

# Philosophy 110; Lecture 1 (Day 2)

## 1. What Is Logic?

Logic is the *science of reasoning*,  
which is to say:  
the discipline that studies and evaluates reasoning.

## 2. What Is Reasoning?

Reasoning is *inferring*, or making inferences.

To *infer* is

to draw conclusions (output)  
from premises (input).

### Example 1:

You see smoke, .....(input)  
and you *infer* that  
there is a fire. ....(output)

### Example 2:

You count 19 in a group .....(input)  
that originally had 20, .....(input)  
and you *infer* that  
someone is missing. ....(output)

### 3. Arguments

Logic evaluates reasoning in terms of arguments.

An **argument** is

a collection of **statements**,  
one of which is designated  
as the ***conclusion***,  
and the remainder of which are designated  
as the ***premises***.

A **statement** is

a **declarative sentence**,  
i.e., a sentence that is capable of being  
true or false.

#### **Example 1:**

there is smoke .....(premise)  
*therefore*,  
there is fire .....(conclusion)

#### **Example 2:**

there were 20 persons originally .....(premise)  
there are 19 persons currently .....(premise)  
*therefore*,  
someone is missing .....(conclusion)

## 4. Deductive Logic versus Inductive Logic

In Example 1,  
the truth of the premise *does not guarantee*  
the truth of the conclusion,  
but only makes the conclusion *likely*.

By contrast, in Example 2,  
the truth of the premises *guarantees*  
the truth of the conclusion.

This corresponds to the traditional distinction between

**INDUCTIVE LOGIC**

and

**DEDUCTIVE LOGIC**

## 5. Validity, Factual Correctness, and Soundness

Two questions about an argument.

1. Are the premises true?
2. Does the conclusion **follow from** the premises?

Alternatively,

1. Are the premises *supported by* the facts?
2. Is the conclusion *supported by* the premises?

## 6. Definitions

An argument is

|                          |                       |   |
|--------------------------|-----------------------|---|
| <b>factually correct</b> | <i>if and only if</i> | all of its premises are true.                         |
| <b>valid</b>             | <i>if and only if</i> | its conclusion follows from its premises.             |
| <b>sound</b>             | <i>if and only if</i> | it is <i>both</i> factually correct <i>and</i> valid. |

## 7. Examples to evaluate

|  |                    |
|--|--------------------|
| Parish is taller than McHale<br>McHale is taller than Bird<br>/ Parish is taller than Bird | Factually Correct? |
|  | Valid?             |
|  | Sound?             |

|  |                    |
|--|--------------------|
| Parish is taller than McHale<br>Parish is taller than Bird<br>/ McHale is taller than Bird | Factually Correct? |
|  | Valid?             |
|  | Sound?             |

|  |                    |
|--|--------------------|
| Bird is taller than McHale<br>McHale is taller than Parish<br>/ Bird is taller than Parish | Factually Correct? |
|  | Valid?             |
|  | Sound?             |

|  |                    |
|--|--------------------|
| McHale is taller than Parish<br>McHale is taller than Bird<br>/ Bird is taller than Parish | Factually Correct? |
|  | Valid?             |
|  | Sound?             |

## 8. The Fundamental Principle Of Logic

WHETHER AN ARGUMENT IS **VALID** OR **INVALID** IS DETERMINED ENTIRELY BY ITS **FORM**.

In other words,

**VALIDITY IS A FUNCTION OF FORM.**

In other words,

IF AN ARGUMENT IS **VALID**,  
THEN EVERY ARGUMENT WITH THE SAME FORM  
IS ALSO **VALID**.

And similarly,

IF AN ARGUMENT IS **INVALID**,  
THEN EVERY ARGUMENT WITH THE SAME FORM  
IS ALSO **INVALID**.

### A. The Fundamental Principle

IF AN ARGUMENT IS **VALID**, THEN EVERY ARGUMENT  
WITH THE SAME FORM IS ALSO **VALID**.

### B. The “Trivial” Principle Of Logic

IF AN ARGUMENT HAS ALL TRUE PREMISES BUT A  
FALSE CONCLUSION, THEN IT IS **INVALID**.

#### Terminology:

if an argument **clearly** has all true premises, but a false conclusion, we say that it is **OBVIOUSLY INVALID**.

### C. Putting A and B together:

SUPPOSE ARGUMENT  $A_1$  HAS THE **SAME FORM** AS  $A_2$ ;  
SUPPOSE THAT  $A_2$  IS **OBVIOUSLY INVALID**;  
THEN  $A_1$  IS ALSO **INVALID**.

## 9. The Method Of Counterexamples

In order to show that an argument is **invalid**, it is sufficient to find a **counterexample**.

### A. Definition of 'counterexample'

Let A be an argument.

Then a **COUNTEREXAMPLE TO A**

is, by definition, any argument A\* with the following properties:

1. A HAS THE SAME FORM AS A\*;
2. A\* HAS ALL TRUE PREMISES;
3. A\* HAS A FALSE CONCLUSION.

### B. Example 1:

#### Argument:

Parish is taller than McHale T

Parish is taller than Bird T

/ McHale is taller than Bird T

#### Form:

X is taller than Y

X is taller than Z

/ Y is taller than Z

#### Counterexample:

The Library is taller than PeeWee Herman T

The Library is taller than Bill Bradley T

/ PeeWee Herman is taller than Bill Bradley F

## C. Example 2:

### Argument:

all UMass Students are High School Graduates      T  
some High School Graduates are Athletes      T  
/ some UMass Students are Athletes      T

### Form:

all X are Y  
some Y are Z  
/ some X are Z

### Counterexample:

all UMass Students are High School Graduates      T  
some High School Graduates are U.S. Senators      T  
/ some UMass Students are U.S. Senators      F