Logic.

We argue based on statements.
In mathematics, we are concern with two types of statements - true or false.
It can only take these two value.

- For example:

1) 2 is greater than 1 - true
2) There are finite numbers of integers - false
3) This sentence is false. (neither true or false.)

If the above sentence is true - then the sentence can't be false.
If the statement is false - the sentence is true. - Therefore, it can is neither true ~~or~~ nor false.

4) $1+1=2$ (always true) - this statement is always true.

5) $x^2=1$, true when $x=1$ or $x=-1$.
It is false when $x=5$.

So the last sentence is true based on context. We need to specify the context.

Based on the simple sentences which are true or false we can form complex statements. This is through connectives.

Logical connectives:

We ~~do~~ denote sentences through A and B.

① negation. A can take two truth values: truth, false.

A	$\sim A$
True	False
False	True.

~~If A is~~ When A is true, negation of A is false. And when A is false negation of A is true.

4) to

A	$\sim(\sim A)$
True	True
False	False

double negation is same as the orginal statement.

2) Conjunction of statements A, B is denoted as A and B .
In symbol $A \wedge B$

Truth value of $A \wedge B$

A	B	$A \wedge B$
True (T)	True	T
T	False (F)	F
F	T	F
F	F	F

A statement A and B ($A \wedge B$) is true when both A and B are true.
when any one of them is false the statement is false.

3) Disjunction of A, B is denoted as A or B , in symbol $A \vee B$

The truth table is:

A	B	A ∨ B
T	T	T
T	F	T
F	T	T
F	F	F

A ∨ B / A or B is a true statement when both A and B are true, any one of them (A, B) is true. It is false when both A, B are false.

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3) Implication of statements A, B,

If A then B , A → B.

Truth table is :

A	B	A → B
T	T	T
T	F	F
F	T	T
F	F	T

The statement A → B is true when B is true and A is true. Whenever A is false, it is always true.

This statement is false when A is true and B is false.

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4) Equivalence of statements A, B

A if and only if B , A ↔ B.