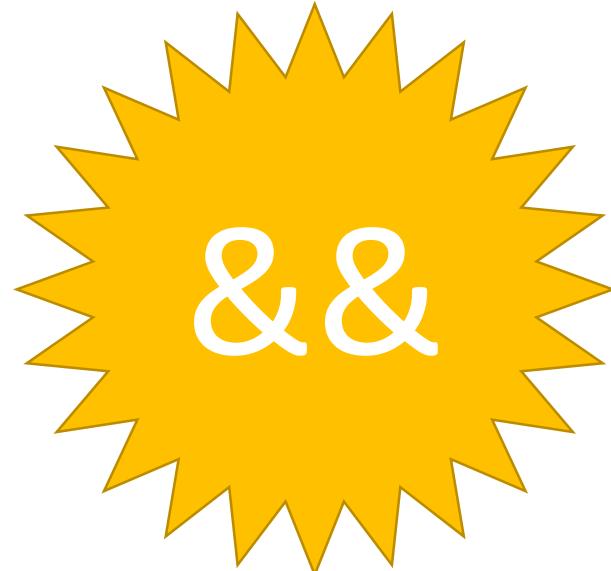
Boolean Algebra

Result in a True or False



Named for
George
Boole
1815-1865

Some Java
Symbols
for you...



2. What do each of the following Boolean operators mean?

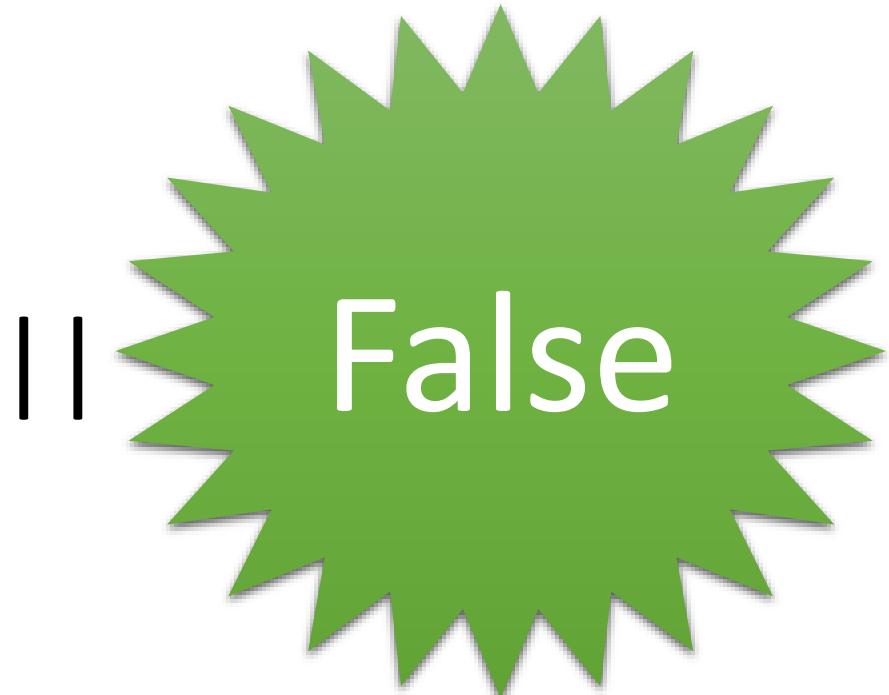
&&		
!		

Can you read
this shirt now?



2b || !2b

Boolean Algebra evaluates
to only two answers.



Relational Operators

Operator	Meaning
>	Greater than
>=	Greater than or equal to
<	Less than
<=	Less than or equal to
==	Equal to
!=	Not equal to
.equals()	Equal for strings

1. What do each of the following relational operators mean?

==	
!=	
>	
>=	
<	
<=	

The variable **num** holds the value of **5**.
Are these true or false?

`num > 6`

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num < 2`

`num >= 5`

T

`num != 6`

T

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

T

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

T

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

T

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

T

The variable **num** holds the value of **5**.

Are these true or false?

`num > 6`

F

`num >= 5`

T

`num != 6`

T

`num < 2`

F

`num == 4`

F

`!(num==3)`

T



Says: “Yes or
no? I won’t
take anything
else for an
answer!”

BOOLE ORDERS LUNCH

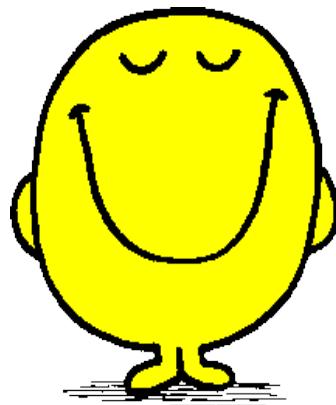


A photograph of a young girl with blonde hair in a ponytail, wearing a purple shirt, hugging her mother from behind. The mother has long brown hair and is wearing a grey tank top. They are both smiling. A blue speech bubble originates from the girl's mouth.

Would you like some
cake & ice cream?

Depending on what you give them, the kid is either happy or sad.

True



False





&&



=



Where's my
ice cream?



&&

=



Where's my
cake?

&&



=



Where's my
cake and ice
cream?

&&

=



And Truth Table

Value 1		Value 2		Answer
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

3. Evaluate the following.

a) What is the symbol for and?	—	AND	OR
b) What is the symbol for or?	—	f) What is T && T?	j) What is T T? —
c) What is the symbol for not?	—	g) What is T && F?	k) What is T F? —
d) What is !T?	—	h) What is F && T?	l) What is F T? —
e) What is !F?	—	i) What is F && F?	m) What is F F? —

If x is 4 and y is 7...

Evaluate

$(x > 3) \&\& (x < 9)$

				Ans
T	$\&\&$	T	=	T
T	$\&\&$	F	=	F
F	$\&\&$	T	=	F
F	$\&\&$	F	=	F

If x is 4 and y is 7...

Evaluate

$$(x > 3) \&\& (x < 9)$$

$$= (4 > 3) \&\& (4 < 9)$$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

If x is 4 and y is 7...

Evaluate

$(x > 3) \&\& (x < 9)$

$= (4 > 3) \&\& (4 < 9)$

$= T \&\& T$

					Ans
T	$\&\&$	T	=	T	
T	$\&\&$	F	=	F	
F	$\&\&$	T	=	F	
F	$\&\&$	F	=	F	

If x is 4 and y is 7...

Evaluate

$$(x > 3) \&\& (x < 9)$$

$$= (4 > 3) \&\& (4 < 9)$$

$$= T \&\& T$$

$$= T$$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

If x is 4 and y is 7...

Evaluate

$$(x > 3) \&\& (x < 9)$$

$$= (4 > 3) \&\& (4 < 9)$$

$$= T \&\& T$$

$$= T$$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

A close-up photograph of a young man with dark, wavy hair. He is wearing a white t-shirt and has a slight smile on his face. His gaze is directed upwards and to the left, suggesting he is in deep thought or considering something.

What can go in the
recycling bin?
Paper || Plastic



||



=



||

=



||



=



||

=



OR Truth Table

Value 1		Value 2		Answer
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F

3. Evaluate the following.

a) What is the symbol for and?	___	AND	OR
b) What is the symbol for or?	___	f) What is T && T?	___ j) What is T T?
c) What is the symbol for not?	___	g) What is T && F?	___ k) What is T F?
d) What is !T?	___	h) What is F && T?	___ l) What is F T?
e) What is !F?	___	i) What is F && F?	___ m) What is F F?

If x is 4 and y is 7...

Evaluate

$(x==3) \text{ || } (y>9)$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

				Ans
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & (x==3) \quad || \quad (y>9) \\ & = (4==3) \quad || \quad (7>9) \end{aligned}$$

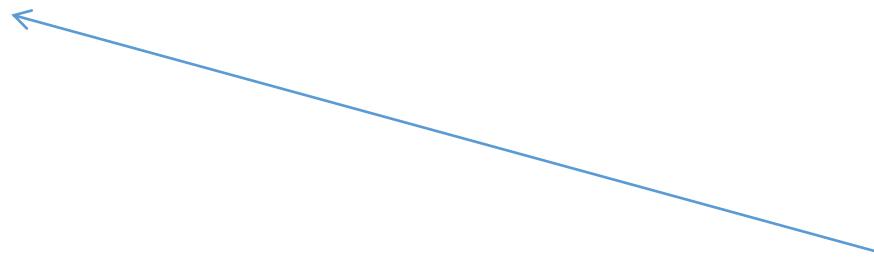
				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

				Ans
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & (x==3) \text{ || } (y>9) \\ &= (4==3) \text{ || } (7>9) \\ &= F \text{ || } F \end{aligned}$$



				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

				Ans
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F

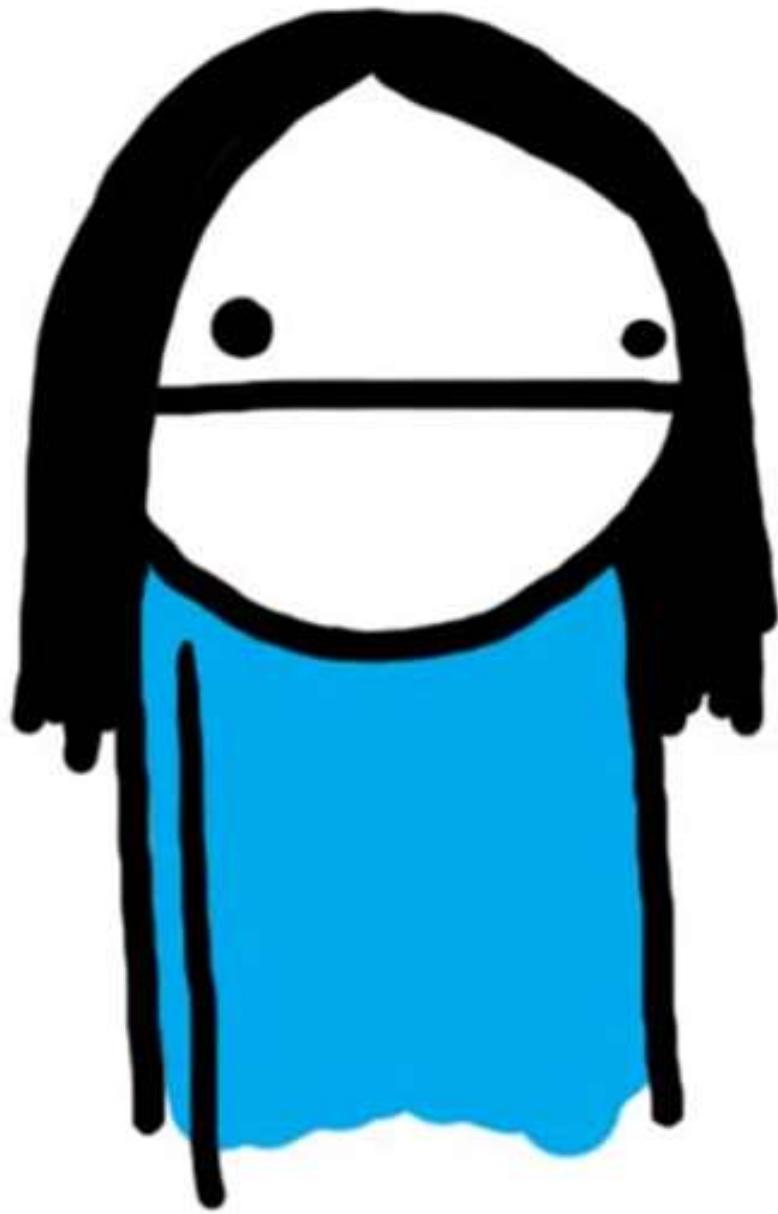
If x is 4 and y is 7...

Evaluate

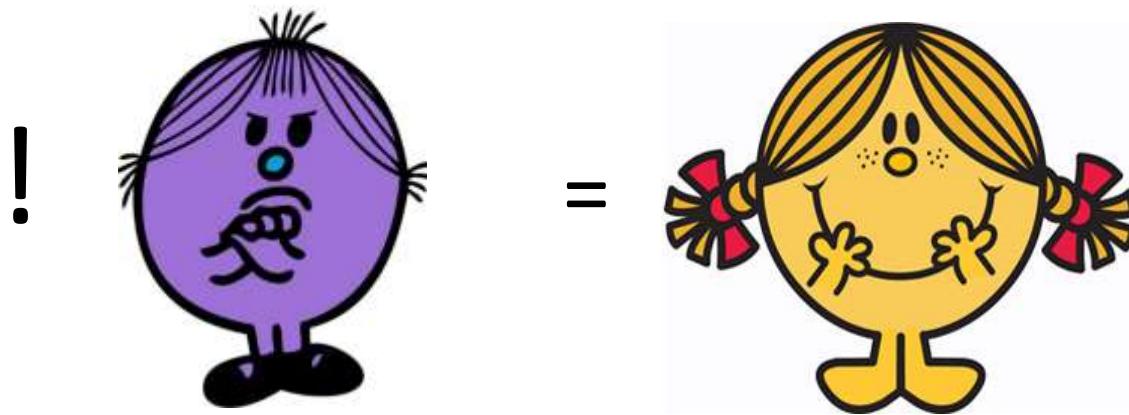
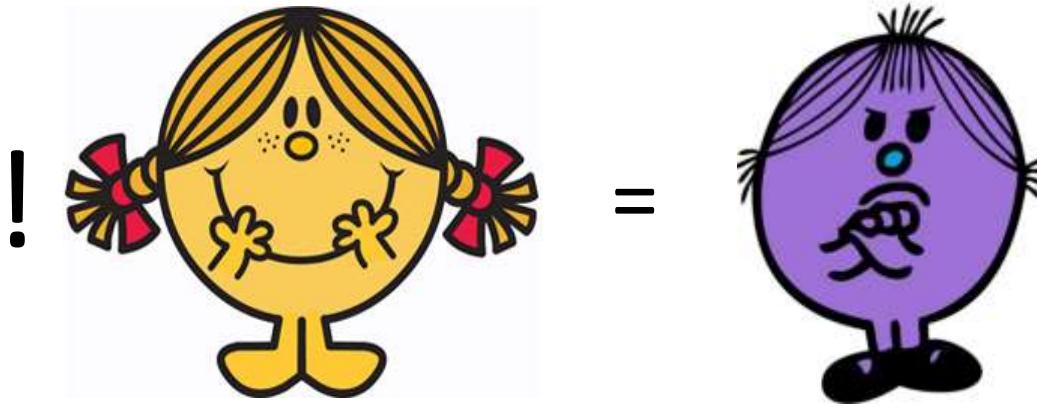
$$\begin{aligned} & (x==3) \quad || \quad (y>9) \\ &= (4==3) \quad || \quad (7>9) \\ &= F \quad || \quad F \\ &= F \end{aligned}$$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

				Ans
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F



I talking
to
you.



NOT Truth Table

Value		Answer
$!T$	=	F
$!F$	=	T

3. Evaluate the following.

a) What is the symbol for and?	___	AND	OR
b) What is the symbol for or?	___	f) What is $T \&& T$?	g) What is $T T$?
c) What is the symbol for not?	___	g) What is $T \&& F$?	h) What is $T F$?
d) What is $!T$?	___	h) What is $F \&& T$?	i) What is $F T$?
e) What is $!F$?	___	i) What is $F \&& F$?	j) What is $F F$?

If x is 4 and y is 7...

Evaluate

$!(!(x \leq 7) \&\& !(y \neq 9))$

				Ans
T	&&	T	=	T
T	&&	F	=	F
F	&&	T	=	F
F	&&	F	=	F

				Ans
T		T	=	T
T		F	=	T
F		T	=	T
F		F	=	F

		Ans
!T	=	F
!F	=	T

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & \neg(\neg(x \leq 7) \And \neg(y \neq 9)) \\ &= \neg(\neg(4 \leq 7) \And \neg(7 \neq 9)) \end{aligned}$$

				Ans
T	\And	T	=	T
T	\And	F	=	F
F	\And	T	=	F
F	\And	F	=	F

				Ans
T	\Or	T	=	T
T	\Or	F	=	T
F	\Or	T	=	T
F	\Or	F	=	F

		Ans
$\neg T$	=	F
$\neg F$	=	T

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & \neg(\neg(x \leq 7) \And \neg(y \neq 9)) \\ &= \neg(\neg(4 \leq 7) \And \neg(7 \neq 9)) \\ &= \neg(\text{!T} \And \text{!T}) \end{aligned}$$

				Ans
T	\And	T	=	T
T	\And	F	=	F
F	\And	T	=	F
F	\And	F	=	F

				Ans
T	\Or	T	=	T
T	\Or	F	=	T
F	\Or	T	=	T
F	\Or	F	=	F

			Ans
!T	=	F	
!F	=	T	

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & \neg(\neg(x \leq 7) \And \neg(y \neq 9)) \\ &= \neg(\neg(4 \leq 7) \And \neg(7 \neq 9)) \\ &= \neg(\neg T \And \neg T) \\ &= \neg(F \And F) \end{aligned}$$

				Ans
T	\And	T	=	T
T	\And	F	=	F
F	\And	T	=	F
F	\And	F	=	F

				Ans
T	\Or	T	=	T
T	\Or	F	=	T
F	\Or	T	=	T
F	\Or	F	=	F

		Ans
!T	=	F
!F	=	T

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & \neg(\neg(x \leq 7) \And \neg(y \neq 9)) \\ &= \neg(\neg(4 \leq 7) \And \neg(7 \neq 9)) \\ &= \neg(\neg T \And \neg T) \\ &= \neg(F \And F) \\ &= \neg F \end{aligned}$$

				Ans
T	$\And\And$	T	=	T
T	$\And\And$	F	=	F
F	$\And\And$	T	=	F
F	$\And\And$	F	=	F

				Ans
T	$\mid\mid$	T	=	T
T	$\mid\mid$	F	=	T
F	$\mid\mid$	T	=	T
F	$\mid\mid$	F	=	F

		Ans
!T	=	F
!F	=	T

If x is 4 and y is 7...

Evaluate

$$\begin{aligned} & \neg(\neg(x \leq 7) \And \neg(y \neq 9)) \\ &= \neg(\neg(4 \leq 7) \And \neg(7 \neq 9)) \\ &= \neg(\neg T \And \neg T) \\ &= \neg(F \And F) \\ &= \neg F \\ &= T \end{aligned}$$

				Ans
T	$\And\And$	T	=	T
T	$\And\And$	F	=	F
F	$\And\And$	T	=	F
F	$\And\And$	F	=	F

				Ans
T	$\mid\mid$	T	=	T
T	$\mid\mid$	F	=	T
F	$\mid\mid$	T	=	T
F	$\mid\mid$	F	=	F

		Ans
$\neg T$	=	F
$\neg F$	=	T

5. In each pair, circle the one which creates the correct code to make a Boolean Expression.

(a) one => two

or

one >= two

(b) one = two

or

one == two

(c) one > two > three

or

one > two && two > three

8. Write a Boolean expression to represent each of the following:

(a) x is greater than 34 _____

(b) x is less than or equal to 25 _____

(c) x is not equal to 3 _____

(d) x is between 1 and 12 _____

(e) x is over 17 _____

(f) x is under 17 _____

(g) x equals 3 or 5 _____

(h) x equals 5 or 9 _____

9. AND expressions.

If I want x to be between 1 and 4, I write ($x \geq 1 \text{ && } x \leq 4$).

Fill in the following.

a) x is between 5 and 9 _____

b) x is between 4 and 10 _____

c) x is between 2 and 100 _____

d) x is between 6 and 99 _____

A close-up photograph of a small, young green turtle resting on a person's skin. The turtle's head is turned slightly to its left, and its front legs are visible. The background is blurred.

Some
jokes.



an inconvenient boolean

the crisis of
global variables

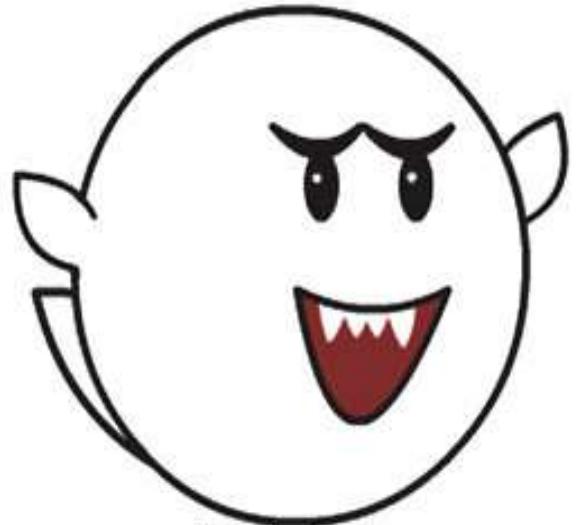
Adapted for A NEW GENERATION
from the New York Times Bestseller

an inconvenient truth

the crisis of
global warming



AL GORE



BOO



BOOLEAN