AccessionIndex: TCD-SCSS-U.20121208.001 Accession Date: 8-Dec-2012 Accession By: Prof.J.G.Byrne Object name: Abacus Calculations Vintage: c.1xxx Synopsis: Descriptions of calculations on the abacus (invented by the Chinese).

Description:

Text excerpt from a chapter on abacus calculations in a book titled *Reckoning in the Middle Ages*.

Photographs courtesy Prof.J.G.Byrne and Dr.Arthur Hughes.

The homepage for this catalog is at: <u>https://www.scss.tcd.ie/SCSSTreasuresCatalog/</u> Click '*Accession Index*' (1st column listed) for related folder, or '*About*' for further guidance. Some of the items below may be more properly part of other categories of this catalog, but are listed here for convenience.

Accession Index	Object with Identification
TCD-SCSS-U.20121208.001	Abacus Calculations, Descriptions of calculations on the abacus (invented by the Chinese), c.1xxx.

References:

1. Maxwell, R.P., *How to use the Chinese abacus*, Trowbridge, 1979, see catalog Literature entry: TCD-SCSS-V.20121208.328

RECKONING IN THE MIDDLE AGES

(a) 200 goes 20 times into 5000 + , leaving 1685 167 leaves an additional remainder of 20 × 33 or 660 and next dividend is 2345 (b) and (c) similarly.

(d) and (c) summary.
(d) 200 will not go into 174, but 167 will go (1) once, leaving a remainder of 7.
(e) Add the quotients 20, 10, 3, 1. Total is 34.

A third of the treatise is devoted to fractions. Below are the names of the fractions, with their values in modern symbols.

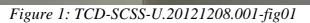
I as	¹ _{wa} semuncia
11 deunx	na duella
å dextans	1 sicilicus
a dodrans	J _a sextula
a bisse	¹ / _{2 d} dragma
Te septunx	The hemisecula or dimidia
1 semis	[1] tremissis] sext
a quincunx	¹ / ₂ scripulus
1 triens	al obolus
1 quadrans	1 bissiliqua
1 sextans	T152 cerates
1 sexcuncia	T728 siliqua
1. uncia	1 calcus

Very little explanation is given in multiplication, but instead a long and fairly comprehensive list of products. As the fractions given above are the only ones used the products have to be expressed in terms of them; for example, "dimidia sextula [multiplied] by a dextans, a scripple and a barrier to the the device of a scripulus and an obolus and a third of an obolus or a siliqua," i.e., $\frac{1}{144} \times \frac{5}{6} = \frac{1}{188} + \frac{1}{576} + \frac{1}{5} \text{ of } \frac{1}{576}$

THE ABACUS

Division proceeds on lines similar to those given above for integers, and the remainders often contain a series of fraction symbols.

Work in fractions was difficult and the results often too cumbrous to be of any general value. In later manuscripts this section was omitted.



RECKONING IN THE MIDDLE AGES

(a)	200 goes 20 times into $5000 +$, leaving 167 leaves an additional remainder of 20×33 or	
	and next dividend is	660
(b)	and (c) similarly.	2345

- (d) 200 will not go into 174, but 167 will go (1) once, leaving a remainder of 7. (e) Add the quotients 20, 10, 3, 1. Total is 34.

A third of the treatise is devoted to fractions. Below are the names of the fractions, with their values in modern symbols.

I as	¹ / ₂₄ semuncia
$\frac{11}{12}$ deunx	1 duella
5 dextans	1 sicilicus
a dodrans	Ja sextula
a bisse	1 dragma
T septunx	$\frac{1}{144}$ hemisecula or dimidia
1 semis	[1] tremissis] sextula
5 quincunx	1 scripulus
1 triens	ale obolus
1 quadrans	1 bissiliqua
1 sextans	1 cerates
1 sexcuncia	1 siliqua
1 uncia	1 calcus

Very little explanation is given in multiplication, but instead a long and fairly comprehensive list of products. As the fractions given above are the only ones used the products have to be expressed in terms of them; for example, "dimidia sextula [multiplied] by a dextans, a scripulus and an obolus and a third of an obolus or a siliqua," *i.e.*,

 $\frac{1}{144} \times \frac{5}{6} = \frac{1}{288} + \frac{1}{576} + \frac{1}{5} \text{ of } \frac{1}{576}$

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THE ABACUS

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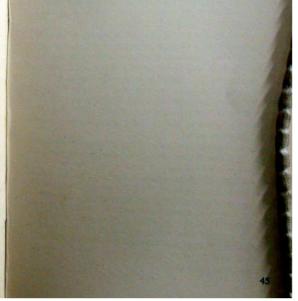


Figure 2: TCD-SCSS-U.20121208.001-fig02