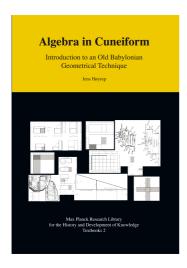
Max Planck Research Library for the History and Development of Knowledge

Textbooks 2

Jens Høyrup:

Bibliographical Note



In: Jens Høyrup: Algebra in Cuneiform: Introduction to an Old Babylonian Geometrical Technique

Online version at http://mprl-series.mpg.de/textbooks/2/

ISBN 978-3-945561-15-7

First published 2017 by Edition Open Access, Max Planck Institute for the History of Science under Creative Commons by-nc-sa 3.0 Germany Licence.

http://creativecommons.org/licenses/by-nc-sa/3.0/de/

Printed and distributed by:

PRO BUSINESS digital printing Deutschland GmbH, Berlin

http://www.book-on-demand.de/shop/15336

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available in the Internet at http://dnb.d-nb.de

Bibliographical Note

The largest batch of Old Babylonian mathematical texts has been published (with German translation) in

Otto Neugebauer, *Mathematische Keilschrift-Texte*. I–III. Berlin: Julius Springer, 1935, 1935, 1937. Reprint Berlin etc.: Springer, 1973,

and most of them also (with French translation) in

François Thureau-Dangin, *Textes mathématiques babyloniens*. Leiden: Brill, 1938.

The above texts BM 13901, AO 8862, VAT 7532, YBC 6504, VAT 8512, VAT 8520, BM 85200+VAT 6599, BM 15285, VAT 8389, VAT 8390 and Str 368 are all contained in one as well as the other¹. Neugebauer's edition contains a very substantial commentary, that of Thureau-Dangin (meant to be economically accessible) only a general introduction.

Other texts are found in

Otto Neugebauer & Abraham Sachs, *Mathematical Cuneiform Texts*. New Haven, Connecticut: American Oriental Society, 1945.

The text YBC 6967 comes from this work.

All texts from Susa (TMS) come from

Evert M. Bruins & Marguerite Rutten, *Textes mathématiques de Suse*. Paris: Paul Geuthner, 1961.

The text Db₂-146 comes from a journal publication,

Taha Baqir, "Tell Dhiba'i: New Mathematical Texts." Sumer 18 (1962), 11–14, pl. 1–3.

¹However, neither of the two volumes contains more than the principal fragment of BM 15285. A new edition based on the three fragments that are known today can be found in Eleanor Robson, *Mesopotamian Mathematics 2100–1600 BC. Technical Constants in Bureaucracy and Education.* Oxford: Clarendon Press, 1999.

150 Bibliographical Note

Neugebauer's and Thureau-Dangin's editions are solid and dependable, as are their commentaries. However, when using Neugebauer's *Mathematische Keilschrift-Texte* one should remember to consult the corrections that are given in volumes II and III—a pioneering work cannot avoid to formulate hypotheses and to propose interpretations that afterwards have to be corrected. Evidently the commentaries are based on the arithmetical interpretation of the algebraic texts, the originators of this interpretation being precisely Neugebauer and Thureau-Dangin.

The edition of the Susa texts is much less reliable. Too often, and in the worst sense of that word, the French translation and the mathematical commentary are fruits of the imagination. Even the translations of logograms into syllabic Akkadian are sometimes misleading—for instance, the logogram for "joining" is rendered by the Akkadian word for "heaping." Everything needs to be controlled directly on the "hand copy" of the cuneiform text.²

The basis for most of what is new in the present book compared to the original editions—the geometric interpretation, the relation between the school and the practitioners' tradition, the historical development—is set out in

Jens Høyrup, Lengths, Widths, Surfaces: A Portrait of Old Babylonian Algebra and Its Kin. New York: Springer, 2002.

This volume also contains editions of almost all the texts presented above with an interlinear English translation and with philological commentary and precise indication of all restitutions of damaged signs (the exceptions are TMS XVI #2, Str 368 and VAT 8520 #1). At least until further notice, large extracts can be found on Google Books.

²In other words, the edition is almost useless for non-specialists, even for historians of mathematics who do not understand the Old Babylonian tradition too well; several general histories of mathematics or algebra contain horrendous mistakes going back to Evert Bruins's commentary.

A	pretendedly practical
Abacus, 73, 128	problems, 7, 66, 70, 101 principles of interpretation,
see also Dust Abacus	12, 16
Abū Kāmil, 106	problems with no practical
Akkadian	applications, 42, 66, 99,
principal language, 8	101, 102
sentence structure, 24	product of the Old Babylonian
see also Babylonian dialect	epoch, 105
"Akkadian method", 56, 62, 88	quasi-disappearance, 110
Al-Khwārizmī, 113	resurgence in reduced form,
Algebra	110
and equations, 9	school topic, 101
and quasi-algebra, 83, 89, 93	shortcomings of arithmetical
meaning of word, 9, 83, 97	interpretation, 13, 15, 16,
Algebra, Arabic, 92, 112	41
and geometrical riddles, 113	variation of coefficients, 108,
origin, 113	111
Algebra, Babylonian	see also Equation, Babylonian
and Greek theoretical	Analysis, Greek, 98
arithmetic, 111	Analytic method, 88, 89, 92, 98
arithmetical interpretation, 13,	Angle, Babylonian notion of, 28
15	practically right, 28, 95
based on tangible and	AO 8862, 109, 149
measurable magnitudes,	#2, 18, 19, 22, 60, 74, 103,
28, 46, 98, 101	122, 125
blind alley, 112, 113	
cultural function, 103	В
didactical function, 102	
discovery, 9	Babylonia, 8
erroneous arguments, 80	Babylonian dialect, 8
flexible instrument, 63, 78	Babylonian mathematics
origin, 105	editions of texts, 149

similar to and different from ours, 115 BÁN, 17	change of direction, 11, 67 development, 10 Ideographic writing, 8
"Base", 55, 62, 108	
Bisection of a trapezium, 86	logograms, 11
known before 2200 BCE, 85	principles of transcription, 11
the argument, 86	social use, 8, 11
BM 13901, 48, 62, 73, 108, 149	syllabic, 11, 23
#1, 39, 47, 52	"Cut off", 15
#1, 39, 47, 32 #2, 43, 47, 69	Cut-and-paste, 41, 51, 59, 89, 96,
#10, 42, 48, 68, 79, 94, 122	109
#10, 42, 48, 68, 79, 94, 122 #12, 73, 78, 102	
#12, 73, 78, 102 #14, 49	D
#23, 75, 108, 109, 111, 127	D
#23, 73, 108, 109, 111, 127 #23, an archaizing fossil, 76,	Db ₂ -146, 126, 137, 149
108, 109	Diagrams
BM 15285	drawn in sand, 97
#24, 93, 136, 149	drawn on the tablet, 66, 94
BM 85200+VAT 6599, 136, 149	see also Structure diagrams
#6, 89, 126	Dust Abacus, 96
#23, 126	Dust Houcus, 70
"Break", 72	
"Bring", 63	E
Broad lines, 62	
Broken reed, see Reed, broken	Eighth degree, problem of, 102
m, 150	Elements, see Euclid, Elements
вùr, 17, 33, 65, 66, 120	"Encounter, make", 69
Bureaucracy, Ur III, 8	"Equal by", 23, 41, 106
3,	"Equal, the", 23, 46, 92
C	"Equal, 1 joined", 92, 126
	"Equals" that are not equal, 92
Calculation, techniques of, 120	Equation, Babylonian, 29, 97
Cardano, Gerolamo, 113	Equations, operation on, 98
Change of scale in one direction,	Euclid, 89
52, 71, 86–88, 95, 108	and tradition of geometrical
City states, 8	riddles, 112
Civilization, the first, 7	Elements, 112, 113
"Confront each other", 23, 77	Excavation, problems of, 93, 126
"Confrontation", 22, 39, 43, 45	Explanations, pedagogical, 28, 33
Cuneiform writing, 8, 10	36, 54

F	and "raising", 20
	igûm-igibûm, 46, 123
Factorization, 91, 93, 108	Indeterminate equations, 35
False position, 32, 48, 64, 67–69,	Inscribe, 46
87, 90, 93	"Inside" of a magnitude, 15, 41, 43
False value of a magnitude, 68,	т
119, 124	J
Fibonacci, Leonardo, 113	"Inim" 15 10 41 42 47 50 50
Field plans, 95	"Join", 15, 18, 41, 43, 47, 58, 59,
First degree, techniques for the, 27	62, 72, 125
C	Journal des mathématique
G	élémentaires, 103
Genres, mathematical, 93	K
Geometrica, 111	
Geometry, mental, 96	кùš, 17, 19
Geometry, practical, Arabic, 111	standard height, 19
"Go away, make", 18, 66	Ŧ
"Go beyond", 18, 129	${f L}$
"Go", repetitive operation, 19, 58	
Grammatical person in	Ladies' Diary, 103
mathematical texts, 33,	Latinity, 103
62	"Lay down", 46, 47, 94
Gύ, 17	"Length", 16
GUR, 17, 120	M
Н	
	Mathematical texts
Halves, 22, 62	authors, 23
"Hand", a reckoning board, 128	dating, 23
"Head" meaning beginning, 67	language, 23, 62
"Heap", 12, 18, 28, 43, 48, 62, 99	Mathematicians, Babylonian?, 102
History of Mesopotamia, 7	Metrology
Hittites, 110	for area, 17
"Hold, make", 19, 22, 49, 61, 64,	for hollow measures, 17
69, 122	for horizontal distance, 17
producing a surface, 61, 121	for vertical distance, 17
, , ,	for volumes, 17
I	for weight, 17
	Mina, 17
IGI, 20, 23, 46, 48, 64, 77, 106	"Modification", 120

"Moiety", 22, 62, 128 Moral of history writing, 115 Multiplicative operations, 19	Practitioners, mathematical, 106 and mathematical riddles, 76, 106
N 	taught in apprenticeship, 106 Pride, professional, of scribes, 103, 110
Naive approach, 41, 81	Problems
Negative numbers	about rectangles, 46, 73, 93,
absence from Babylonian	102, 107, 108, 124, 125
mathematics, 42, 45, 115	about squares, 39, 48, 73, 93,
"found" with the Babylonians,	107, 111
43, 115	constructed backwards, 45, 99
Neo-Sumerian state, 8	Progress, 115, 116
and place-value system, 8	"Projection", 15, 40, 43, 44, 62, 76
Neugebauer, Otto, 9, 13, 15, 16, 77,	108
149, 150	Proof, numerical, 120
nindan, 17, 20	Proofs of problem solutions, 120
Non-normalised equation,	Pure mathematics, Babylonian, 7
technique for, 51, 52, 87	
Numerical values	Q
known but not given, 37, 90,	0 1 1 1 10 10 10 17
99	Quadratic completion, 12, 42, 45,
used as names, 37	46, 53, 56, 77, 80, 88, 107
0	Quotation from the statement, 32,
	111
Old Babylonian epoch, 8	
Operations	R
additive, 18	
multiplicity of, 13	"Raise", 12, 19, 20, 22, 29, 49, 79,
of divisions, 20	122
subtractive, 18	Recreational problems, 107
Orientalism, 105	Rectangles
	primacy compared to
P	triangles, 28
	problems about, see Problems
Pacioli, Luca, 111, 113	about rectangles
PI, 17	Reed, broken, problem of, 65, 124
Place value number system, 8, 14	Reed, metrological unit, 66
"Posit to", 21	Reference volume, 91, 92, 126
"Posit", 21, 29	Regular numbers, 21

Remainder, notions of, 18	Shekel, 17
"Repeat" ("until n"), 122	sìla, 17, 120, 132
Representation, 16, 72, 73, 99, 110,	"Sixty", 66
111	Square and square roots, 22
fundamental, 46, 98	Square roots, approximated, 23, 92
fundamental, Babylonian, 16	Squares
geometric, 16, 72	concentric, 87
of areas by line segments, 75	problems about, see Problems
Riddle format, 34, 76, 107, 108	about squares
Riddles, geometric, 107	Standard units, 17
adopted and transformed by	"Steps of", 19, 22, 23
the school, 108, 109	Str. 368, 123, 149
Riddles, geometric, tradition of,	Structure diagrams, 95
106, 109	Substractive magnitudes, 42, 45
and modern mathematics, 113	Sum, notions of, 18
Riddles, mathematical, 34, 76, 106	Sumerian, 8
their functions, 107	dead language, 8
Rodet, Léon, 43	learned language of scribes, 8,
	23
\mathbf{S}	support for professional pride,
	103
sar, 17, 19, 120	"Surface", 16, 17, 19, 39
"Scatter", 99	Surveyors, 62, 63, 86, 109
School dimension of figures, 33,	Akkadian, 76, 106
109	riddle tradition of, 108, 111
Scribe school, 8, 20, 21, 24, 33, 56,	Synonyms in mathematical
62, 101, 103, 105, 108,	terminology, 15, 16, 69,
110, 125, 127, 150	99
Scribes, 10, 95, 108	
profession of, 8	T
their duties, 101	
see also Pride, professional, of	Tables, 92
scribes	"equal, 1 joined", 92
Second degree	learned by heart, 20, 120
complex problems, 57	metrological, 120
fundamental techniques, 39	of cubic "equals", 92
Second degree equations, practical	of igi, 21, 23, 31, 46, 64, 111,
application of, 5	123
"Separate", 99	of multiplication, 20, 62, 120
Sexagimal system, 11, 17, 21	of squares and "equals", 111

Tablets	\mathbf{U}
damaged, 25 for rough work, 65, 77, 120 support for writing, 10 Talent (weight unit), 18 "Tear out", 15, 18, 29, 41, 43, 45, 72, 90	Units, 17 Ur, centre of neo-Sumerian state, 8 Ur III, 8, 23, 109 see also Neo-Sumerian State Uš, unit, 93
Terminology, Babylonian mathematical, 9	V
Third degree, problems of, 90, 92 Thureau-Dangin, François, 9, 13, 15, 16, 149, 150	Variables, 16 VAT 7532, 18, 65, 103, 124, 142, 149
TMS IX, 139 #1, 54, 62 #2, 54 #3, 19, 57, 62, 64, 74, 78, 123	VAT 8389, 149 #1, 118, 142 VAT 8390, 149 #1, 122
TMS VII, 99, 138 #1, 99, 118, 138 #2, 19, 34, 42, 70	VAT 8512, 83, 145, 149 VAT 8520, 149 #1, 122, 150
TMS VIII #1, 19, 49, 77, 139	W
TMS XIII, 87, 89, 141	Width, 16, 76
TMS XVI, 51, 99 #1, 27, 42, 54, 58, 88 #2, 99, 117	Y
Translation conformal, 24, 25, 113 of numbers, 14, 25 principles, 25	YBC 6504, 146, 149 #1, 124 #3, 125 #4, 79 YBC 6967, 17, 45, 60, 71, 72, 123,
True value of a magnitude, 33	125, 128, 148, 149