Introduction What is proof?



Proof is method of obtaining / ascertaining a truth.

Example

- L. Experimentation
- 2. Observation
- 3. Sampling & Counter examples
- 1. Judge & Juries
- 5. Religion (Word of God)
- 5. Word of Boss

Important

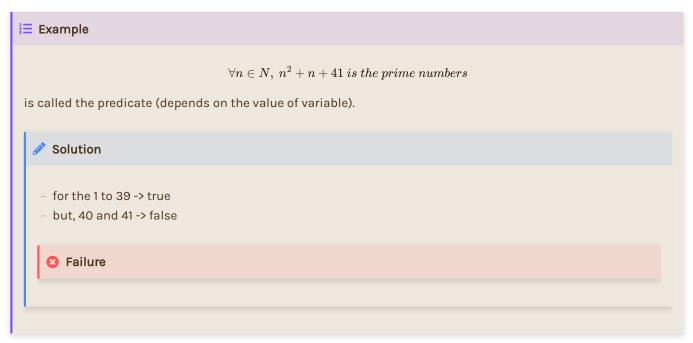
In mathematics, a mathematical proof is a verification of a **proposition** by a chain of **logical deductions** from a set of **axioms**.

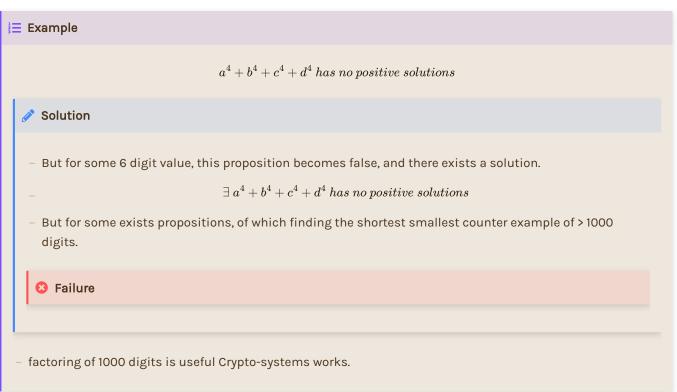
Proposition



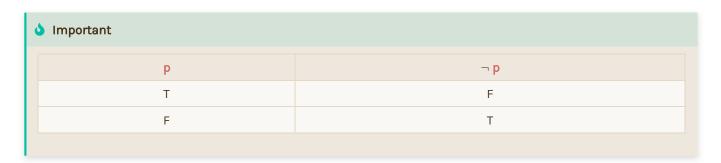
A proposition is statement which is either true or false.

For this proposition to be to, the predicate has to come true.

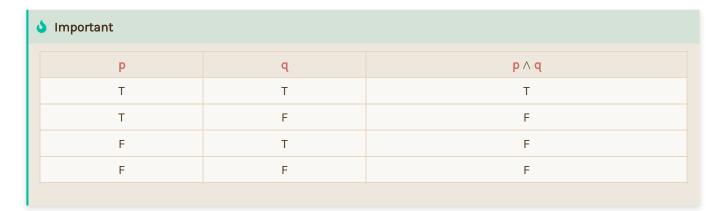




Not



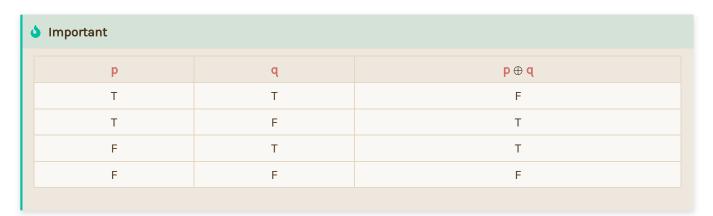
And



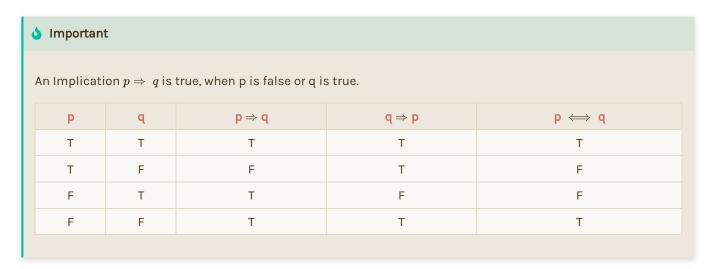
Or

\undersigned Important		
р	q	p∨q
Т	Т	Т
Т	F	Т
F	Т	Т
F	F	F

Exclusive Or (xor)



Implies



"If pigs fly, I would be king" is true.

if and only if

• Important				
- either both true or both false				
р	q	$p \Longleftrightarrow q$		
Т	Т	Т		
Т	F	F		
F	Т	F		
F	F	Т		
<u>‡</u> ≣ Example				
$x^2-4 \geq 0 \iff x \geq 2$				

Conjecture



Conjecture is an opinion or conclusion formed on the basis of incomplete information.

Axiom



An axiom is a proposition that is assumed to be true.

Example

- In Euclidean Geometry, Given a line L and a point P not on line L, there is exactly one line through P || L.
- In Euclidean Geometry, Given a line L and a point P not on line L, there is no line through P \parallel L.
- In Hyperbolic Geometry, Given a line L and a point P not on line L, there is infinite lines through P || L.

Attention

- Axioms should be consistent and complete
- A set of Axioms is said to be consistent if no proposition can be proved to be both true and false.
- A set of Axioms are said to be complete if it can be used to prove every proposition is either true or false.

Notations

- ∀ (for all)
- ∃ (ther exists)
- $-\in$ (belongs to)