BO1 History of Mathematics
Lecture I
Introduction
Part 1: What is the history of mathematics?

MT 2021 Week 1

Summary

Part 1

- **The nature of history**
- **How can we organise/break down the history of mathematics?**
- **Rough overview of the course**

Part 2

- Arrangements: lectures, classes, the nature of the course
- Some advice on reading and taking notes

Part 3

- Napier's Logarithms

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However, the history of mathematics is not linear: there were false starts and dead-ends, twists and turns, parallel developments. It is not a story of relentless progress: there were fallow periods and mistakes which shaped mathematics in their own ways.

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As much as mathematicians are usually imagined as solitary workers, a man on his own in a room can hardly affect mathematical research. Mathematicians need networks, collaborators, common goals, and a way of reaching consensus on new results.

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. The lectures will provide much of the who, what, where, when; the classes will be where we can discuss the broader implications and historical questions. What can we learn from these mini historical episodes?

How do we organise the history of mathematics?

- periods (ancient, mediaeval, *n*th century, ...)
- places/cultures (Greece, Islam, Britain, ...)
- people (Archimedes, Newton, Euler, Galois, Hilbert, ...)
- topics (geometry, algebra, topology, probability, ...)

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- 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; analytic geometry

Week 2: The origins of calculus; Newton's *Principia*

Week 3: Developing calculus; infinite Series

Week 4: The beginnings of rigour; classical algebra

Week 5: Algebra: from modern to linear

Week 6: Rigour in real analysis

Week 7: Complex analysis; geometry; number theory

Week 8: Ancient mathematics; 19th century historiography

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, du Châtelet, Laplace, Lagrange...

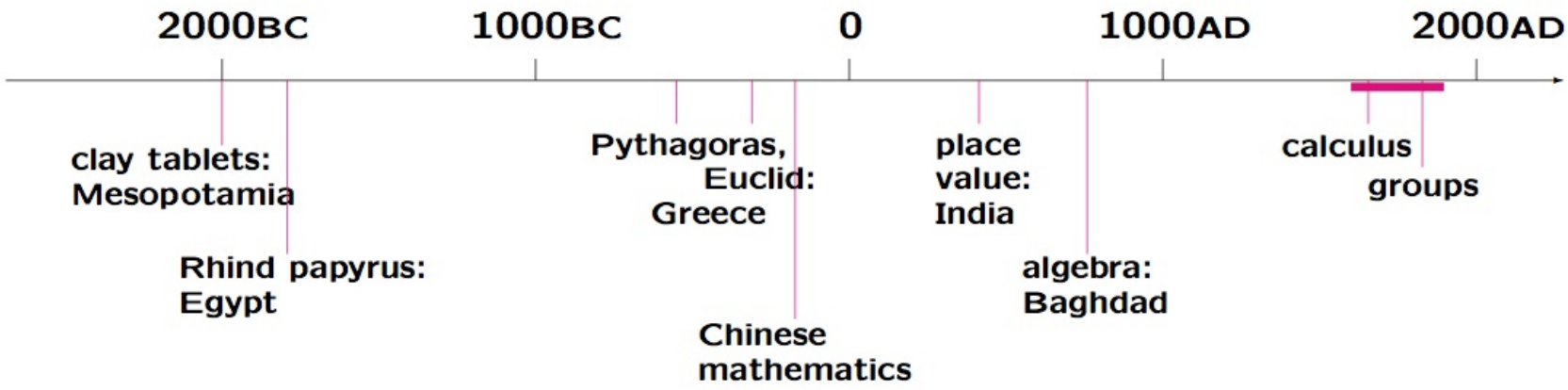
Organisation by period: 19th century

Topics:

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

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

A timeline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Pythagoras, Euclid: Greece
Chinese mathematics
place value: India
algebra: Baghdad
calculus
groups

A non-Eurocentric history of mathematics?

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This was a time of intense imperialism and colonialism; the mathematics of navigation, surveying, statistics, all had military or imperial uses. David Aubin, Catherine Goldstein (eds), *The War of Guns and Mathematics : Mathematical Practices and Communities in France and Its Western Allies around World War I*, American Mathematical Society, 2014.

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I encourage you to consider that the way mathematics was — and is — practiced is not necessarily the only nor by any means the 'best' way of doing so. And indeed to consider how the idea of being the 'best' varies depending on when or where you look.

On non-European mathematics

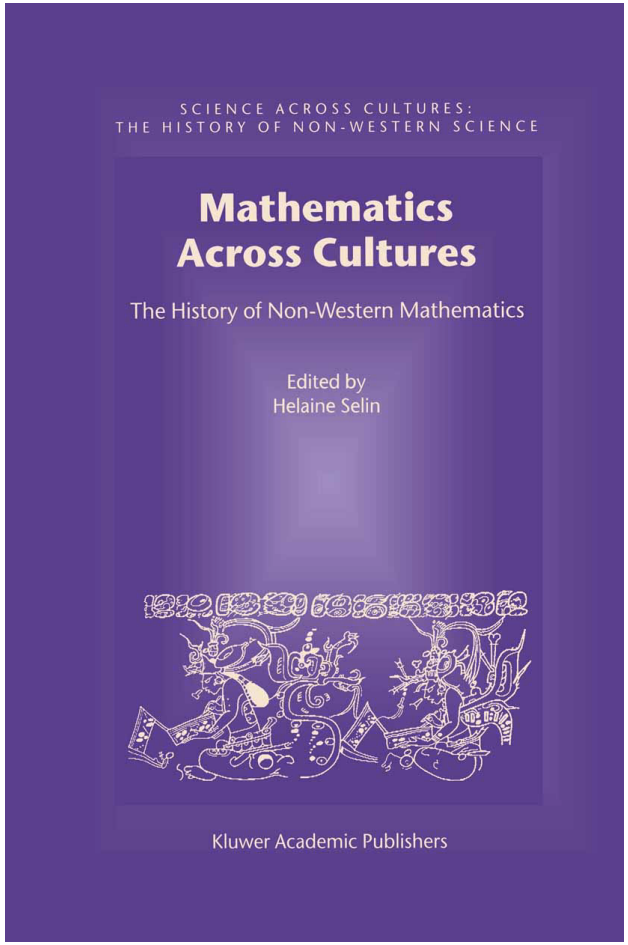
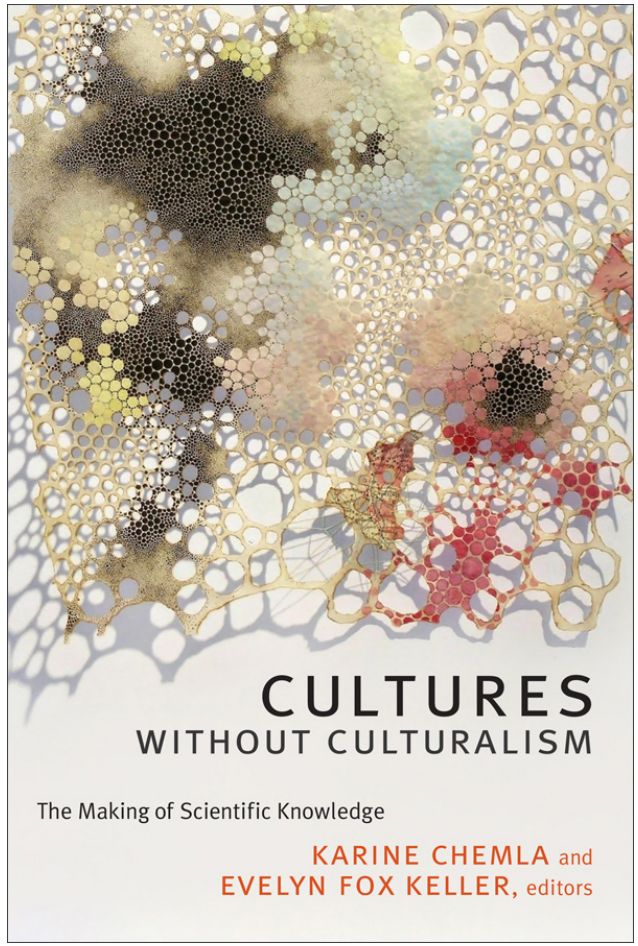


Figure: Helaine Selin (ed), Mathematics Across Culutres: The History of Non-Western Mathematics, Kluwer, 2000.



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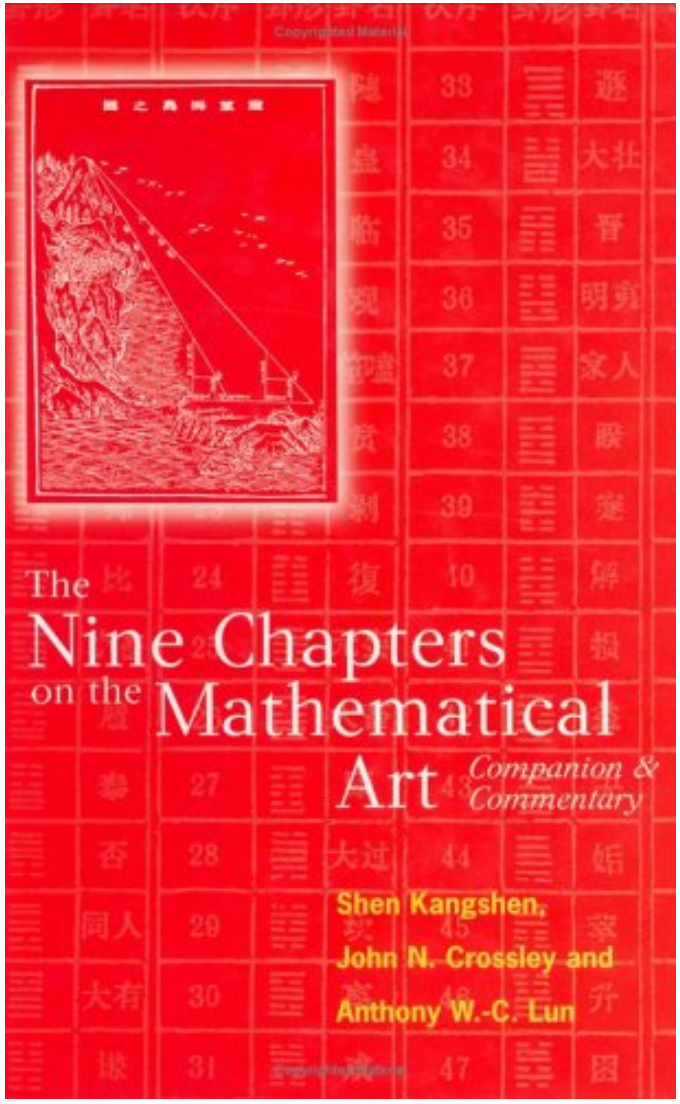

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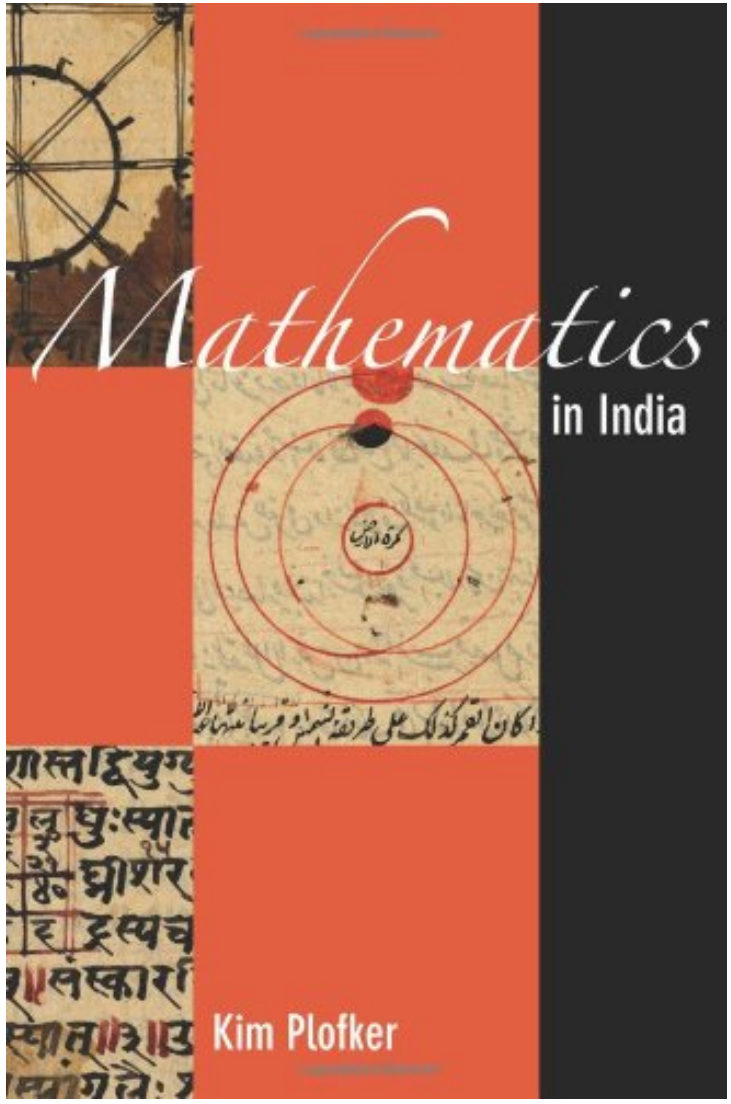

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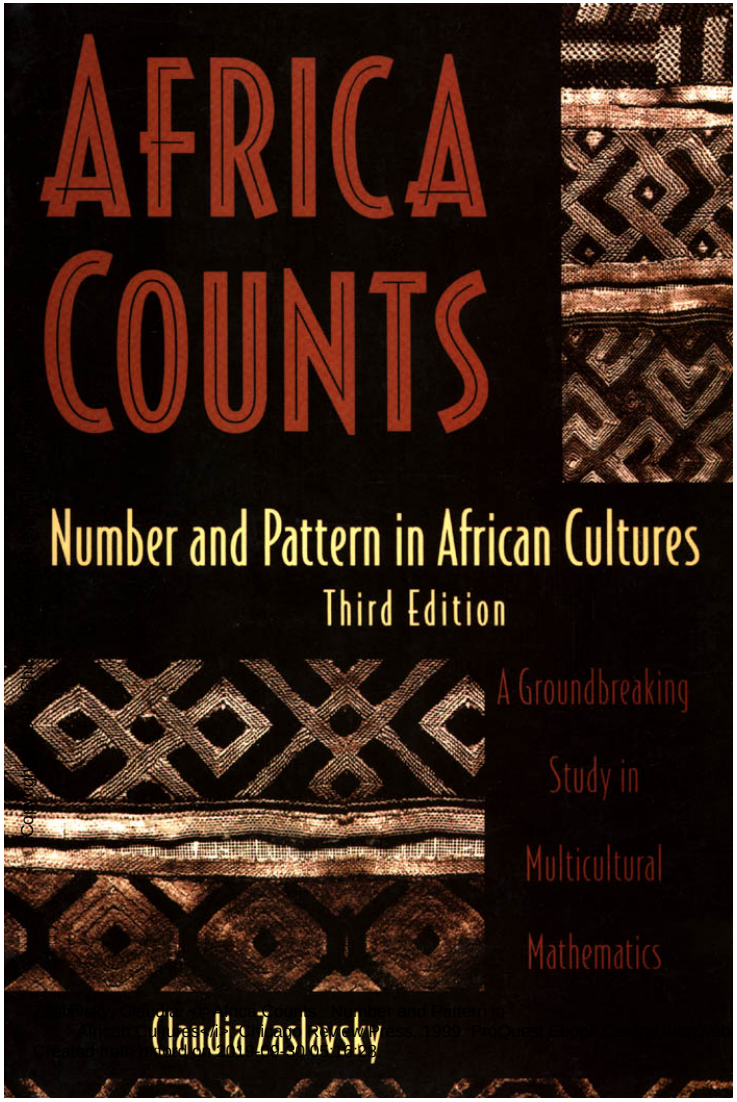

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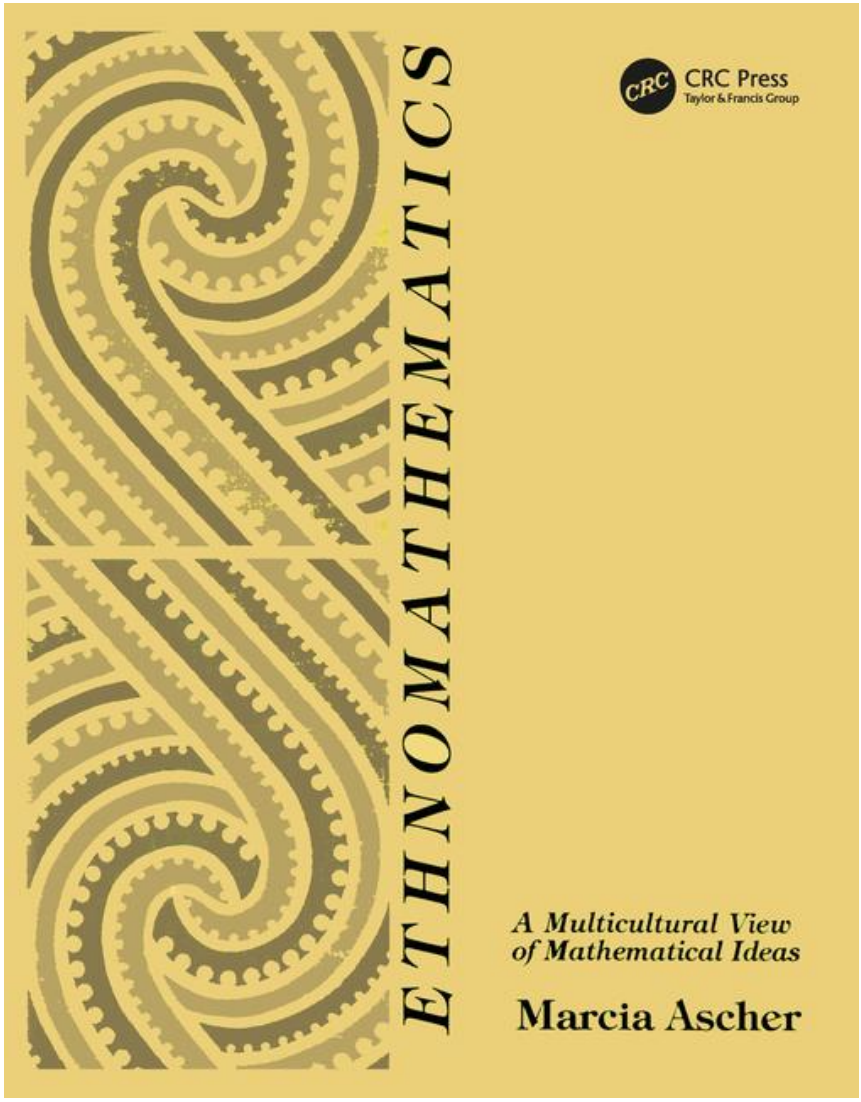

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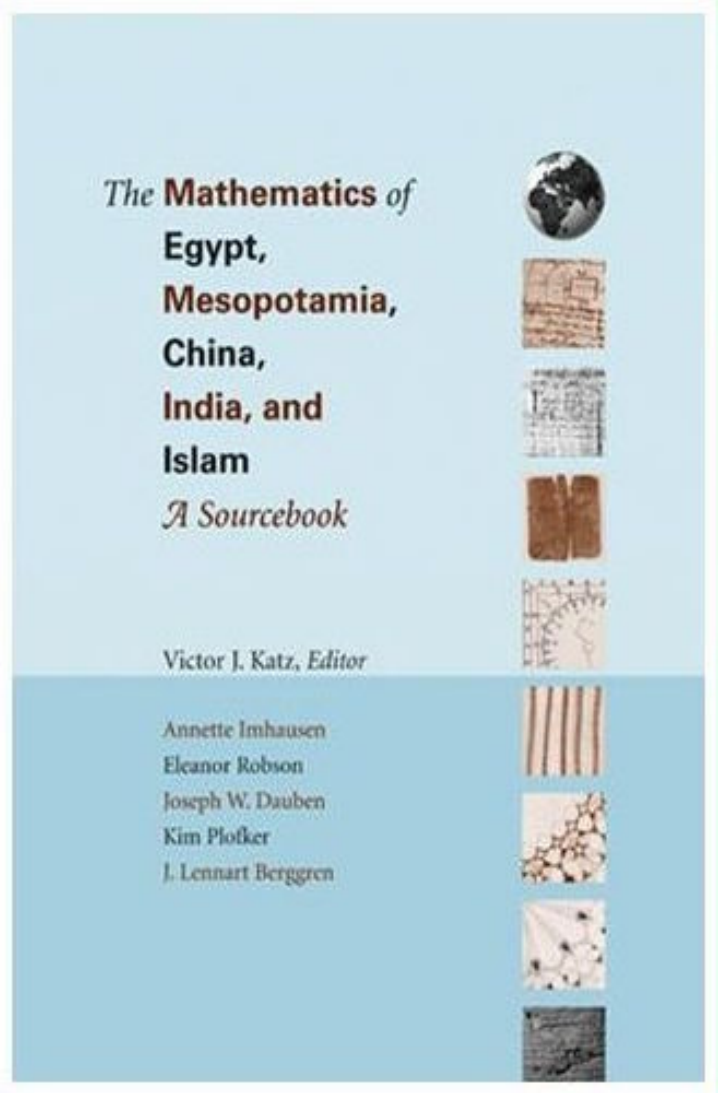
Ancient mathematics



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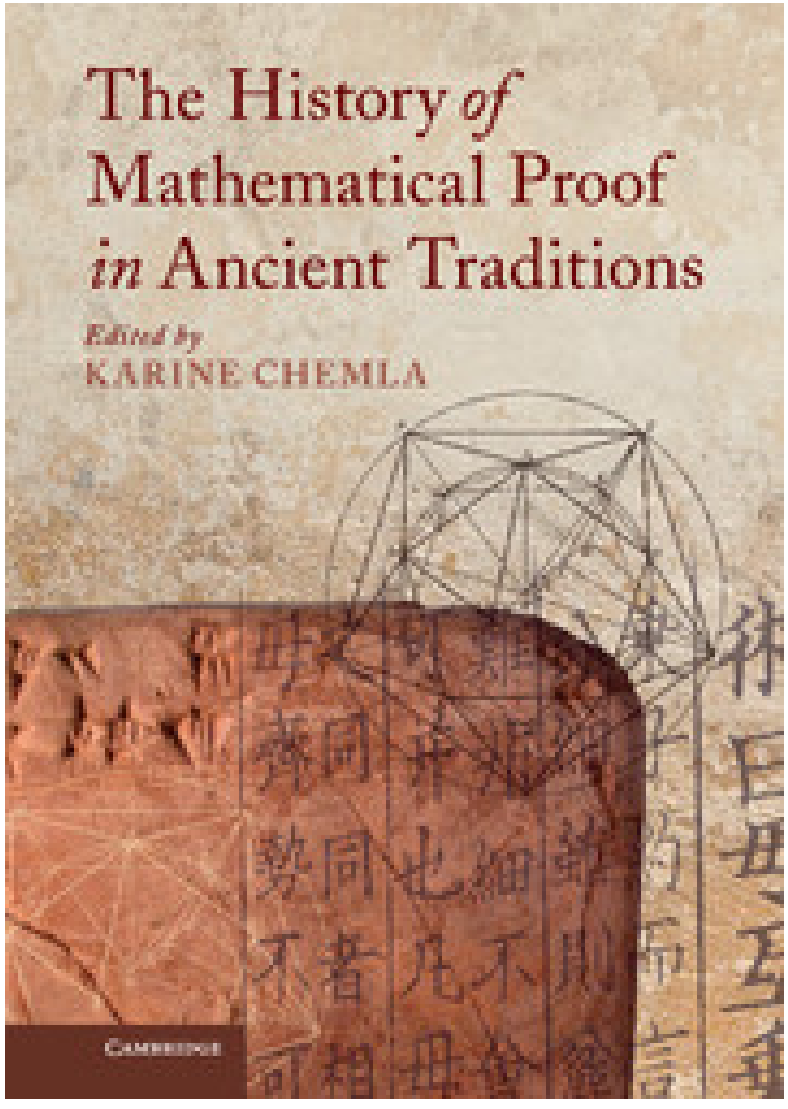

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