Deduction

Syllogism ('modus ponens')

Suppose P and Q are statements, that $P \implies Q$ is true, and that P is true. Then Q is true.

P hypothesis statements

Q conclusion statement

$P \Rightarrow Q$ statement

$P \Rightarrow Q$ is true
AND
P is true
THEN
Q is true

→

P	Q	P⇒Q
T	T	T
T	F	F
F	T	T
F	F	T

Indirect Proof

Suppose that P and Q are statements, that $P \implies Q$ is true, and that Q is false. Then P is false.

$P \Rightarrow Q$ true
$\sim Q$ true (Q false)
$\sim P$ true (P false)

P	Q	$P \Rightarrow Q$
T	T	T
T	F	F
F	T	T
F	F	T

If X is a set with 3 elements then $\wp(X)$ has 8 elements:

P: X has 3 elements
Q: $\wp(X)$ has 8 elements

$P \Rightarrow Q$ true.

X is a set, $\wp(X)$ does not have 8 elements, then X does not have 3 elements

Elimination

Suppose that $P \vee Q$ is true, and P is false. Then Q is true.

P: I live on the moon

Q: I love math

P OR Q is TRUE

P is FALSE

must be the case that Q is TRUE

P	Q	PvQ
T	T	T
T	F	T
F	T	T
F	F	F

~~EA~~

$P \Rightarrow Q$ true

Q true