Unit 3: Computing Truth

- The component sentences can only have one of two values, namely, they are either true or false. A system with only two possible values is a two value logic.
- The truth value of the compound formed by combining 2 simple sentences with a sentential operator can be determined solely by the truth value of each of the component sentences.
- Given the truth value of each of the components which are combined with one of the five sentential operators, it is possible to determine the truth value of the compound sentence by referring to the truth tables

Conjunction (AND)

p	q	$p \cdot q$
T	T	T
T	F	F
F	T	F
F	F	F

Disjunction (OR)

p	q	pvq
T	T	T
T	F	T
F	T	T
F	F	F

Material Condition (IF THEN)

p	q	$p \supset q$
T	T	T
T	F	F
F	T	T
F	F	T

Bi-Conditional (If And Only If)

p	q	$p \equiv q$
T	T	T
T	F	F
F	T	F
F	F	T

Negation

p	~p
T	F
F	T

Computing Truth Values Using

1. Determine the main connective
2. Assign truth values to each of the variables.
3. Begin with what is in parenthesis and work your way out to the main connective.

Example : ~(A∨X)⊃~(B⊃Z)

- Let A and B = True
- Let X and Z = False

Example Problems

[A, B, C]=T

[X, Y, Z]=F

1. $(A \supset B) \vee X$
2. $(A \equiv B) \equiv (Z \equiv X)$
3. $(\sim X \cdot \sim Y) \equiv (A \supset \sim(X \cdot Y))$
4. $((\sim X \supset \sim A) \cdot (\sim Z \cdot \sim Y)) \supset ((A \supset X) \vee C)$

Truth Functional and Non-Truth

- For an operator to be truth functional, the truth value of the compound that it forms is completely determined by the truth value of the component parts.
- A truth functional operator guarantees the T/F outcomes regardless of the components substituted.
- Other sentential operators such as “because” do not guarantee the outcomes like the truth tables for the five operators we work with do.