

Algebra Activities from Many Cultures

Beatrice Lumpkin

J. WESTON
WALCH
PUBLISHER

Portland, Maine

Contents

<i>Introduction</i>	<i>v</i>
African Number Systems	1
1. Early African Calendars	4
2. Measuring Lengths Along the Nile River	6
3. Measuring the Height of Nile Floods with Cubits	7
4. Early Egyptian Numerals	10
5. Egyptian Script Numerals: The First Ciphers	13
6. Building the Pyramids: The First Number Line	15
7. The Egyptian Zero	18
8. The Wolof Number System	19
9. Yoruba Numbers	21
Mesopotamian Number Systems	22
10. Numerals from Babylonia	23
11. Babylonian Mathematical Tablet: A Project	25
Pre-Columbian Number Systems	26
12. Number Systems of Central America	27
13. Aztec Numerals	28
14. Maya Numerals	31
15. Calendars of Central America: The Least Common Multiple	33
Chinese Number Systems	35
16. Chinese Rod Numerals	36
17. Signed Numbers with Chinese Rod Numerals	38
Indian Number Systems	40
18. Indian Numerals: From Harappan to Modern	41
19. Indian History: A Puzzle	44
Fractions from Africa and Asia	45
20. Take $\frac{1}{2}$ to Infinity: Horus Eye Fractions	46
21. Modern Fractions from North Africa	48
22. Equations with Fractions from Egypt, India, and China	49
First-Degree Equations	50
23. The Egyptian Method of Solving Equations	52
24. More Equations from Africa and Asia	54
25. Equations from Mexico	55
26. Equations from Guatemala	56
27. Making Models for Algebra	57
28. Slopes of the Pyramids in Africa and America	58

Systems of Equations	60
29. Systems of Equations from Guatemala	61
30. The Chinese Matrix Solution	62
31. Systems of Three Linear Equations: The Chinese Solution	64
Proportion and Variation	67
32. Multicultural Examples	68
33. Aztec Land Taxes	69
34. Money Changers in Colonial Mexico	70
Quadratic Equations	71
35. The Multicultural Origin of the Quadratic Formula	72
36. Quadratic Equations from Mexico and Guatemala	75
37. Quadratic Equations with Fractions	76
Radicals and Exponents	77
38. Compound Interest in Babylonia: Fractional Exponents	79
39. Logarithms in Babylonia	81
40. Laws of Exponents from Iraq	82
41. Square Roots in Ancient Egypt	84
42. Square Roots in India	85
Higher-Degree Equations	86
43. Using Tables to Solve Cubic Equations in Babylonia	87
44. Cubic Equations from Umar al-Khayyami (Omar Khayyam)	89
Series: Number Patterns	90
45. The Doubling Series	92
46. Egyptian Multiplication	93
47. Base-2 Numerals in Ancient Egypt	96
48. A Puzzle from Ancient Egypt	97
49. The Chinese Arithmetic Triangle	98
50. The Arithmetic Triangle in Africa, Asia, and Europe	99
51. Series from India	100
52. An Indian Series for π	102
Probability and Statistics	103
53. Statistics from Ancient Egypt	105
54. Rabbi Ibn Ezra's Formula	107
55. Counting with Silk in Marrakesh	108
56. Games of Chance: A Zuni Example	109
Problem Solving	111
57. Benjamin Banneker: Puzzle Solver	113
58. Kill No Camels	114
59. Problem Solving in India: Inverse Operations	115
60. Problem Solving in Latin America	117
<i>Bibliography</i>	119
<i>Index</i>	120