6AANA022: Philosophy of Mathematics
Syllabus – Academic year 2016/17

Basic information

Credits: 15
Module Tutor: Dr Tamsin de Waal
Office: Rm 702
Consultation time: TBC
Semester: 1
Lecture time and venue: Tuesday 16:00-17:00, St David’s Rm, King’s Building, Strand Campus
Class time and venue: Thursday 15:00-16:00 (JH) or Friday 13:00-14:00 (TdW), Rm 306, Philosophy Building, Strand Campus

Module description

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. In the last two weeks of the course, we'll focus on the role of representations, such as geometric diagrams, in mathematical reasoning.

All students are required to prepare the required reading in advance of both the lecture and seminar each week. See the outline below for details.

Key texts – books to consider purchasing:
- Shapiro, S., Thinking About Mathematics (OUP 2000).
- Brown, J.R., Philosophy of Mathematics (Routledge 2008).
- Colyvan, M., An Introduction to the Philosophy of Mathematics (CUP 2012).
Assessment Methods and Deadlines

- **Formative assessment**: one 2,500-word essay due Monday November 7th, 2016, by 16:00.
- **Summative assessment**: two 2,500-word essays due Wednesday January 18th, 2017, by 16:00. (Summative essays should be submitted via KEATS).

Lecture Outline (plus suggested readings)

- **Week One** (Sept 27th), Introduction: Philosophy and Mathematics
  Required reading

- **Week Two** (Oct 4th), Plato
  Required reading
  - S. Shapiro, *Thinking about Mathematics* (OUP, 2000), ch.3.
  - Plato's *Meno*, 82b-85d.
  - Plato's *Republic*, Bk VI, 509d-511e.
  Further reading

- **Week Three** (Oct 11th), Modern Platonism: Gödel, Maddy, and the Epistemological Challenge
  Required reading
  Further reading
  - Gödel, K., ‘Russell’s Mathematical Logic’ (1944), and ‘What is Cantor's Continuum Problem?’ (1964), in Benacerraf and Putnam (1983), 447-485. See also ‘Some basic theorems on the foundations of mathematics and their implications’.
• Restall, G., 'Just what is full-blooded platonism?', *Philosophia Mathematica* 11, no. 1 (2003), 82-91.

**Week Four** (Oct 18\textsuperscript{th}), Modern Platonism: The Indispensibility Argument

*Required reading*
• Putnam, H., *Philosophy of Logic* (Harper & Row 1971), §VIII.

*Further reading*

**Week Five** (Oct 25\textsuperscript{th}), Logicism

*Required reading*
• Shapiro, S., *Thinking about Mathematics* (OUP 2000), ch.5.

*Further reading*
Week Six (Nov 8\textsuperscript{th}), Nominalism (Guest lecturer: John Heron)

Required reading

Further reading

Week Seven (Nov 15\textsuperscript{th}), Structuralism.

Required reading

Further reading

Week Eight (Nov 22\textsuperscript{nd}), The Applicability of Mathematics.

Required reading

Further reading

• Week Nine (Nov 29th), The Role of Representations in Mathematics: Plato and Kant
Required reading
• Shapiro, S., Thinking about Mathematics (OUP 2000), ch.4.
• For Plato, the reading for wk 2 is relevant again here. Cf. also Republic, Bk VII, 528e-531d (and cf. esp. the papers in J.P. Anton, ed., Science and the Sciences in Plato (Caravan Books 1980) on this passage).

Further reading
• Shabel, L., Mathematics in Kant’s Critical Philosophy: Reflections on Mathematical Practice (Routledge 2003).

• Week Ten (Dec 6th), The Role of Representations in Mathematics: Contemporary views
Required reading
• Brown, J.R., Philosophy of Mathematics (Routledge 2008), esp. chs.3 and 6.
Further reading

• Colyvan, M., An Introduction to the Philosophy of Mathematics (CUP 2012), ch.8.
• Giaquinto, M., Visual Thinking in Mathematics (OUP 2007).
• Lakatos, I., Proofs and Refutations: The Logic of Mathematical Discovery (CUP 1976).

• On aspects of the Philosophy of Mathematics that we won’t be covering in detail on this course, in particular, finitism and intuitionism, see esp. George, A., and Velleman, D.J., Philosophies of Mathematics (Blackwell 2002). Also S. Shapiro, ed., The Oxford Handbook of Philosophy of Mathematics and Logic (OUP 2005), and Shapiro, S., Thinking about Mathematics (OUP 2000).

The Stanford Encyclopedia of Philosophy is a good online resource – plato.stanford.edu