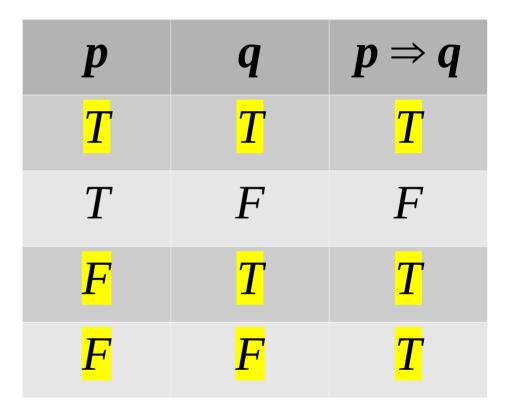
Implication and Equivalence

Implication (⇒)

- Implication is a conditional
 - e.g. "if I am drinking tea then I am happy"
- However, when the antecedent is false, the statement becomes vacuously true

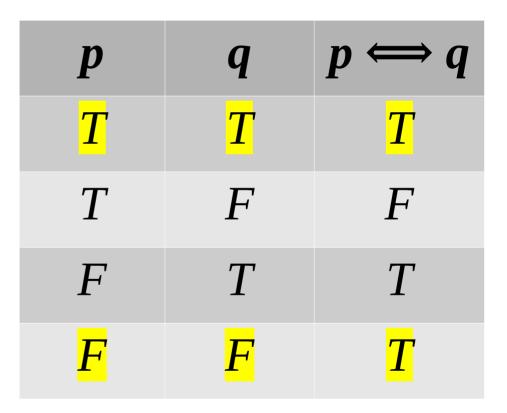


Vacuous Truth

- Vacuous truth is a weird idea
 - The statement "all dogs on the moon are blue" is (vacuously) true
- In an implication, there is an antecedent and a consequent
 - If antecedent, then consequent
- If the antecedent is false, the statement is always (vacuously) true

Equivalence (\iff)

- An equivalence is true when **both** truth values are **the same**
 - e.g.this is true:
 - "I am wearing socks" ↔ "The sun rises in the east"
 - This is false:
 - "I am wearing socks" ↔ "The UK is in the southern hemisphere"
- Often read "if and only if"



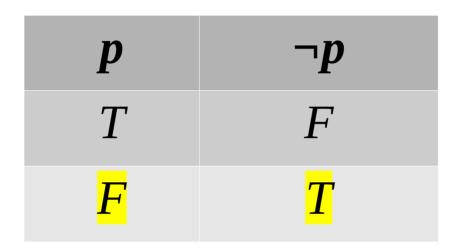
Tautology

р	$p \Longleftrightarrow p$
T	<mark>T</mark>
F	<mark>T</mark>

Contradiction

р	$p \Longleftrightarrow \neg p$
Т	F
F	F

Contingiency



Precidence

- Precidence in Proposional Logic
 - 1. Negation ¬
 - 2. Conjunction \wedge
 - 3. Disjunction v
 - 4. Implication \Rightarrow
 - 5. Equivalence \iff
- For example $\neg p \land q$ means ($\neg p$) $\land q$ and not $\neg (p \land q)$.

Summary

- Logical Operators
 - Implication \Rightarrow
 - Vacuous Truth
 - Equivalence \iff
- Tautology
- Contradiction
- Contingiency