

Truth table to compound proposition

Given a truth table, how do we find an expression using the input variables and logical operators that has the output values specified in this table?

Application: design a circuit given a desired input-output relationship.

| Input | | Output | |
|-------|-----|-------------|-------------|
| p | q | $mystery_1$ | $mystery_2$ |
| T | T | T | F |
| T | F | T | F |
| F | T | F | F |
| F | F | T | T |

Expressions that have output $mystery_1$ are

Expressions that have output $mystery_2$ are

Idea: To develop an algorithm for translating truth tables to expressions, define a convenient **normal form** for expressions.

Dnf cnf definition

Definition An expression built of variables and logical operators is in **disjunctive normal form** (DNF) means that it is an OR of ANDs of variables and their negations.

Definition An expression built of variables and logical operators is in **conjunctive normal form** (CNF) means that it is an AND of ORs of variables and their negations.