

Section 1.5: Intro to Logic

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2:18 PM

logical proposition : a statement which is either true or false.

examples :

- ① Python is a computer language.
- ② Bill Gates cofounded Microsoft.
- ③ The number seven is an even integer.

non-examples :

- ④ Please put your books away.
- ⑤ Where is Pat's office?
- ⑥ He is six feet tall.



note: if the statement contains a variable (he) and that variable is undefined, it's not a proposition

"Paul is Pat's neighbour and he is six feet tall"

is a proposition

notation: use letters $p, q, r, s,$ and t for propositions

example: "Pat drinks coffee"

let $p =$

operators:

"not" - negation

for p , the negation can be written as

\bar{p} ← we will use

$\sim p$

$\neg p$

Wolfram Alpha

p'

examples:

Are the following pairs of statements negations of each other?

①

Pat drinks coffee.

Pat does not drink coffee.

Y

Pat does not drink coffee. 'N

(2) Pat drinks coffee.
Pat drinks tea. N

(3) Everyone at the bar right now wants a beer.
No-one at the bar right now wants a beer. N

↑
there is a third possibility:
some do and some do not

⇒ the negation of "Everyone is ..."
is "At least one person is not ..."

logical connectives:

"and" (conjunction) joins two propositions

notation: $p \wedge q$

$p \wedge q$ is true when both p and q are true

$p \wedge q$ is false when at least one of them
is false

"or" (inclusive disjunction)

notation: $p \vee q$

$p \vee q$ is true when at least one of them
is true
(one or the other or both)

"exclusive or" (exclusive disjunction)

notation: $p \oplus q$ \leftarrow I will use

$p \text{ xor } q$ \leftarrow you can use
if you like

$p \oplus q$ is true when one of the other is
true but not both