Truth tables

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1 Truth Tables

A truth table is a mathematical table used in logic and mathematics.

The truth table is important for listing all possible values in an expression and determining whether their results are true or false.

There are more than one relationship in truth tables, such as: Conditional, Biconditional, Conjunction, Disjunction, and Negation.

Below are the truth tables for these relationships:

1.1 Negation ($\neg P$)

P	$\neg P$
T	F
F	T

Negation takes a proposition P and reverses its truth value.

1.2 Conjunction ($P \wedge Q$)

P	Q	$P \wedge Q$
T	T	T
T	F	F
F	T	F
F	F	F

Conjunction is true if and only if both P and Q are true.

1.3 Disjunction ($P \vee Q$)

P	Q	$P \vee Q$
T	T	T
T	F	T
F	T	T
F	F	F

Disjunction is true if at least one of P or Q is true.

1.4 Conditional ($P \to Q$)

P	Q	$P \to Q$
T	T	T
T	F	F
F	T	T
F	F	T

A conditional statement is false only when P is true and Q is false.

1.5 Biconditional ($P \leftrightarrow Q$)

P	Q	$P \leftrightarrow Q$
T	T	T
T	F	F
F	T	F
F	F	T

A biconditional is true if and only if both P and Q have the same truth value.

2 Conclusion

This document provides a basic overview of truth tables and their relationships in logic and mathematics. Truth tables are very important for understanding logic and mathematics, and they are foundational concepts in fields such as linear algebra, fundamentals of math, or discrete mathematics. You may learn this before diving into more advanced topics in the world of mathematics.

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