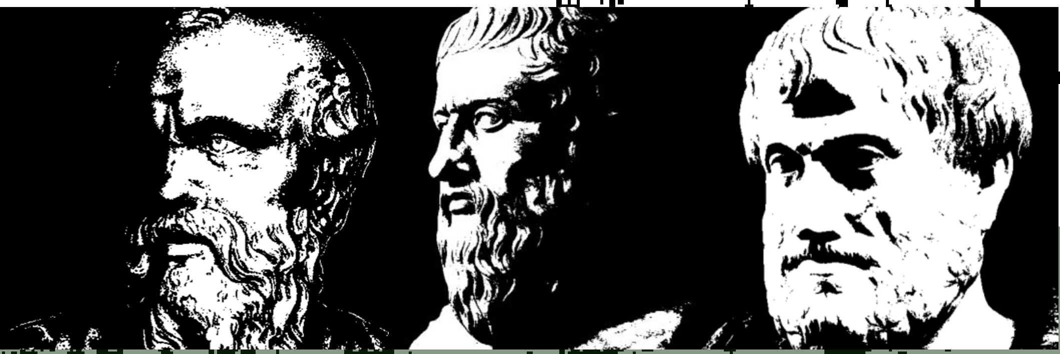
LOGIC I



PROPOSITIONAL LOGIC

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QUIZ II TODAY!!

Access: PANDA > Logic I > Tests & Quizzes > Quiz II

Begins at 15:00
Closes at 15:25
Save often

DO NOT USE: notes, lecture slides, or other internet sites.
I will be sneaking around you to make sure.

Password: tacos

REVIEW

Create an <u>EIO-3 standard syllogism</u>

Proposition	Letter name
All *S* are *P*.	**A**
No *S* are *P*.	**E**
Some *S* are *P*.	**I**
Some *S* are not *P*.	**O**

<u>Standard Form Categorical Syllogism</u>

1. All three statements are categorical propositions
2. Each term occurs 2 times and each time is identical.
3. Each term is used with the same meaning throughout the argument.
4. The major premise is listed first, the minor premise second, and the conclusion last.

Propositional Logic

REVIEW: Categorical Propositions

1. Defining propositions
2. Understanding category relationships
3. Understanding form and mood
4. Using symbols to simplify arguments
5. Methods to evaluate validity

Proposition	Letter name	Quantity	Quality	Terms distributed
All *S* are *P*.	**A**	universal	affirmative	*S*
No *S* are *P*.	**E**	universal	negative	*S* and *P*
Some *S* are *P*.	**I**	particular	affirmative	none
Some *S* are not *P*.	**O**	particular	negative	*P*

Propositional Logic

REALITY

1. People do not communicate is clear syllogisms
2. We will learn to evaluate natural language
3. We will further simplify with symbols called **operators**
4. And now we will evaluate truth, validity, and soundness

Operator	Name	Logical function	Used to translate
$\sim$	tilde	negation	not, it is not the case that
$\bullet$	dot	conjunction	and, also, moreover
$\vee$	wedge	disjunction	or, unless
$\supset$	horseshoe	implication	if . . . then . . . , only if
$\equiv$	triple bar	equivalence	if and only if

Propositional Logic

REALITY

1. Previous arguments were made of **simple** statements
2. Now we will focus on **compound** statements

SIMPLE

Fast foods tend to be unhealthy.

Murakami Haruki wrote 1Q84.

Parakeets are colorful birds.

The bluefin tuna is threatened with extinction.

Propositional Logic

REALITY

1. Previous arguments were made of **simple** statements
2. Now we will focus on **compound** statements

COMPOUND

- It is not the case that McDonald’s is a humanitarian organization.
- Billy Holiday sings jazz, and Taylor Swift sings pop.
- Either people conserve energy or costs will increase.
- If countries ignore international law, then war is a guarantee.
- The Broncos will win if and only if they score touchdowns.

Propositional Logic

USING OPERATORS TO SIMPLIFY

FIRST – Read the compound proposition

- It is not the case that McDonald’s is a humanitarian organization.
- Billy Holiday sings jazz, and Taylor Swift sings pop.
- Either people conserve energy or costs will increase.
- If countries ignore international law, then war is a guarantee.
- The Broncos will win if and only if they score touchdowns.

SECOND - Substitute Subject and Predicate with a Letter

- It is not the case that M
- B and T
- Either P or C
- If I then W
- B if and only if S

THIRD - Substitute meaning with Operators

- ~ M
- B • T
- P ∨ C
- I ⊃ W
- B ≡ S

Propositional Logic

USING OPERATORS TO SIMPLIFY

Operator	Name	Logical function	Used to translate
~	tilde	negation	not, it is not the case that
•	dot	conjunction	and, also, moreover
∨	wedge	disjunction	or, unless
⊃	horseshoe	implication	if . . . then . . . , only if
≡	triple bar	equivalence	if and only if

Compound proposition

1. It is not the case that McDonald's is a humanitarian organization. → **~ M**
2. Billy Holiday sings jazz, and Taylor Swift sings pop. → **B • T**
3. Either People conserve energy or Costs will increase. → **P ∨ C**
4. If countries Ignore international law, then War is a guarantee. → **I ⊃ W**
5. The Broncos will win if and only if they Score touchdowns. → **B ≡ S**

Propositional Logic

USING OPERATORS TO SIMPLIFY

Compound Proposition

It is not the case that McDonald's is a humanitarian organization.

Letter Substitution

It is not the case that M.

Symbolic Proposition

~M

Operator	Name	Logical function	Used to translate
~	tilde	negation	not, it is not the case that
•	dot	conjunction	and, also, moreover
∨	wedge	disjunction	or, unless
⊃	horseshoe	implication	if . . . then . . . , only if
≡	triple bar	equivalence	if and only if

Propositional Logic

NEGATION

Operator	Name	Logical function	Used to translate
~	tilde	negation	not, it is not the case that

The tilde always goes before
Cannot be used to connect to propositions
NO: G ~ H → **YES**: G ● ~ H

These statements are all **negations**. The main operator is a tilde.

$\sim B$

$\sim(G \supset H)$

$\sim[(A \equiv F) \cdot (C \equiv G)]$

Propositional Logic

CONJUNCTION

Operator	Name	Logical function	Used to translate
•	dot	conjunction	and, also, moreover

I like tacos and udon

T • U

• often indicates where () are needed

These statements are all **conjunctions.** The main operator is a dot.

$K \cdot \sim L$

$(E \vee F) \cdot \sim(G \vee H)$

$[(R \supset T) \vee (S \supset U)] \cdot [(W \equiv X) \vee (Y \equiv Z)]$

Propositional Logic

DISJUNCTION

Operator	Name	Logical function	Used to translate
v	wedge	disjunction	or, unless

You won't graduate unless you pass freshman English
~G v E
v often indicates where () are needed

These statements are all **disjunctions**. The main operator is a wedge.

$\sim C \vee \sim D$

$(F \bullet H) \vee (\sim K \bullet \sim L)$

$\sim[S \bullet (T \supset U)] \vee \sim[X \bullet (Y \equiv Z)]$

Propositional Logic

CONDITIONAL

Operator	Name	Logical function	Used to translate
⊃	horseshoe	implication	if . . . then . . . , only if

IF…THEN: If **K**yoto University increases tuition, then so will **R**itsumekan. → K ⊃ R
Only IF: **S**tanford will cut tuition if **H**arvard does. → H ⊃ S
After the "if"

These statements are all **conditionals** (material implications). The main operator is a horseshoe.

$H \supset \sim J$

$(A \vee C) \supset \sim(D \cdot E)$

$[K \vee (S \cdot \sim T)] \supset [\sim F \vee (M \cdot O)]$

Propositional Logic

CONDITIONAL

Operator	Name	Logical function	Used to translate
≡	triple bar	equivalence	if and only if

Haneda will tighten security if and only if Narita does. → H ≡ N
Order does not matter, because:
Simpler than (H ⊃ N) • (N ⊃ H)

These statements are all **biconditionals** (material equivalences). The main operator is a triple bar.

$M \equiv \sim T$

$\sim(B \vee D) \equiv \sim(A \cdot C)$

$[K \vee (F \supset I)] \equiv [\sim L \cdot (G \vee H)]$

Propositional Logic

CAUTION

Parenthesis: When there are more than 2 terms
students study hard and get As, or they don't study and get Fs.

$$(S \bullet A) \vee (D \bullet F)$$

Main Operator: Most important of the compound statement. If multiple operators it will <u>not</u> be in parentheses

$$\sim (W \supset T) \bullet (\sim T \supset L)$$

Notice the function of "either" and "both":

Not either *A* or *B*.	$\sim(A \vee B)$
Either not *A* or not *B*.	$\sim A \vee \sim B$
Not both *A* and *B*.	$\sim(A \bullet B)$
Both not *A* and not *B*.	$\sim A \bullet \sim B$

Do not confuse these three statement forms:

A if *B*	$B \supset A$
A only if *B*	$A \supset B$
A if and only if *B*	$A \equiv B$