

Multicultural Mathematics

the origins of mathematics around the world

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Course Goals. To strengthen and expand students' understanding of fundamental mathematics, including arithmetic, algebra, and geometry, through comparative study of the mathematics of world cultures. To understand mathematics as a universal human endeavor. To appreciate the contributions of all cultures to the development of mathematics. To explore the connections between mathematics, art, and music. The course is particularly appropriate for majors in elementary education and fine arts and any student interested in non-European history or culture. Students may receive Gender Studies credit if they complete an additional project.

Syllabus.

Number Systems.

- Finger counting.
- Counting in different languages.
- A comparative study of the ancient Egyptian, Sumerian, Babylonian, Greek, and Indian number systems.
- Discussion of base and place value.
- Chronograms.
- History of the decimal system.

Arithmetic.

- Addition and subtraction in different number systems and bases.
- Algorithms for multiplication—the method of duplation, gelosia multiplication, and Vedic multiplication—and why they work.
- The distributive law.

Fractions, Ratios, and Proportions.

- Egyptian fractions.
- Proportion in art.
- Estimating the number π .

Areas and the Pythagorean Theorem.

- Finding areas by dissection.
- A dissection proof of the Pythagorean Theorem from China.
- The Plimpton tablet and Pythagorean triples.

The Math of Sona Drawings.

- Traceable graphs.
- Number theory of sona designs.

The Math of Drumming.

- Polyrythms and the least common multiple.
- Fibonacci numbers and poetry.

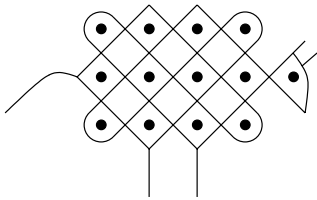
Examples.

The Api counting system
from the South Pacific

1 tai	10 lualuna
2 lua	11 lualuna tai
3 tolu	12 lualuna lua
4 vari	13 lualuna tolu
5 luna	14 lualuna vari
6 otai	15 toluluna
7 olua	16 toluluna tai
8 otolu	17 toluluna lua
9 ovari	18 toluluna tolu

What comes next?

What's 25 in Api? What's 30?



Antelope sona
from South Central Africa

How is it constructed?

How much of the graph is traceable?

Gelosia multiplication
from Medieval Europe:

$$987 \times 961 = 948,507$$

		9	8	7	
9	8	1	2	3	9
4	5	4	8	2	6
8	0	0	0	7	1
	5	0	7		

Why does it work?

Try 428×790 .

Reading List.

George Gheverghese Joseph. *The Crest of the Peacock: Non-European Roots of Mathematics*. Princeton University Press, 2000.

Claudia Zaslavsky. *Africa Counts: Number and Pattern in African Cultures*. 3rd ed., Lawrence Hill, 1999.

Paulus Gerdes. *Geometry from Africa*. MAA, 1999.

Georges Ifrah. *The Universal History of Numbers*. Wiley, 1999.

Karl Menninger. *Number Words and Number Symbols: A Cultural History of Numbers*. Dover, 1992.

Liping Ma. *Knowing and Teaching Elementary Mathematics: Teachers' Understanding of Fundamental Mathematics in China and the United States*. Lawrence Erlbaum Assoc., 1999.