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Logic: Propositional Logic (Quickstudy: Academic)

Quick Study ACADEMIC WORLD'S #1 ACADEMIC OUTLINE

LOGIC

THE BASIC PRINCIPLES OF PROPOSITIONAL & SYLLOGISTIC LOGIC - PLUS QUANTIFICATION THEORY

PROPOSITIONAL LOGIC

BASIC ELEMENTS

EQUIVALENT NAMES
Propositional Calculus: Symbolic Logic
Symbolic Functional Logic: Algebra of Propositions

SYMBOLS
• Sentence Variables: p, q, r, \dots
• Sentence Abbreviations: A, B, C, ...
• Parenthetical Marks: parentheses (bracketing device)
• Operators: " \neg ", " \wedge ", " \vee ", " \rightarrow ", " \leftrightarrow ", " \equiv " (read only if \leftrightarrow)

Operations
1. **Negation**: " \neg "
Read as "not", "is false", "is not true"
2. **Disjunction**: " \vee "
Read as "or", "at least one", "is true or is false"
3. **Conjunction**: " \wedge "
Read as "and", "both", "is true and is false"
4. **Implication**: " \rightarrow "
Read as "if... then...", "implies", "is a sufficient condition for"
5. **Biconditional**: " \leftrightarrow "
Read as "if and only if", "is equivalent to", "is true exactly when", "is true exactly when", "is true exactly when", "is true exactly when"

Well-Formed Formulas (wff)
• If A is a wff, then $\neg A$ is a wff.
• If A and B are wffs, then $(A \wedge B)$, $(A \vee B)$, $(A \rightarrow B)$, and $(A \leftrightarrow B)$ are wffs.

TRUTH-TABLE METHOD

OUTLINE OF METHOD
• An inference is correct (is valid) only if its conclusion wff yields a tautology on the final column of a truth-table. A sentence is consistent if its symbolized wff yields a tautology on the final column of a truth-table. If the purpose for generating a truth-table is to determine validity, then there is no need to complete the table as soon as a single "F" is detected in its final column.

INFERENCES: PREMISES & CONCLUSION:
An inference for argument is usually indicated by the presence of a premise-wff and a conclusion-wff, or both.
• **Premise-wffs**: since, because, for, for the reason that, etc.
• **Conclusion-wffs**: therefore, hence, thus, an consequence, it follows that, etc.
Note: The conclusion of an inference is always appearing on the final column of a truth-table. It is usually the last sentence of an inference in ordinary language.

TRUTH-TREE METHOD

OUTLINE OF METHOD
• General: This method uses the **method of Assumption** (or **Indirect Proof**) under **Truth-Table**. The formula being tested is first assumed (joined with the table). Truth (tautology) formula is Assumption until the result is either an atomic proposition or a negation. If and only if the tree yields a contradiction at every branch is the formula a tautology.

Setting up the Tree
1. **Formulas for an Inference**
A. List each premise.
B. Add the negation of the conclusion.
C. Decompose every molecular formula, checking off each formula separately.
2. **Key Well-Formed Formulas**
A. **Negation**
B. **Disjunction**
C. **Conjunction**
D. **Implication**
E. **Biconditional**

Examples:
1. **Disjunction**
 $(p \vee q) \wedge (q \vee r) \wedge (r \vee p) \rightarrow (p \vee q) \vee (q \vee r) \vee (r \vee p)$
2. **Implication**
 $(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$
3. **Disjunction**
 $(p \vee q) \wedge (q \vee r) \wedge (r \vee p) \rightarrow (p \vee q) \vee (q \vee r) \vee (r \vee p)$

SHORTER TRUTH-TABLE METHOD

OUTLINE OF METHOD
• **Indirect Proof** (method of **assumption**): Assume a wff is false. If proposition leads to a contradiction, then the wff is necessarily true; otherwise, it is false. If a truth-table assignment can be found that is consistent with the initial proposition of false, then the wff is not necessarily true; inference is invalid.

Limitations in Method: Not every effective inference can be used in a unique mechanical procedure on all wffs. Conjunctions, biconditionals, negations of conditionals or disjunctions can be falsified to make them true. Method is applicable to inferences. The wff that symbolizes an inference is always a conditional, which is falsifiable in only one way: The antecedent must be true while the consequent is false. Only one consistent falsifying assignment of truth-values is required for determining invalidity.

Valid Inference: Symbolic Inference
If $V_1 \wedge V_2 \wedge \dots \wedge V_n$ is false, then V_1 is false and the consequent false. A true conjunction requires all true conjuncts.
If $V_1 \wedge V_2 \wedge \dots \wedge V_n$ is true, then V_1 is true and the consequent true. A true conjunction requires all true conjuncts.
If $V_1 \wedge V_2 \wedge \dots \wedge V_n$ is true, then V_1 is true and the consequent true. A true conjunction requires all true conjuncts.

NOTE: An inference is indicated by the " \rightarrow " in a conditional. This inference is **valid** if the consequent is a tautology. Conversely, the inference is **invalid** if the consequent is a contradiction.



Synopsis

This 4-page study guide contains fundamental logic definitions and analysis which is specifically designed to aid science students.

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Customer Reviews

Read with an introduction to logic, this BarChart fits well with the student who wishes to 'think-straight,' a task which seems harder to do in this age when ideology and dogma clutter the open-ness of mind which is the requisite of reality-based progress. I carry this chart with me in my back-pack and refer to it often as a corrective to 'boners' and lapses in sound reason. Would that everyone who is patsy for demagogues could do the same! For the price and for the reward of clear address to problem-solving, this chart is certainly 'well worth the price.'--Vernon Lynn Stephens

I completed a Logic class about a year ago and having this Quickstudy is a good reference instead of digging into my notes or textbook .

I bought this for my son's first logic class at Alabama, and it really helped to define some of the basic principles. Good item !

Durable, may be punched to fit a ring binder, fit in standard binder cover pockets, and good for

skim-studying or memory refreshing on a topic.

cool... though i don't understand it yet... haha... plan on keeping it as a reference.

High quality and delivered on time.

Chart arrived in good conditon.

great.

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