PHI 103 - Propositional Logic
Lecture 1

Symbols and Translations

⊃ ≡ ∴ ~ • ∨

Statement: any sentence that is bivalent (*has one of two possible truth values*).

Proposition: the meaningful *content* of a statement.

Propositional Logic

Part 1 - Symbols and Translations

I. Propositions -

A. **Simple** - a single, complete, statement -

1. Dogs are mammals.
2. Ray-Bans are expensive.
3. Kato is a beautiful dog.
4. *Rick and Morty* is a great TV show.

B. **Complex** - one or more conjoined statements -

1. Both dogs ***and*** cats are mammals.
2. ***If*** Kato is a dog, ***then*** he is a mammal.
3. ***Either*** you like *Rick and Morty*, ***or*** you like *Family Guy*.
4. You'll like *Futurama* ***if and only if*** you like *The Simpsons*.

Propositional Logic

Part 1 - Symbols and Translations

II. **Symbols -**

A. **Propositions** - use a capital letter to symbolize a proposition (use *the first letter of the subject term*) -

1. **Simple** -

a. ***D***ogs are mammals. = **D**

b. ***R***ay-Bans are expensive. = **R**

c. ***K***ato is a beautiful dog. = **K**

d. ***R****obot Chicken* is a great TV show. = **R**

2. **Complex** -

a. Both ***d***ogs and ***c***ats are mammals. = **D** and **C**.

b. If ***K***ato is a dog, then Kato is a ***m***ammal. = If **K**, then **M**.

c. Either you like ***R****obot Chicken*, or you like ***F****amily Guy*. = Either **R** or **F**.

Propositional Logic

Part 1 - Symbols and Translations

B. **Operators** (*connectives*) -

1. **Negation** 'it is not the case that' - *tilde* ~
2. **Conjunction** 'and' - *dot* ·
3. **Disjunction** 'or' - *wedge* ∨
4. **Material Implication** (conditional) - 'if, then' - *horseshoe* ⊃
5. **Material Equivalence** (biconditional) 'if and only if' - *triple bar* ≡

C. **Propositions** -

1. ***D*** and ***C***. = **D · C**
2. It's not the case that ***K***. = **~K**
3. If ***K***, then ***M***. = **K ⊃ M**
4. Either ***R*** or ***F***. = **R ∨ F**
5. ***S*** if and only if ***I***. = **S ≡ I**

Propositional Logic

Part 2 - Order of Operation and Punctuation

D. **Punctuation** - Identifying Order of Operations

1. **Parentheses** (*first order*)

Both Lucia and Kato are dead.

Lucia is dead *and* **K**ato is dead.

L *and* **K**

L · **K** a ***W***ell-***F***ormed ***F***ormula

Lucia or Kato are not dead.

It's not the case that **L**ucia *or* **K**ato is dead.

It's not the case that **L** *or* **K**.

~ **L** ∨ **K** ***not*** a ***W***ell-***F***ormed ***F***ormula

~ (**L** ∨ **K**) a ***WFF***

Propositional Logic

Part 2 - Order of Operation and Punctuation

D. **Punctuation** - Identifying Order of Operations

1. **Parentheses (**first order**)**
2. **Brackets [***second order***]**

Lucia or Kato are dead, and so is Silver and Moose.

Lucia is dead *or* **K**ato is dead, *and* **S**ilver is dead *and* **M**oose is dead.

L *or* **K** *and* **S** *and* **M**.

(L ∨ K) · (S · M) ***WFF***

It's not true that, Lucia or Kato are dead and Silver and Moose are.

~ (L ∨ K) · (S · M) ***not*** a ***W***ell-***F***ormed ***F***ormula

~ [(L ∨ K) · (S · M)] ***WFF***

Propositional Logic

Part 2 - Order of Operation and Punctuation

D. **Punctuation** - Identifying Order of Operations

1. **Parentheses (**first order**)**
2. **Brackets [**second order**]**
3. **Braces {***third order***}**

~{ ~[(L ∨ K) · (S · M)] ≡ [(L ⊃ K) · (S · M)] }