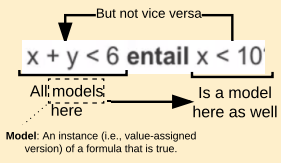
WEEK 1: Entailment and other concepts

ENTAILMENT IN ARITHMETIC FORMULAS



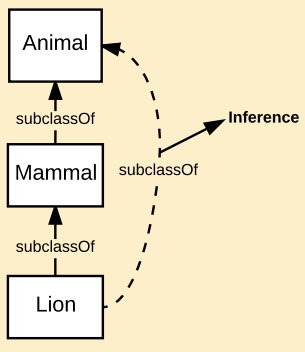
Model: An instance (i.e., value-assigned version) of a formula that is true.

ENTAILMENT IN CONCEPT HIERARCHIES

Concept: An abstraction or generalization arrived through experiences or transformation of existing ideas.

Lion subclassOf Mammals

Everything that is true for mammals must be true for all lions, but not everything true for lions is true for all mammals.



Universe:
{object1, object2, object3, ...}

Knowledge base:
{axiom1, axiom2, axiom3, ...}

Axiom:
Lion subclassOf Mammal

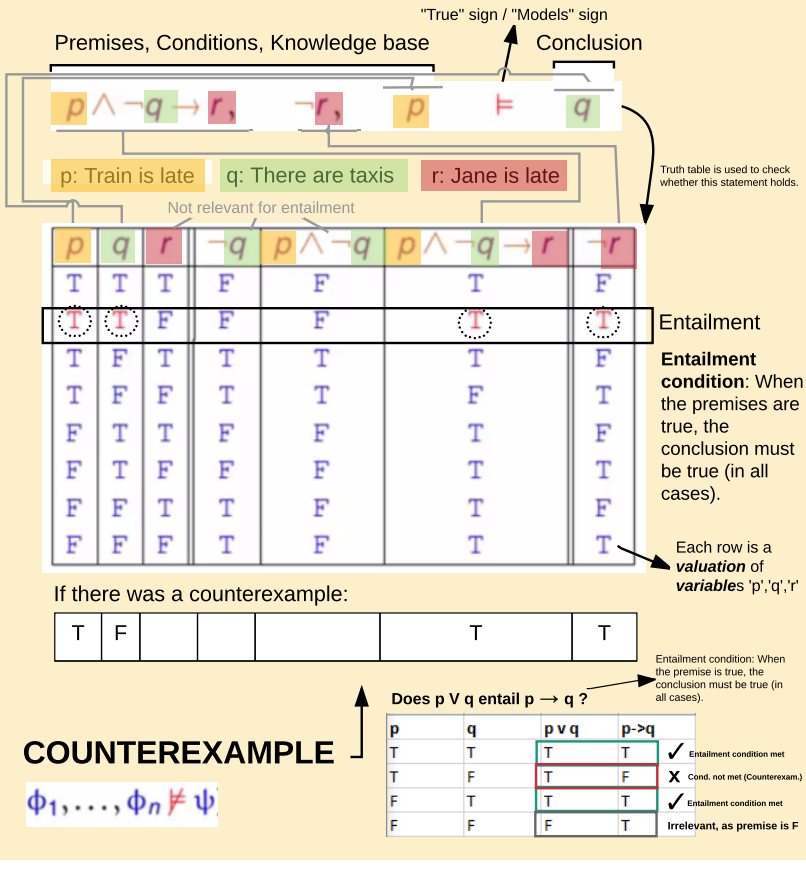
This statement becomes a *model* of the *axiom* only if the model is true,.

Model:
lionNamedX subclassOf Mammals

Not a model (and not a counterexample):
snakeNamedY subclassOf Mammals

This statement is not true; therefore, it is not a model. If it was true, then it would have been a counterexample, but it is not.

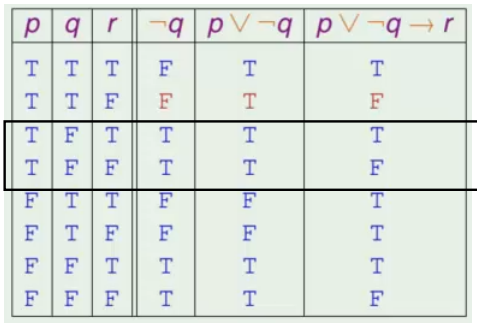
ENTAILMENT IN PROPOSITIONAL LOGIC



Entailment condition: When the premises are true, the conclusion must be true (in all cases).

TRUTH TABLE

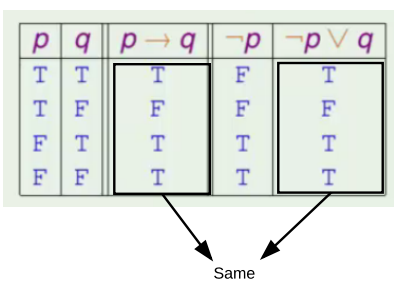
Not all lines in a truth table make sense. Establishing validity is to ascertain which ones do.



e.g., Train is late (p), and there are no taxis (-q), but in one case Jane is late (r) and in the other she is not late.

EQUIVALENCE

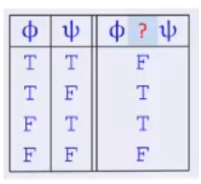
$p \rightarrow q \equiv \neg p \vee q$



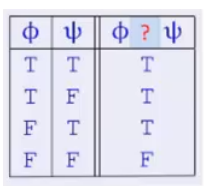
COUNTEREXAMPLE

$\phi_1, \ldots, \phi_n \not\models \psi$

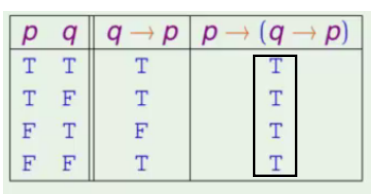
EXCLUSIVE 'OR'



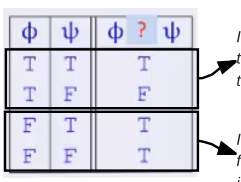
DISJUNCTION ('OR')



TAUTOLOGY



IMPLICATION



*If you start out with a true premise, then the implication should be true only when the conclusion is also true. (This corresponds to the scenario in when **ϕ** is true, the truth of the implication is the same as the truth of **ψ**.)*

*If you start out with a false premise, then, as far as implication is concerned, you are free to conclude anything. (This corresponds to the scenario in when **ϕ** is false, the implication **ϕ**→**ψ** is true no matter what **ϕ** is.)*

CONTRADICTION

ENTAILMENT IN SIMPLE GROUNDED GRAPHS