

## ELEMENTS OF DEDUCTIVE LOGIC

### 1. Admin & Introduction

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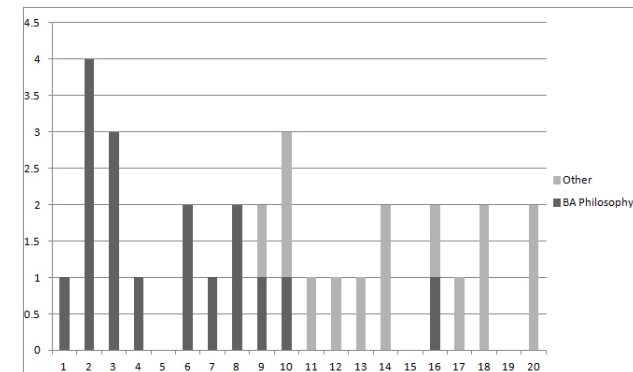
## Reading & advice

- Reading:
  - Main textbook (to purchase):  
Restall, G. (2006). *Logic: an introduction*.
  - Possible supplementary material (pdf's to be posted on website):  
Priest, G. (2001). *An Introduction to Non-Classical Logic: From If to Is*.
- Note: the Restall book contains a few serious typos. Print out the errata from [consequently.org/logic/](http://consequently.org/logic/)
- Also on that site: the answers to the exercises from the book.

## General admin

- Course composition:
  - 20 × 1h lectures
  - 10 × 1h exercise sessions
- Time & location:
  - Monday 11:00–13:00, HIW 00.16 (room C)
  - Friday 11:00–12:00, HIW 00.16 (room C)
- Assessment:
  - Closed book written exam during exam period
  - Theoretical questions + technical exercises
- Course website:
  - Toledo ('W0EA1A Logic')
  - Materials also posted on [jakechandler.com/teaching.html](http://jakechandler.com/teaching.html)
- Office hours:
  - By appointment only ([jacob.chandler@hiw.kuleuven.be](mailto:jacob.chandler@hiw.kuleuven.be))
  - Room 01.24, 1<sup>st</sup> floor, Vesaliusstraat 2

## A warning



- Last year's exam results, *including resits*...
- Pass rates: 18% (BA Phil), 93% (Other), 52% (Overall)

## Advice

- I strongly urge you to:
  - Ask questions during or after class if you need to
  - Make use of my office hours
  - Keep up to date: do *not* lag behind
  - Do *plenty* of exercises
- Strictly optional but helpful for some:
  - Form study groups to help each other out with the material

## Answer

- The answer: first and last cards.

**E** T 4 **7**

Check first card to verify that there isn't an odd number on the other side.

But also... check last card to verify that there isn't an vowel on the other side!

- If you messed up you are in good company: 75% average failure on this *very elementary* task. (Common answer: first card)

## Survey

### Cards

Four cards, each of which has a letter written on one side and a number written on the other side:

E T 4 7

Claim:

'If a card has a vowel on one side, then it has an even number on the other side.'

Question:

Which card or cards should you turn over in order to decide whether the claim is true or false?

## Why study logic?

- People are generally poor at deductive reasoning.
- Nevertheless it is *absolutely essential* to many activities, both inside and outside of academia.
- Aim of this course: provide some tools to sharpen your reasoning skills.
- A basic grasp of logic will:
  1. greatly improve your ability to read, assess and write philosophy (both 'analytic' *and* 'continental')
  2. enhance your performance in other academic disciplines
  3. equip you with important transferable skills for when you hit the job market
- Last but not least: logic is a rich and fascinating philosophical subject of study in itself.

## Arguments

### Doors

The sign on the red door says that the prize is behind the red door. The signs on both the blue door and the green door say that the prize isn't behind the blue door. At least one of the signs states a falsehood and at least one of the signs states a truth. Therefore the prize is behind the green door.

- This is an **argument**.
- Arguments: particular kinds of sets of sentences.

## Sentences vs propositions

- Note: Restall talks of **propositions** rather than declarative sentences.
- Whilst nothing much of substance hangs on this, I find it philosophically objectionable, for reasons that needn't concern us here.
- Translation manual:
  - 'proposition' = 'declarative sentence' (henceforth 'sentence' for short)
  - 'propositional' = 'sentential'

## Declarative sentences

- Arguments aren't just made up of *any* old kind of sentences: they are made up of **declarative sentences**.
- Declarative sentences: sentences making a factual claim, and thus in principle evaluable as being true or false.

### Declarative sentences

It was way past the Dormouse's bedtime.  
A Caucus race will take place today.

### Non-declarative sentences

What time is it? (interrogative)  
Drink up! (imperative)

## Premises and conclusions

- The sentences that make up an argument are divided into two parts:
  - (i) the **premise(s)**,
  - (ii) the **conclusion**.with (i) *purporting* to constitute grounds for believing (ii)
- Often, this division is flagged out by a **conclusion marker**.
- In the previous example:
  - 'Therefore the prize is behind the green door.'
- Other conclusion markers:
  - hence
  - thus
  - for that reason. . .

## Premises and conclusions (ctd.)

- Sometimes the division is signalled by **premise markers**.

### *Cheshire cat*

The Cheshire cat could, after all, be beheaded, *since* it was only a head, and anything with a head can be beheaded.

- Other premise markers include:
  - given that
  - as indicated by the fact that
  - for the reason that
  - because
  - seeing as...
- Warning: in some cases, there are no explicit markers *at all*.

## Standard form (ctd.)

### *Standard form*

- (1) The sign on the red door says that the prize is behind the red door.
- (2) The signs on both the blue door and the green door say that the prize isn't behind the blue door.
- (3) At least one of the signs states a falsehood and at least one of the signs states a truth.

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- (4) The prize is behind the green door. (From (1)–(3))

- Note: standardising isn't always this easy. It is somewhat of an art, and requires practise.

## Standard form

- To promote order and clarity, philosophers like to present arguments in **standard form**.
- In standard form:
  - The premises are listed, numbered and followed by a horizontal line.
  - The conclusion is listed below the line, numbered and followed by a list of the numbers of the premises that were used to derive it.
- Here is the standardised version of our *Doors* argument...

## Compound arguments

- **Compound arguments** are chains of arguments: the conclusion of one sub-argument is a premise of another sub-argument.

### *Chains*

- (1) Either Alice had green tea or she had a cappuccino.
- (2) And if she had a cappuccino then she didn't take sugar.
- (3) But she did take sugar.

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- (4) So she had green tea. (From (1)–(3))
- (5) If Alice had green tea, then the Dormouse didn't.
- (6) If the Dormouse didn't have green tea, then he had nothing at all.

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- (7) The Dormouse had nothing at all. (From (4)–(6))

## Evaluating arguments

- Some arguments are good; others are bad.
- A good argument should *at least* be such that:
  - The truth of the premises would provide sufficient reason for believing the conclusion.
- This requirement is met, for instance when:
  - The truth of the premises would *guarantee the truth of the conclusion*
- In other words:
  - It would not have been possible for the premises to be true and the conclusion false.
- Such arguments are called ‘**deductively valid**’ (antonym: **deductively invalid**).

## Next session

- Topic: more on argument evaluation and some issues in finding standard form.

## Further remarks on deductive validity

- How validity constrains possible truth values:

	All premises true	At least one premise false
Conclusion true	Possible (1)	Possible (2)
Conclusion false	<b>Impossible</b> (3)	Possible (4)

- So note that saying that an argument is valid:
  - Does *not* tell us whether or not the premises or the conclusion are true (see (1), (2) and (4)).
  - Does *not* tell us what happens to the truth value of the conclusion if at least one of the premises is false (see (2) and (4)).
  - Does *not* tell us what happens to the truth value of any of the premises if the conclusion true (see (1) and (2)).