BO1 History of Mathematics
Lecture I
Introduction
Part 2: What is the history of mathematics?

MT 2020 Week 1

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... history is much more than a catalogue of events

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The story of mathematics is not linear: there are false starts and dead-ends, twists and turns, parallel developments; it is not a story of relentless progress: there are fallow periods and mistakes — but these too have shaped mathematics in their own ways

Augustus De Morgan on the history of mathematics (1865)

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But this is not a disaster, provided we remain aware that it is happening

How do we organise the history of mathematics?

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- periods (ancient, mediaeval, *n*th century, ...)
- places/cultures (Greece, Islam, Britain, ...)
- people (Archimedes, Newton, Euler, Galois, Hilbert, ...)
- topics (geometry, algebra, topology, probability, ...)
- sources (manuscripts, letters, books, journals, websites, ...)
- institutions (Royal Society, universities, LMS, ...)
- conferences (international congresses, local seminars, ...)

An outline of the course

Week 1: Introductory material: mathematics up to 1600

Week 2: Analytic geometry and the origins of calculus

Week 3: Newton's *Principia*; the further development of calculus

Week 4: Infinite series; the beginnings of rigour

Week 5: Algebra: from classical to modern

Week 6: Rigour in real analysis

Week 7: Complex analysis; linear algebra

Week 8: Geometry; number theory

Organisation by period

This course deals with (largely European) mathematics during the period 1600–1900

At different points of the course, we will consider particular places, people, and topics.

But if we were to divide up the course by century, we might see the following:

Organisation by period: 17th century

Topics:

- new notation
- analytic (co-ordinate) geometry
- calculus
- infinite series
- mathematics applied to the physical world

People: Descartes, Fermat, Wallis, Newton, Leibniz, Huygens, l'Hôpital, ...

Organisation by period: 18th century

Topics:

- many applications of (and some problems with) calculus
- applications (and problems) of infinite series
- developments in algebra and number theory
- mathematics applied to the physical world

People: Bernoullis, Euler, d'Alembert, de Moivre, Laplace, Lagrange, ...

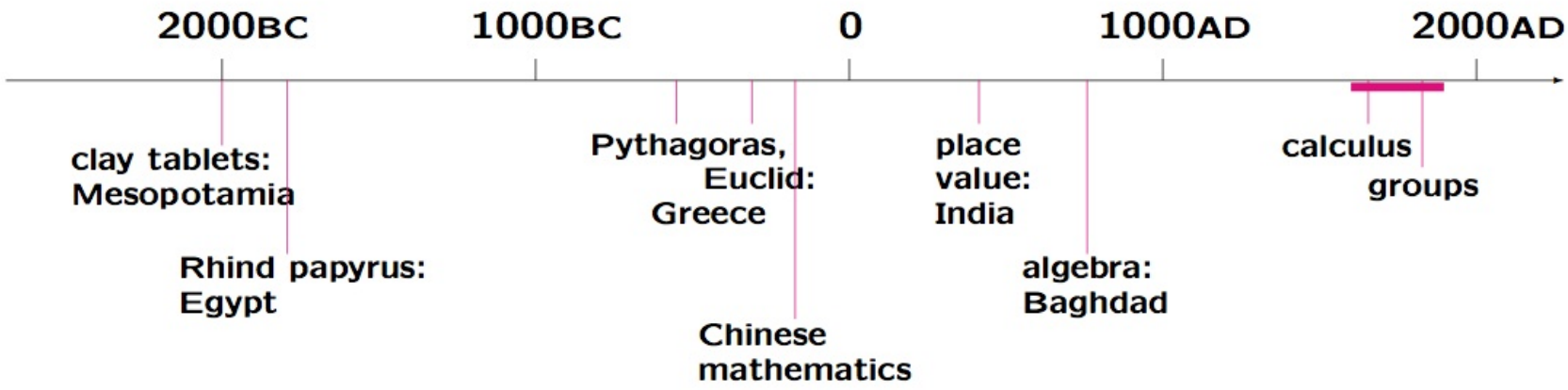
Organisation by period: 19th century

Topics:

- from calculus to analysis
- development of complex analysis
- rise of abstract algebra
- beginnings of linear algebra
- non-Euclidean geometry
- beginnings of axiomatisation

People: Gauss, Fourier, Bolzano, Cauchy, Abel, Galois, Dirichlet, Cayley, Dedekind, Cantor, ...

A timeline


2000BC
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2000AD
clay tablets: Mesopotamia
Rhind papyrus: Egypt
Pythagoras, Euclid: Greece
Chinese mathematics
place value: India
algebra: Baghdad
calculus
groups

But what about non-Western mathematics?

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In the period 1600–1900, most of the parts of the world that had a culture of mathematics that went beyond arithmetic were doing mathematics in a European style

Wasan

A major exception was wasan 和算 (Japanese mathematics) which flourished during the Edo Period (1603–1867)

See Tsukane OGAWA, 'A review of the history of Japanese mathematics', *Revue d'histoire des mathématiques* **7** (2001) 137–155

and also Japanese Mathematics in the Edo Period

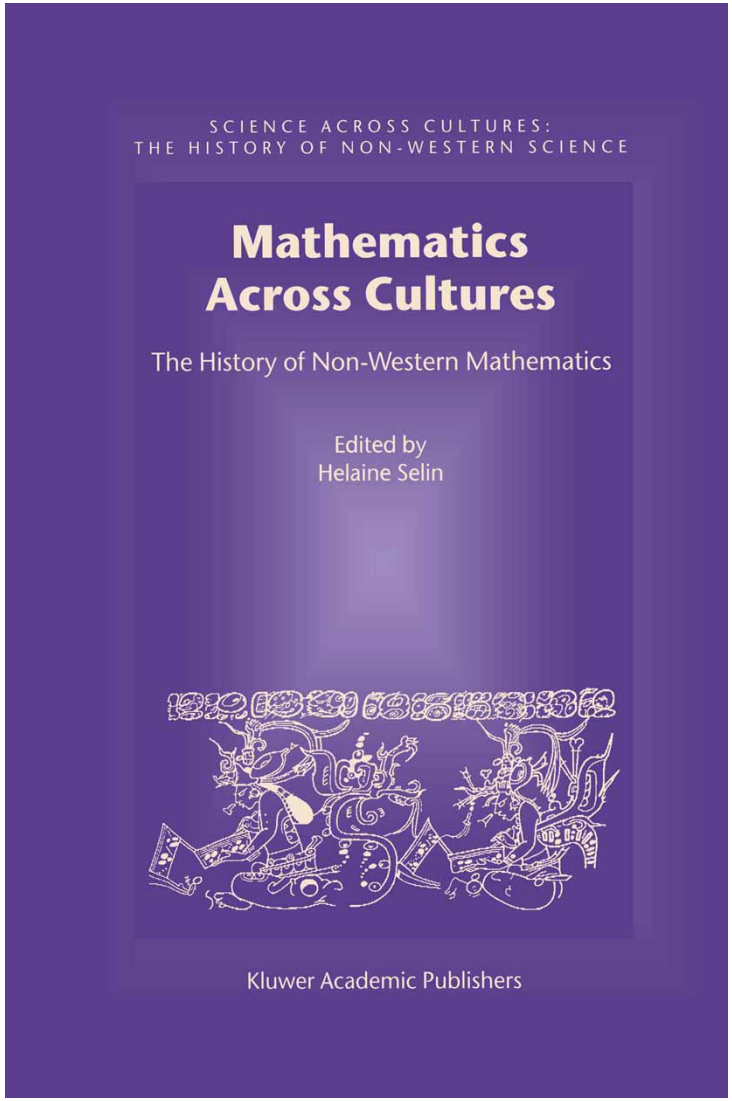
Other non-European mathematics

In this course, we will see other instances of non-European mathematics that are important for our story; for example:

- solution of systems of linear equations in the *Jiǔzhāng Suànshù* (2nd century BC, China) [week 7]
- solution of polynomial equations by al-Khwārizmī (9th century Baghdad) [week 5]
- study of infinite series by the 'Kerala School' (14th–16th-century India) [week 4]

But we will not be systematic in our treatment of non-European mathematics

On non-European mathematics



Helaine Selin (ed.), *Mathematics across Cultures: The history of non-Western mathematics*, Kluwer Academic Publishers, 2000

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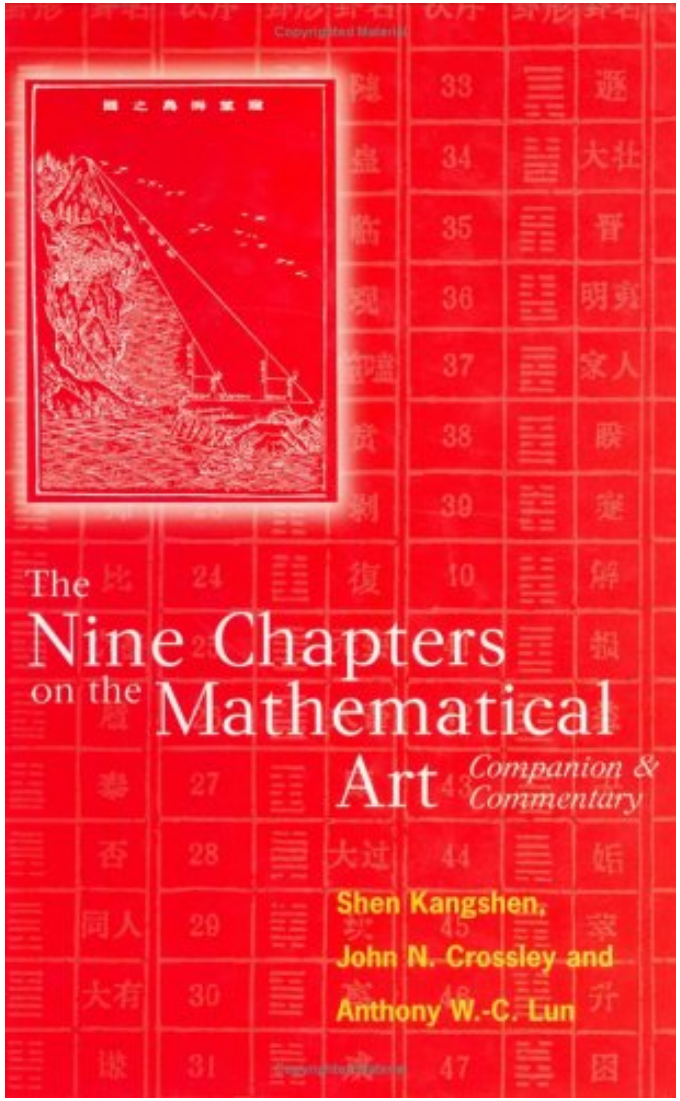

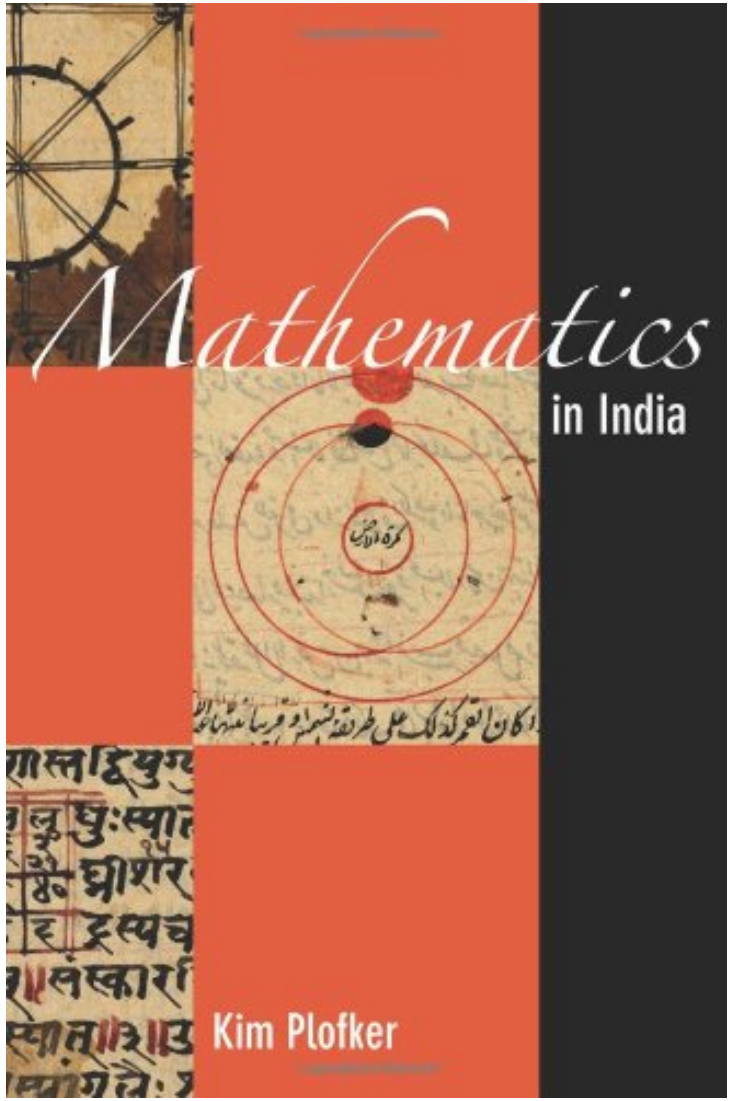

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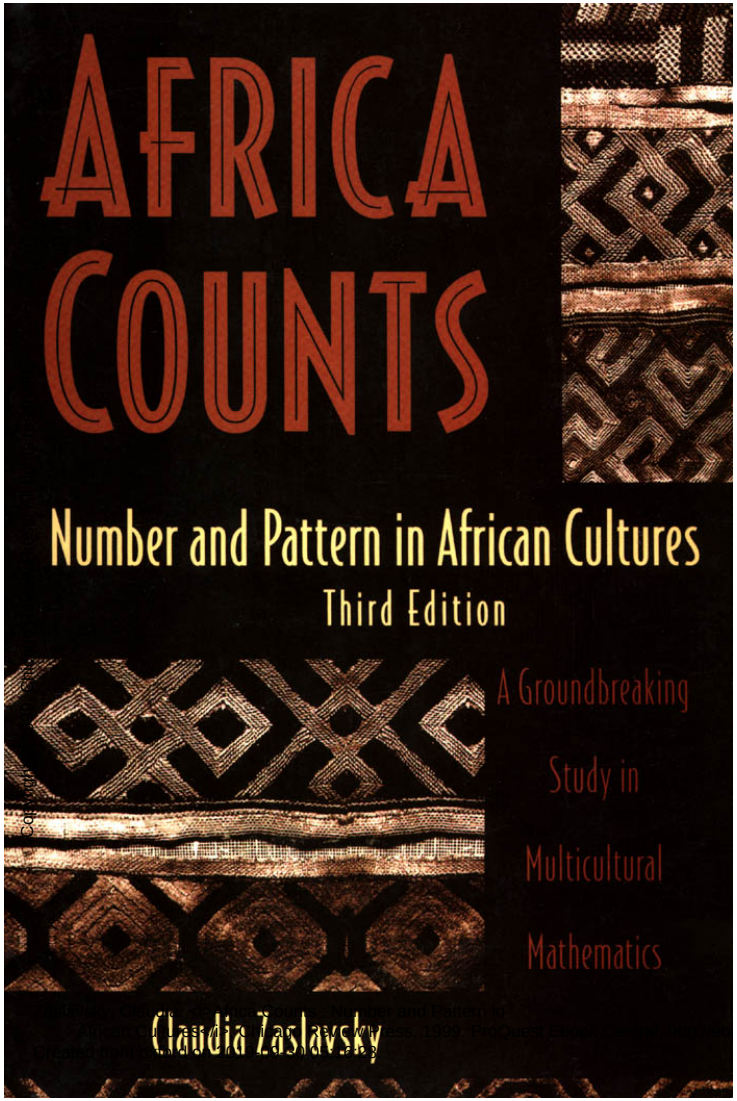
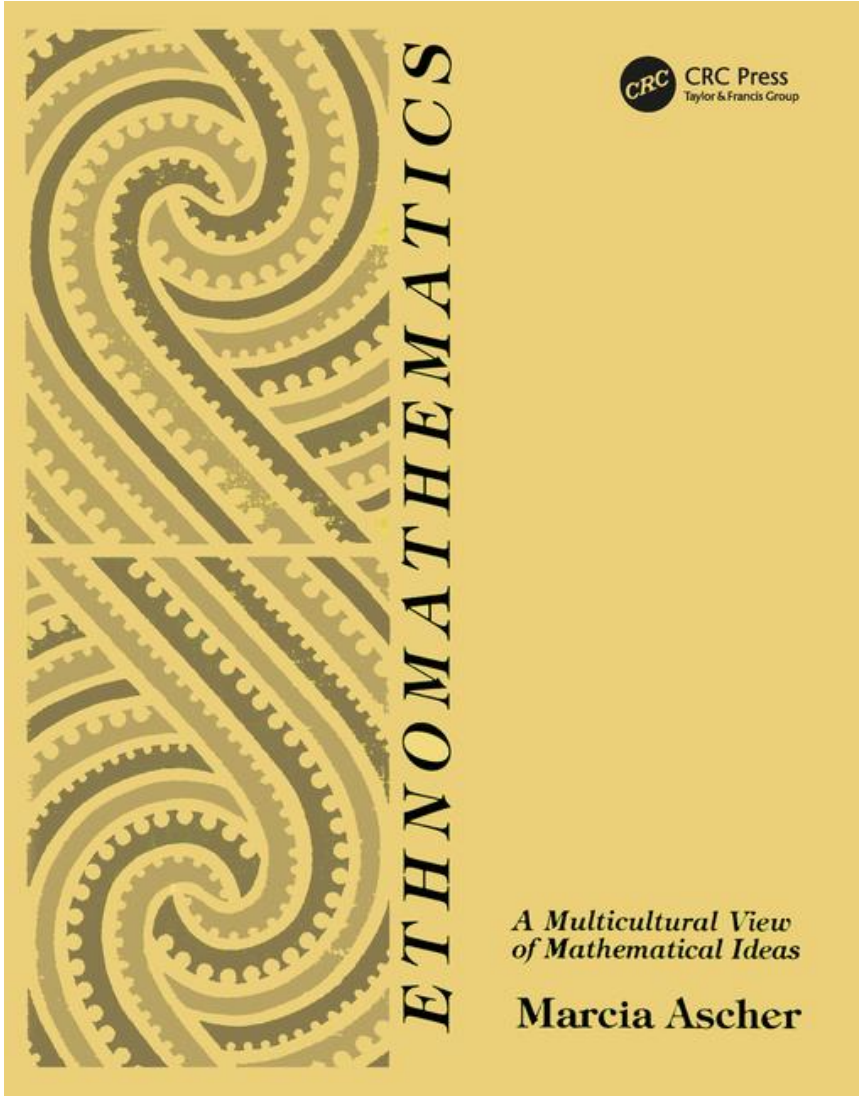
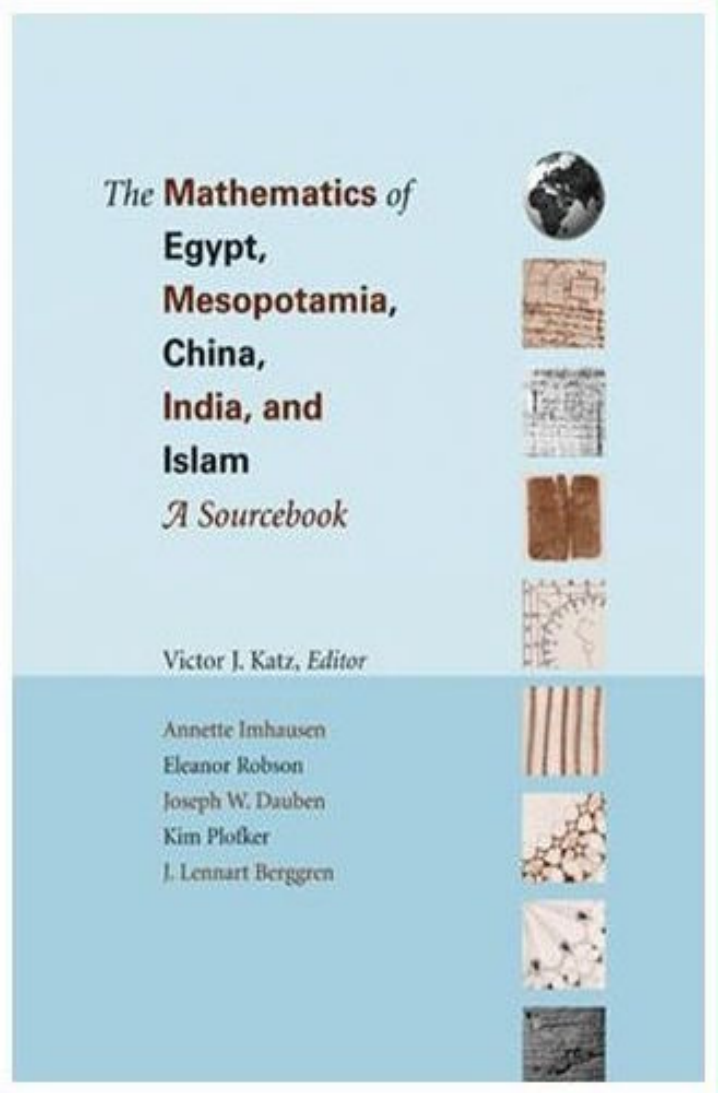




Ancient origins of mathematics



On the ancient oriental origins of mathematics see:

Victor J. Katz (ed.), *The mathematics of Egypt, Mesopotamia, China, India, and Islam: a sourcebook*, Princeton University Press, 2007