6AANA022: Philosophy of Maths
Syllabus – Academic year 2015/16

Basic information

Credits: 15
Module Tutor: Eleanor Knox
Office: PB413
Consultation time: Mondays 11:00-12:00, Wednesdays 15:30-16:30
Semester: 2
Lecture time and venue: 9:00-10:00 Wednesdays, K4.31
Class time and venue: Please see your personal timetable.

Module description (plus teaching arrangements, aims and objectives)

What is the subject matter of mathematics? Is it abstract mathematical objects, or can apparent facts about mathematical objects be reduced to facts about something else? Assuming we have knowledge of mathematical facts, how is this knowledge acquired? Despite being essential to the sciences (and often thought of as one of the sciences), the non-empirical nature of mathematics raises epistemological and metaphysical questions quite distinct from those that arise in, say, physics. This course will examine approaches to answering these questions, including varieties of Platonism, and various forms of nominalism. We’ll also take a close look at the role of mathematics in the sciences, with the aim of evaluating one of the key arguments in the debate between the Platonist and the nominalist: the indispensability argument.

Nb. Materials, including readings and lecture notes, will be posted on the KEATS site for the module. Students should ensure they have access to this.

Assessment Methods and Deadlines

- **Formative assessment**: 2x1500 word essays
  - 1st formative essay due: 5pm Friday 26th February.
  - 2nd formative essay due: 5pm Friday 8th April.

  Essays may answer any of the questions suggested below. Please answer the question *exactly as written* unless you have explicit permission from the module tutor to do otherwise.

  Any essays received past the deadline without prior permission or an *extremely* good excuse will not be given feedback.

- **Summative assessment**: 2 x 2,500-word essays due in May. Please hand these essays in on KEATS.
General Textbooks

Books to consider purchasing:
- Stewart Shapiro, *Thinking About Mathematics*. (OUP 2000) (*A useful introduction, particularly for Part One of the course.*)
- Mark Colyvan, *An Introduction to the Philosophy of Mathematics*. (CUP 2012) (*Another introduction that will be useful for Part Two.*)

Other general textbooks:

Other Books
- Mark Colyvan, *The Indispensability of Mathematics*, (OUP 2001)
- Christopher Pincock, *Mathematics and Scientific Representation*, (OUP 2012)
- Mary Leng, *Mathematics and Reality*, (OUP 2010)

Online Resources
- [Stanford Encyclopedia of Philosophy](https://plato.stanford.edu)

Some notes on the readings and essays:
- Required reading is just that – required! You should come to class having read this in detail and be able to give a summary of its content if asked.
- Although it’s not required, it’s highly advisable to be reading at least one additional text each week, and you will need to read several more when you come to write your essays.
- That said, there’s more material listed below than could reasonably be covered in a term; don’t feel that you should be on top of all the questions, or all the readings.
- Links to required reading will be posted on KEATS, or in some cases a copy of the book will be placed on reserve at the Maughan library.
- Some of the articles below have hyperlinks to online content – even where not linked, most journal articles are available online – [google scholar](https://scholar.google.com) is a helpful resource.
- In case of (genuine!) difficulty obtaining any readings, please email me.
Lecture Outline

Part One: Historical Positions

- **Week One: Introduction**: Plato, Kant and Mathematics.
- **Week Two: Logicism**: Frege and Russell – reducing mathematics to logic.
- **Week Three: Formalism**: Mathematics as rule-following.
- **Week Four: Intuitionism**: Revising our logic.
- **Week Five: Limiting Results**: The Löwenheim-Skolem Theorems and Gödel’s Incompleteness Theorems.

Part Two: Realism, Applications, and the Contemporary Scene

- **Week Six: Unreasonably Effective?** Mathematics and its applications in science.
- **Week Seven: Indispensability arguments**.
- **Week Eight: Modern platonism**: reconsidering realism.
- **Week Nine: Nominalism**: Fictionalism and other stories.
- **Week Ten: Structuralism**.
Readings and Questions

**Week One: The Theory: Introduction**

**Questions:**
- Why did Kant think that both arithmetic and geometry were synthetic a priori? From a contemporary perspective, is it possible to defend this view?
- Why did Plato believe that geometrical entities are not perceptible? Was he correct?

**Required reading:**

**Additional reading:**

*On Plato:*
- Meno, 80d-86b tr. Grube, G. (Hackett, 1976)
- Phaedo, 72e-77d tr. Gallop, D. (Clarendon, 1975)
- Wedberg, A. Plato's Philosophy of Mathematics (Almqvist & Wiksell, 1955) chs 4-5 on Plato's later theory; appx. B sec. 3 on Republic VI.

*On Kant:*
- Critique of Pure Reason tr. N. Kemp Smith 2nd edition (Macmillan, 1933 or reprint) pp 48-58 (Intro:IV-VI); pp 65-91 (Transcendental Aesthetic); pp 576-93 (Discipline of Pure Reason in its Dogmatic Employment)
- Kitcher, P. ‘Kant and the Foundation of Mathematics’ in Philosophical Review vol 84 (1975), pp 23-50
- Friedman, M. Kant and the Exact Sciences (Harvard UP, 1992), chs 1 & 2
- Mill, J.S. System of Logic (1843, many editions: for example Longmans, 1959 or reprint) book II ch 5 (on geometry)
- Frege, G. Foundations of Arithmetic (originally 1884) tr Austin, J. (Blackwell, 1950) sections. 1-6, 12-17 (on arithmetic)