

Section 2.1: Intro to Logic

Tuesday, January 14, 2020 11:46 AM

logical proposition: a statement that 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 Sergyta's office?
- ⑥ He is six feet tall.

↑ who is he?

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

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

is a proposition

notation: use lower-case letters

p, q, r (and s, t)

for propositions

example: let $p =$ "Pat drinks coffee"

operators:

"not" - negation

for p , the negation can be written as

\bar{p} ← we will use this

$\sim p$ (symbolic logic)

$\neg p$ (Wolfram Alpha)

p'

$!p$ (computing)

when are two propositions negations of each other?

- when only one of them can be true at a time

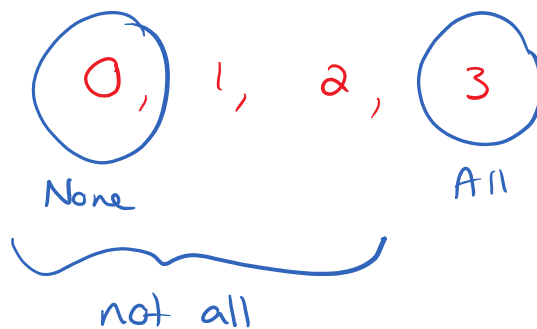
(no overlap / the two propositions between them cover all possibilities)

the negation of "Everyone is ..." is

"At least one person is not ..."

example: suppose there are three objects, let's say, coins

how many are quarters?



None \neq Not all

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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
(one or the other or both)

"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)

$p \vee q$ is false when both p and q are false

"exclusive or" (exclusive disjunction)

notation:

$$p \oplus q$$

← I will use

$$p \text{ xor } q$$

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

problem: in English, the word "or" can mean
either the inclusive or exclusive "or"
and we tell the difference by
context