

## Boolean Logic / Propositional Logic.

True/false values = "Booleans" - named for George Boole, 181? - 186?

1854: "The Laws of Thought"

In DSes: we've seen Boolean values as tests.

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### Propositions.

Def'n A proposition is a declarative statement that can be either true or false.

eg. "Wash. DC is the capital of the US." — true  
"Toronto is the capital of Canada." — false  
"10 is divisible by 3." — false

non-examples: 6

"Could you hold this?"

$x + 2 = 5$  — not a proposition since we don't know what  $x$  is.

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### Negation.

Def'n If  $P$  is a proposition, the negation of  $P$  is also a proposition, written  $\text{not}(P)$ ,  $\neg P$ , or  $\bar{P}$ .

$\neg P$  is true when  $P$  is false and vice versa.

$P$	$\neg P$
T	F
F	T

## Conjunction (AND)

$\wedge$  looks like  
A for "AND".

Def'n If  $P$  and  $Q$  are propositions, their conjunction, written " $P$  and  $Q$ " or " $P \wedge Q$ ", is also a proposition, which is true when  $P$  and  $Q$  are both true, and false otherwise.

$P$	$Q$	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

## Disjunction (OR)

Def'n If  $P$  and  $Q$  are propositions, their disjunction, written " $P$  or  $Q$ " or " $P \vee Q$ ", is also a proposition, which is false when both  $P$  and  $Q$  are false, and true otherwise.

$P$	$Q$	$P \vee Q$
T	T	T
T	F	T
F	T	T
F	F	F

"inclusive or" — or  
if both are true.

(exclusive or = exactly  
one is true)