Conjectures:

$\Rightarrow$ (implies)

e.g. x = 4 $\Rightarrow x^2 = 16$

$\Leftrightarrow$ (equivalent)

e.g. $x = \pm 4 \Leftrightarrow x^2 = 16$

Quantifiers:

$\forall$:(For all)

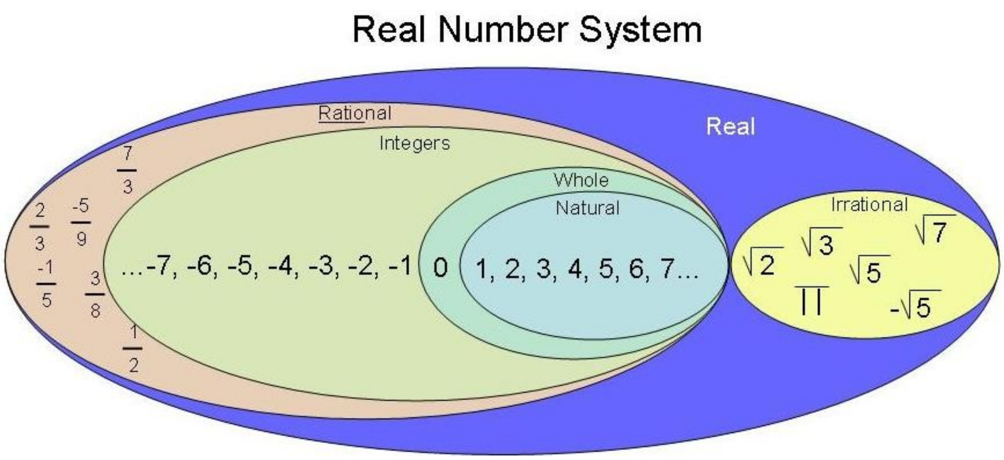
$\exists$: (there exists)

e.g. $\exists x \in \mathbf{Z}$

$\mathbb{R}$: (real set)

Z: (integer set)

$\in$: (element)



Implications: $\Rightarrow$ one way

Equivalence: $\Leftrightarrow$ two-way

Converse:

** Works for most definitions

$P \Rightarrow Q$

Converse is $Q \Rightarrow P$

Is when the hypothesis and conclusion of a statement is switched. However, the converse of a true statement need not be true

e.g. if $x=2$ then $x^2=4$ is true

if $x^2 = 4$ is false (because x could be -2)

Although if the statement are true they are equivalent statements can be written ' P if only Q'

e.g. A triangle has two sides of the same length if and only if it has two angles in size.

Contrapositive:

$P \Rightarrow Q$

The contrapositive is "If not Q then not P"

Is when the hypothesis and the conclusion of a conditional statement is switches and then negating both.

e.g. if $x=2$ then x^2 then $x^2=4$

Contrapositive statement: if $x^2 \neq 4$ then $x \neq 2$

The contrapositive of a true statement is also true

e.g. if a polygon has exactly 4 sides then the polygon is a quadrilateral (True statement)

If a polygon is not a quadrilateral then it does not have exactly four sides (The contrapositive is also true)

Inverse:

$P \Rightarrow Q$

The inverse statement is: if not P then not Q

Negating both the hypothesis and the conclusion of a conditional statement.

Negation: (not)

If P is the statement

It is raining

Then the negation of P is the statement:

It is not raining

Assume the opposite and prove the opposite wrong

e.g. the statement:

You cannot have a right-angle triangle with one side of length 3x cm, another side length (4x+5) cm and the longest side of length (5x+4)

Assume the opposite

Assume that we can indeed have a right-angle triangle with the given side lengths and the prove that this assumption leads to something that cannot be true.

Pigeon-Hole Principles:

If there are n pigeon holes, n **1, and n+1 pigeons go in them, then at least one pigeon hole must get two or more pigeons.**

e.g. a letterman has 7 letters, but there's only 6 letter boxes. Therefore, one of the letter boxes will have at least 2 letters.

Concluding

Thus for this statement	if P then Q
The *converse* statement is	if Q then P
The *contrapositive* is	if not Q then not P
The *inverse* statement is	if not P then not Q

- The *contrapositive* statement involves both the effect of the *converse*, in its switch of P and Q, and the *inverse*, with its negations of both P and Q
- If the original statement is true then the *contrapositive* is also true but the *converse* and the *inverse* may not be