

Grammar of mathematics

I) A Language based on true and false

Definition: A proposition, or statement is a declarative sentence that is either true, or false, but not both.

Examples

<u>Sentence</u>	<u>Statement</u>	<u>Value</u>
I wear brown shoes today	Yes	True
The student on the first row on the right wears glasses	Yes	No
I will eat soup tonight	Yes	We don't know yet
It will rain tomorrow	Yes	

Examples:

(2)

Sentence	Proposition	Value
$2 + 2 = 4$	Yes	True
$1 + 5 = 7$	Yes	False
$X + 2 = 4$	Ambiguous Not a proposition	/
For all natural numbers x , $x + 2 = 4$	proposition	False
There exists a natural number x such that $x + 2 = 4$	proposition.	True
There exists a natural number x such that $x + 5 = 1$	proposition.	False

II Compound propositions

There are two types of compound propositions: those that are associated with an operation on one proposition, and those that are associated with operations on two propositions.

II) 1) 1 proposition

Negation: Let p be a proposition. The sentence "It is not the case that p " is another proposition, called the negation of p , denoted $\neg p$ or $\sim p$.

Logic table

p	$\neg p$
T	F
F	T

2 propositions

(4)

Truth table		AND	OR
P	q	$P \wedge q$	$P \vee q$
T	T	T	T
T	F	F	T
F	T	F	T
F	F	F	F

Conditional proposition:

Definition: The compound proposition written as $P \rightarrow q$ that reads " P implies q " or "if P , then q ".
" P is true unless P is true and q is false."

P	q	$P \rightarrow q$
T	T	T
T	F	F
F	T	T
F	F	T