

Teachers College
Columbia University
New York

ILLUSTRATIONS FOR LECTURES ON THE HISTORY OF MATHEMATICS

In response to requests for the use of stereopticon slides illustrating the history of mathematics, the Educational Museum takes pleasure in announcing that it has made arrangements for supplying this material to schools and colleges. Since the demand thus far has been greatest for illustrations showing the development of arithmetic, the following list relates chiefly to that subject. If, however, there should be a demand for slides illustrating the growth of algebra, geometry, trigonometry, analytic geometry, and the calculus, these can also be supplied. The large collections of instruments, rare books, portraits, manuscripts, and photographs of material in foreign museums and libraries, and in the libraries of the University and Teachers College, as well as in those of George A. Plimpton, Esq., and Professor David Eugene Smith, afford opportunity for the preparation of illustrations in nearly every branch of the subject. Brief accounts of these collections will be sent upon request.

Should a sufficient demand be expressed the Museum will consider the question of making similarly available the resources of other departments of the College.

The slides will be furnished only to schools and colleges, or to those who give courses in such institutions. Since the price represents

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merely the cost to the Museum, no discount can be allowed, whatever the number purchased. The arrangement with the photographer requires that no order for less than twenty-five (25) slides shall be accepted. The price is \$10 for twenty-five slides, and 40 cents each for any number in excess.

Since many of the slides are not kept on hand, there will be a delay of two or three weeks in filling any order. Orders should be addressed to

THE EDUCATIONAL MUSEUM,
Teachers College,
Columbia University, New York City.

EGYPTIAN

1. First trace of Egyptian mathematics, a pottery inscription of the first dynasty.
2. Page from the Ahmes papyrus, c. 1700 B.C., the oldest extant textbook on mathematics.
3. Page from the Akhim papyrus, possibly of the 8th century A.D., showing the same primitive treatment of fractions as in Ahmes.

OUR NUMERALS

4. Nana Chat inscriptions. See Encyclopedia Britannica, under "Numerals."
5. Same in detail.
6. Page from a MS. of Boethius of 1286, showing forms of numerals.
7. From a MS. of Rollandus of 1480, showing forms of numerals.
8. From a MS. of Sacrobosco's "Algorismus" of 1444, showing forms of numerals.
9. From a MS. of the 16th century, showing forms of numerals.
10. Table from Treutlein's "Zahrechen," showing the change in the numeral system from ancient to modern times.

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*This differs from the last
in Weather's Method only
in arrangement*

NUMBER NAMES

11. Page from Borkhi's arithmetic of 1488, showing one of the early uses of "million" in print.

PRACTICAL USE OF ROMAN NUMERALS

12. The Roman numerals in practical use in 1514, from Kohel's arithmetic.
13. The same, showing the curious use of Roman numerals with Arab fraction forms.

ABACUS, OR LINE RECKONING

14. Page from an "Algorithmus linealis" of c. 1400, showing the reckoning with counters.
15. Page from Licht's "Algorithmus" of 1501, showing addition by means of counters.
16. Picture from the "Margarita Philosophica" (1533), showing the old (counter) and new (algorithm) reckoning.
17. Title page of one of Adam Kiese's arithmetics (1538), showing merchants reckoning "on the line."
18. The same, from Gemma Frisius (1565 edition).
19. The same, from Recorde's "Ground of Artes" (1558 edition).
(Kiese, Gemma Frisius, and Recorde were the most popular arithmeticians of their time.)
20. Addition by counters, from Recorde's "Ground of Artes" (1558 edition).
21. Chinese swanpan, Russian tschouis, and Korean rods, the modern relics of the counter reckoning.

MODERN MECHANICAL COMPUTATION

22. Machines for adding, multiplying, and dividing.

FINGER RECKONING

23. The ancient finger reckoning as illustrated in the "Abacus" of Aventinus (1532).
24. The same, from Recorde's "Ground of Artes" (1558 edition).

SYMBOLS

25. Early use of the symbol =, before it was used for equality, from an anonymous MS. of c. 1450.
26. Earliest use of a decimal point (Pelliss. 1492), about a century before decimal fractions were understood.

27. First printed page containing the signs + and - (Widman, 1489), as symbols of excess and deficiency.
28. Early use of the same as algebraic symbols (Stifel, 1545).
29. Symbols of addition and subtraction from Curtius (1619), with curious processes of multiplication.

FUNDAMENTAL OPERATIONS

30. Numeration by the catechism method, from Willchius (1540).
31. Addition, from Hylles (1679), showing curious rhyming rule, and the catechism method of teaching arithmetic.
32. Subtraction (subtraction) from Baker's "Well Spring of Sciences" (1580).
33. Multiplication. Elaborate specimen of the *gelosia* method, from a MS. of c. 1400.
34. Multiplication *per scachier* and *per quadrato*, from a 15th-century MS.
35. Multiplication *per gelosia*, from Feliciano's arithmetic of 1546.
36. The old complementary multiplication, from Huswirt's "Enchiridion" of 1601.
37. Multiplication, with curious illustration, from a student's MS. of 1591.
38. Multiplication and division as performed in the first printed arithmetic (Treviso, 1478).
39. Division by the galley method and multiplication by the common (*scachiera*) plan, from a MS. of the 16th century.
40. Division by the galley method, showing the galley, from a Venetian MS. of c. 1550.
41. Division by the galley method, from a MS. of c. 1600.
42. A very early specimen of the modern form of division, from a MS. of c. 1450.
43. The first printed example of our modern (*a danda*) form of division, from Calandri (1481).
44. Modern division, with curious forms of the numerals, from a MS. of c. 1500.
45. Division of fractions, with curious symbols and proofs, from a MS. of 1546.

46. Cube root by the galley method, from the first arithmetic printed in England (Tonstall's "De Arte Supputandi," 1622).

MEDIAEVAL PROPORTION

47. From a MS. of Boethius, written in 1388, giving the arithmetical, geometric, and harmonic proportion.

48. The same, with musical proportion, from the first printed edition of Boethius (1488).

49. Proportion as the Rule of Three. Examples from Fisher (1776 edition).

SLATE AND BLACKBOARD

50. The first printed mention of a slate (Prosdodimo de Beldamandi, 1488).

51. Curious illustration from a MS. of Scarbosco, written in 1444, showing a master teaching the new numerals.

52. Title page of Boschenstein's arithmetic of 1514, showing merchants using the blackboard.

THE ANCIENT SCHOOL

53. A class in arithmetic in the Middle Ages, from an old engraving.

54. A medieval school, from an old engraving.

55. The seven liberal arts, from an old engraving.

56. The sciences illustrated (Arithmetic with the counters), from an old engraving.

THEORY OF NUMBERS

57. From a MS. of Boethius of 1286, showing figurate numbers.

58. From the first printed edition of Boethius (1488), showing other figurate numbers.

59. From an anonymous chapter on Rithimiacia (1400), showing this famous medieval number game.

60. The first printed Magic Square, from Durer's "Melancholia."

TOPICS STUDIED

61. Title page of Paciolo's great work of 1494 (1523 edition), giving a list of the important topics.

62. The problem of the Venetian clock, from Kobel's arithmetic (1540 edition).

63. Old treatment of Partnership, from Mastereson's arithmetic of 1592.

64. Barter, from Dabell's arithmetic (4th edition).

65. Early American problems, from Pike (1789).

66. Problems of the Civil War, from Johnson's arithmetic (Raleigh, N. C., 1864).

THE ILLUSTRATING OF ARITHMETICS

67. The problems of the jealous husbands, and the jug, from a 14th-century MS.

68. The chessboard problem of the grains of wheat, from a 14th-century MS.

69. From Sacrobosco's "Sphera" (Venice, 1488), showing medieval theory of the apparent rotundity of the sun.

70. From the first printed arithmetic having illustrations. Calandri's book of 1491.

71. From Widman's arithmetic of 1489, showing illustration in exchange.

72. From Kobel's arithmetic (1544 edition), showing one of the problems of the counters.

73. From the same, showing the problem of the market women.

74. Humorous illustrations from Crowquill's arithmetic (1848).

FAMOUS ARITHMETICS

75. Last page of the first printed arithmetic (Treviso, 1478).

76. First page of the rare "Ars Numerandi" (c. 1485, but possibly as early as the Treviso).

77. Last page of the first German arithmetic (1482).

78. Last page of the second German arithmetic (1488).

79. Last page of Calandri's arithmetic (1491).

80. First page of Paciolo's great treatise of 1494 (1523 edition).

81. First page of the part on arithmetic in Capella's work (1490).

82. Last page (colophon) of Tzwifel's arithmetic (1607).

83. Title page of Bonini's arithmetic (1617), with De Morgan's autograph.

84. Title page of Feliciano's arithmetic of 1526 (1636 edition).

ALGEBRA

85. From the Rollandus MS. (c. 1420), showing the names for the powers of the unknown, and a multiplication table of such powers.
 86. Introduction to algebra, from an Italian MS. of c. 1430.
 87. From the same MS., with a reference to the work of Leonardo of Pisa.
 88. From the MS. of Scheubel's algebra, 16th century, showing his symbolism for surds.
 89. The first printed solution of the cubic equation, Cardan's "Ars Magna" (1545).
 90. From Masterston's work of 1592, showing the Renaissance symbolism for the unknowns.
 91. From a MS. of c. 1680, showing the extraction of the square root of a binomial surd.
- ### GEOMETRY
92. Page from the Campanus translation of Euclid, showing the Pythagorean theorem. Original MS. of c. 1240, in the Plimpton library.
 93. Page from a later Campanus MS. of Euclid, c. 1280.
 94. Illustration of *Geometria*, with quadrants, from the "Margarita Philosophica" (1568).
 95. From Fermi's "Opera" (1515), showing the construction of the Platonic bodies.
 96. From Record's "Castle of Knowledge" (1509 edition), showing the geocentric idea of the universe.
 97. From the "Protomathesis" of Finzius (1532), showing the two forms of the quadrans.
 98. From Heutel's "Lustgarten" (1600), showing the use of primitive instruments in mensuration.
- ### GREAT MATHEMATICIANS
99. Pythagoras, from Calandri's arithmetic (1491).
 100. Euclid, from an old engraving.
 101. Ptolemy and Boethius, from a drawing by Raphael.
 102. Claude Ptolemy, from the "Margarita Philosophica."
 103. Leonardo of Pisa, from an engraving.
 104. Adam Riess, the most influential German textbook writer in the 16th century, from an old lithograph.

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105. Gemma Frisius, the most successful writer of a Latin arithmetic in the 16th century, from a contemporary engraving.
106. Clavius, one of the first writers of a practical textbook on algebra, from a contemporary engraving.
107. Cardan, from a contemporary engraving.
108. Tartaglia, from a contemporary engraving.
109. Napier, from a rare lithograph.
110. Bachet de Méziriac, editor of Diophantus, and the first to compile a noteworthy collection of mathematical recreations.
111. Descartes, from an engraving after the Hais painting.
112. Fermat.
113. Pascal.
114. Newton.
115. Leibnitz.
116. Euler.
117. Cocker, the greatest writer of arithmetics in England in the 17th century.
118. Dilworth, Cocker's successor in the 18th century.
119. A collection of autographs, including Hermite, Euler, Legendre, Monge, Johann Bernoulli, Lagrange, Sylvester, Laplace, and others.

To this list may be added the illustrations in Professor Smith's "Rare Arithmetica" (May, 1907), and these may be ordered by specifying the pages. This work also furnishes descriptive matter for many of the slides mentioned in the above list.

The slides above described are prepared largely from the original works in Mr. Plimpton's library.

The circular of the Department of Mathematics, containing Miss Benedict's article on "Algebraic Symbolism," will be sent to teachers interested in the history of mathematics who will send their names and addresses to the Secretary of Teachers College, Columbia University, New York City.

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