AccessionIndex: TCD-SCSS-V.20121208.872
Accession Date: 8-Dec-2012
Accession By: Prof.J.G.Byrne
Object name: Posters on 'Computation in the era of Queen Elizabeth I'
Vintage: c.1986
Synopsis: Trinity College Dublin, for an exhibition to coincide with the IFIP-1986 conference.

Description:
These posters were exhibited to coincide with a conference of the International Federation of Information Processing (IFIP) held in Trinity College Dublin in September, 1986.

These posters describe *Computation in the era of Queen Elizabeth I (1533-1603)*, part of a larger exhibition created by Prof.J.G.Byrne that was entitled *Computing through the Ages* and held in the Long Room of the Old Library in Trinity College Dublin from September, 1986, which amongst other exhibits also included an exhibition on *Charles Babbage's Computing Engines*, see elsewhere in this catalog.

These exhibition materials were re-used as part of the *Treasures of the Mind* exhibition held in the Colonnades Gallery of the Old Library for the TCD Quatercentenary in 1992.

The homepage for this catalog is at: https://www.scss.tcd.ie/SCSSTreasuresCatalog/
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	Location	Vintage	Object and Identification
TCD-SCSS-V.20121208.872		c.1986	Prof.J.G.Byrne, Posters on *Computation in the era of Queen Elizabeth I*, for an exhibition to coincide with the IFIP-1986 conference, c.1986. *[Prof.J.G.Byrne's IFIP-1986 exhibits and 1992 TCD Quatercentenary exhibits]*

References:

1. xxx.

Figure 1: Exhibition publicity materials:
1986: 'Computing Through The Ages'
1992: 'Treasures of the Mind'

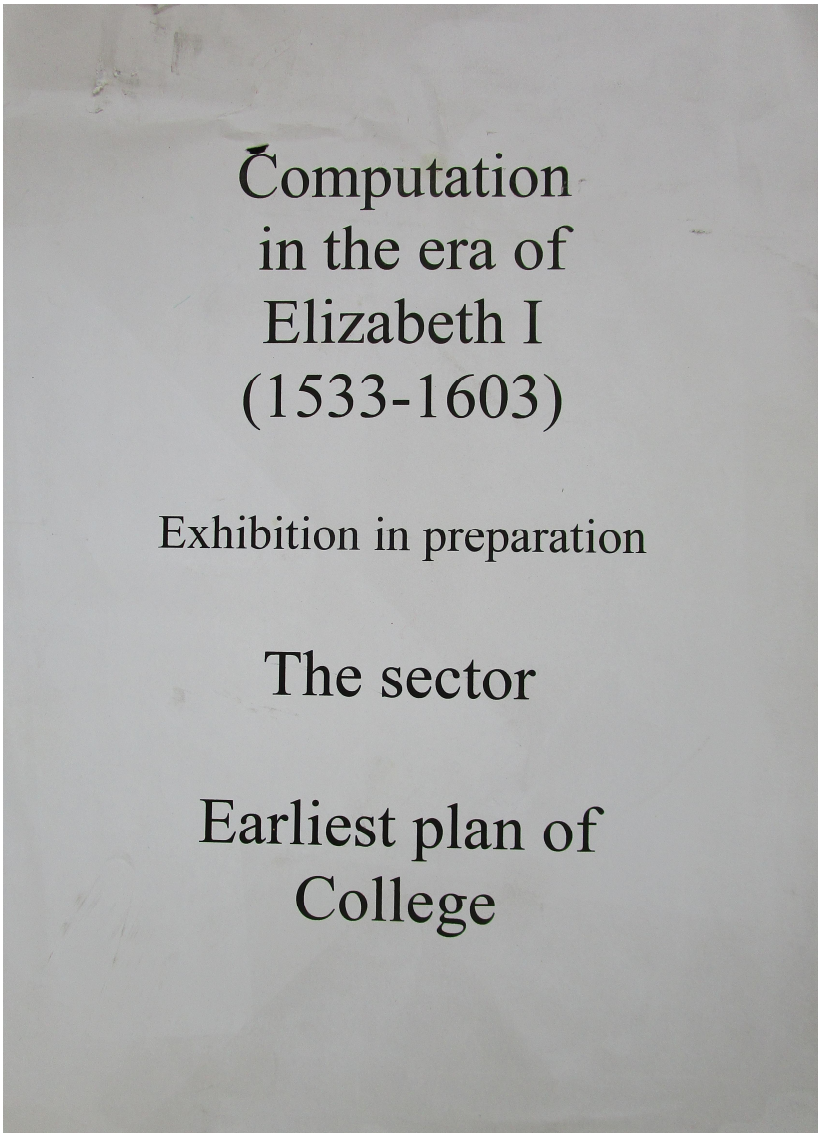

Figure 2: Computation in the era of Queen Elizabeth I (1533-1603)
Preparatory and final title posters

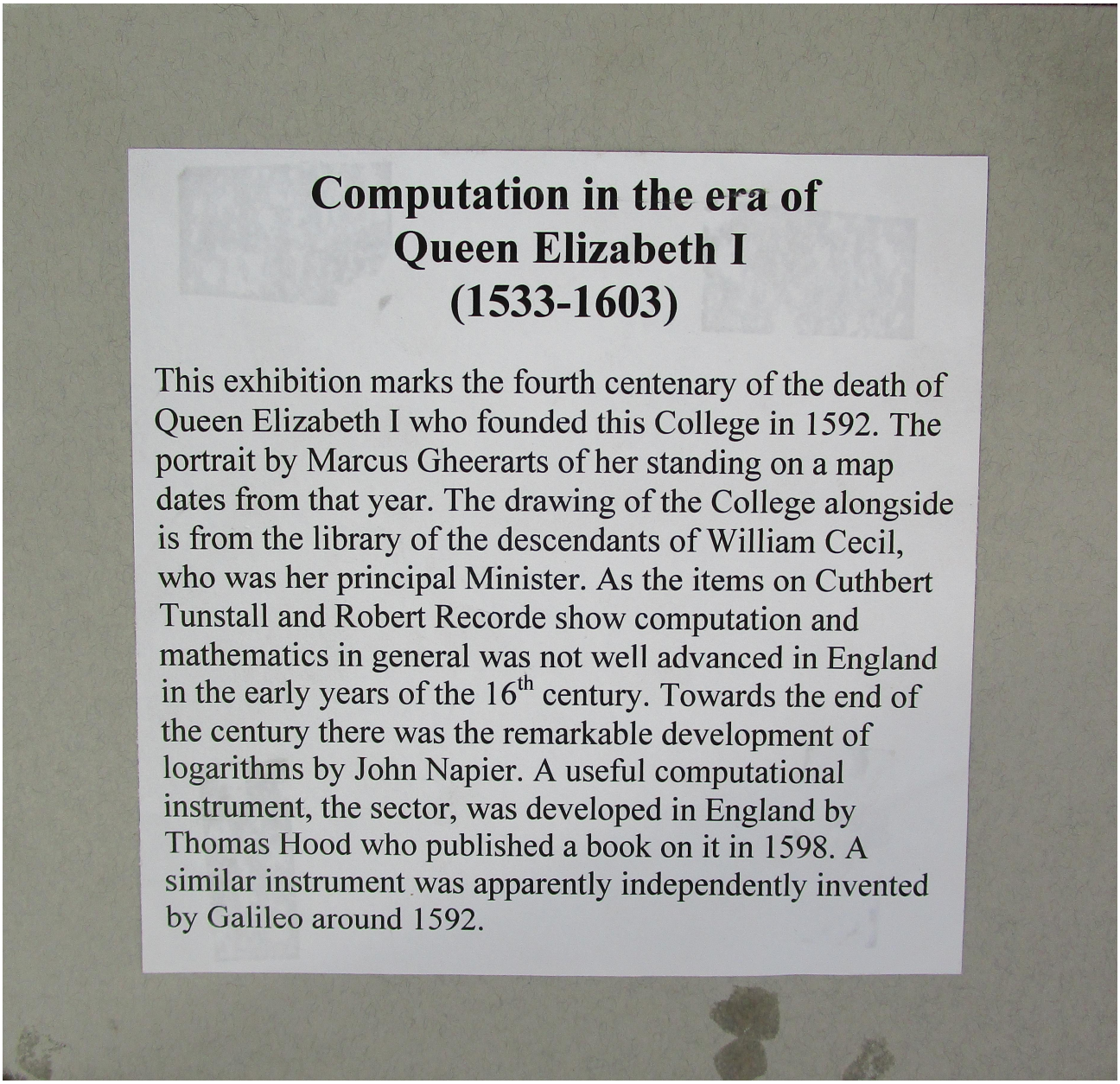

Figure 3: Computation in the era of Queen Elizabeth I

Cuthbert Tunstall
(1474-1559)

In 1522 Tunstall wrote one of the first books printed in England on Arithmetic. It was written in Latin and called De Arte Supputandi libri IV [The Art of Computing in four books]. It made no claims as to originality. Tunstall studied in Padua from 1499 to 1505 and he learned about the Italian mathematicians at that time. The book was more popular on the continent than in England and it was reprinted at least seven times. The copies in the College Library were printed in Paris in 1538 (L.ll. 52 and EE. k. 53). Mathematics is defined to consist of Arithmetic, Music, Geometry and Astrology, although the definition of the latter is closer to what would be called Astronomy to-day. Tunstall became Bishop of London in 1522 and wrote no further secular books. He was transferred to Durham in 1530.

Division of 2915410 by 47 is set out as follows:

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

Note the way the divisor 47 is carried along.

The most complex arithmetic operations discussed are the finding of square and cube roots. The square root of 57836029 is shown as follows:

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

The method taught in schools until the 1960s was based on the theorem of Euclid (Book II Proposition 4, which is expressed algebraically as $(a + b)^2 = a^2 + 2ab + b^2$) and was set out as follows:

```
                57,83,60,29 (7605
                49
146             8 83
                8 76
15205             76029
                  76025
                      4
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Figure 4: Cuthbert Tunstall, author of one of the earliest English books on arithmetic

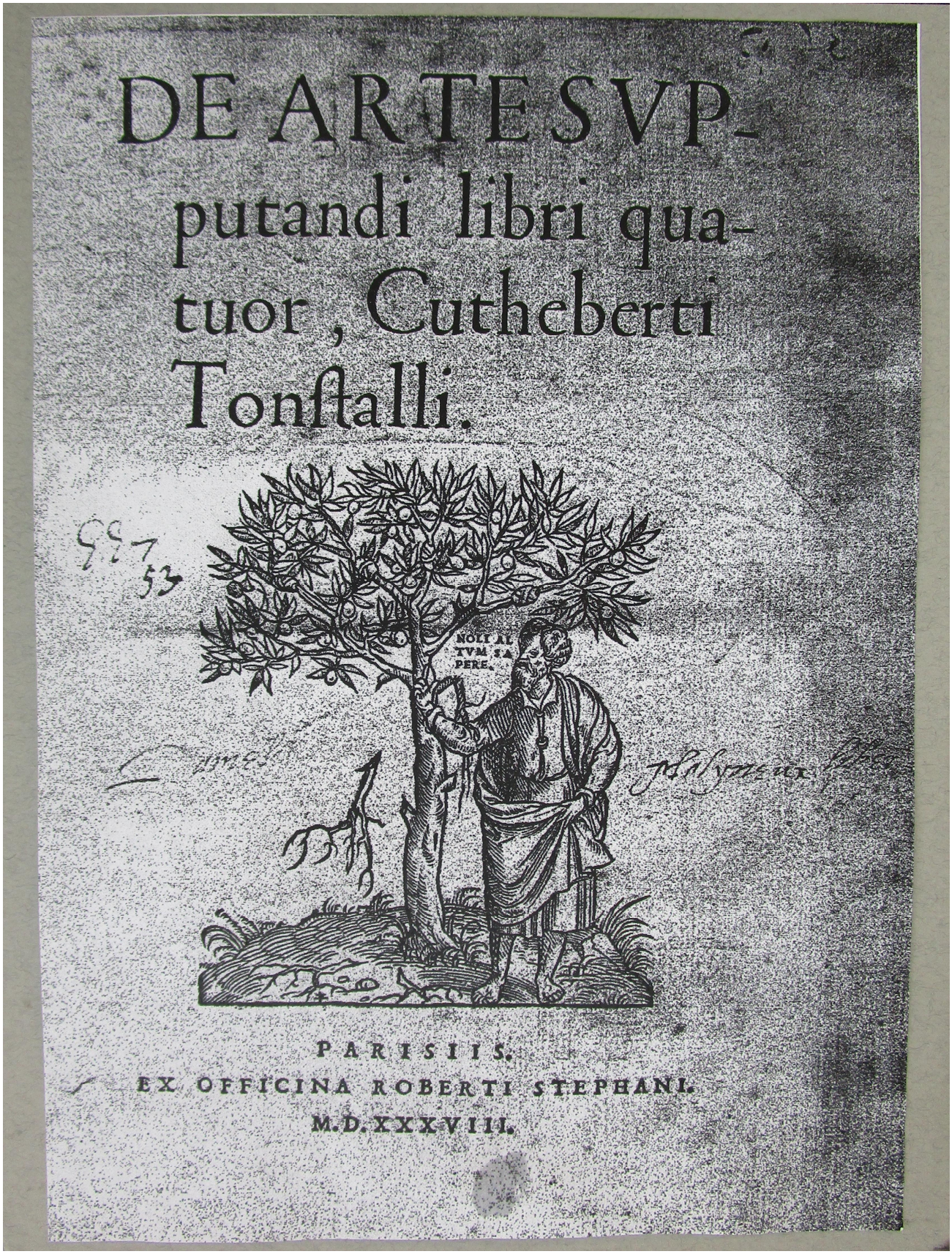


Figure 5: Cuthbert Tunstall's book on arithmetic
'De Arte Supputandi Libri Quattuor' by Cutheberti Tonstalli, c.1538

Robert Recorde
(c1510-1558)

Recorde wrote the first widely used book in English on arithmetic. It was published in 1543 with the title The Ground of Artes. It was republished many times with extensions by others, until 1699.

He gave three methods for the basic arithmetic operations:`

Pencil and paper and tables

Accomptynge by counters
"not only for them who cannot wryte or read but also for them that can do both, but have not at some times their penne or tables with them."

"The arte of the hande". He says this method was 2000 years old but not commonly known in England.

Recorde was born in Tenby, Wales and was a medical doctor. In 1551 he was sent to Wexford to manage the silver mines and he was also in charge of the mint in Dublin. The mines were not successful due to no fault of Recorde and he was recalled in 1553.

Figure 6: Robert Recorde, author of the first widely used English book on arithmetic

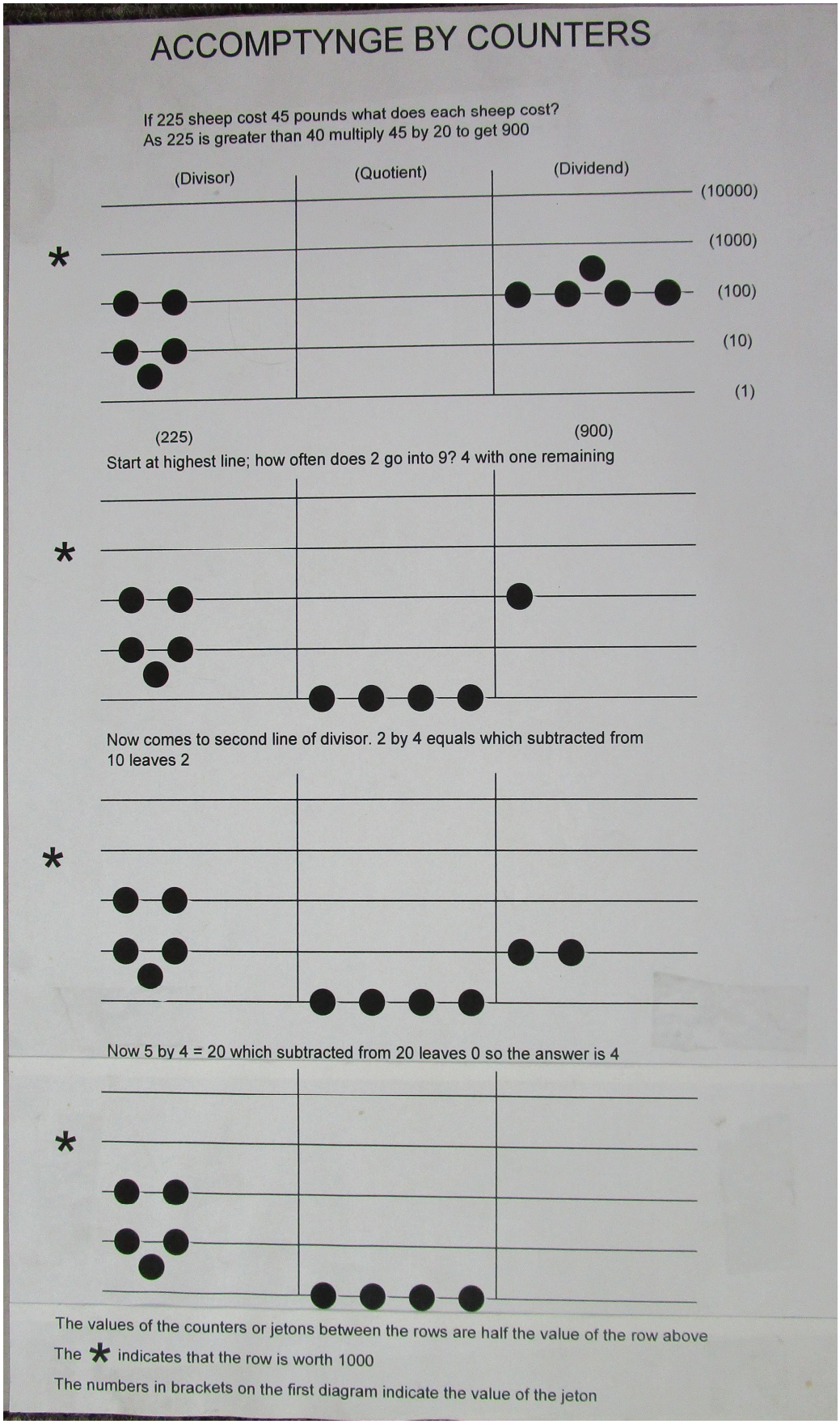
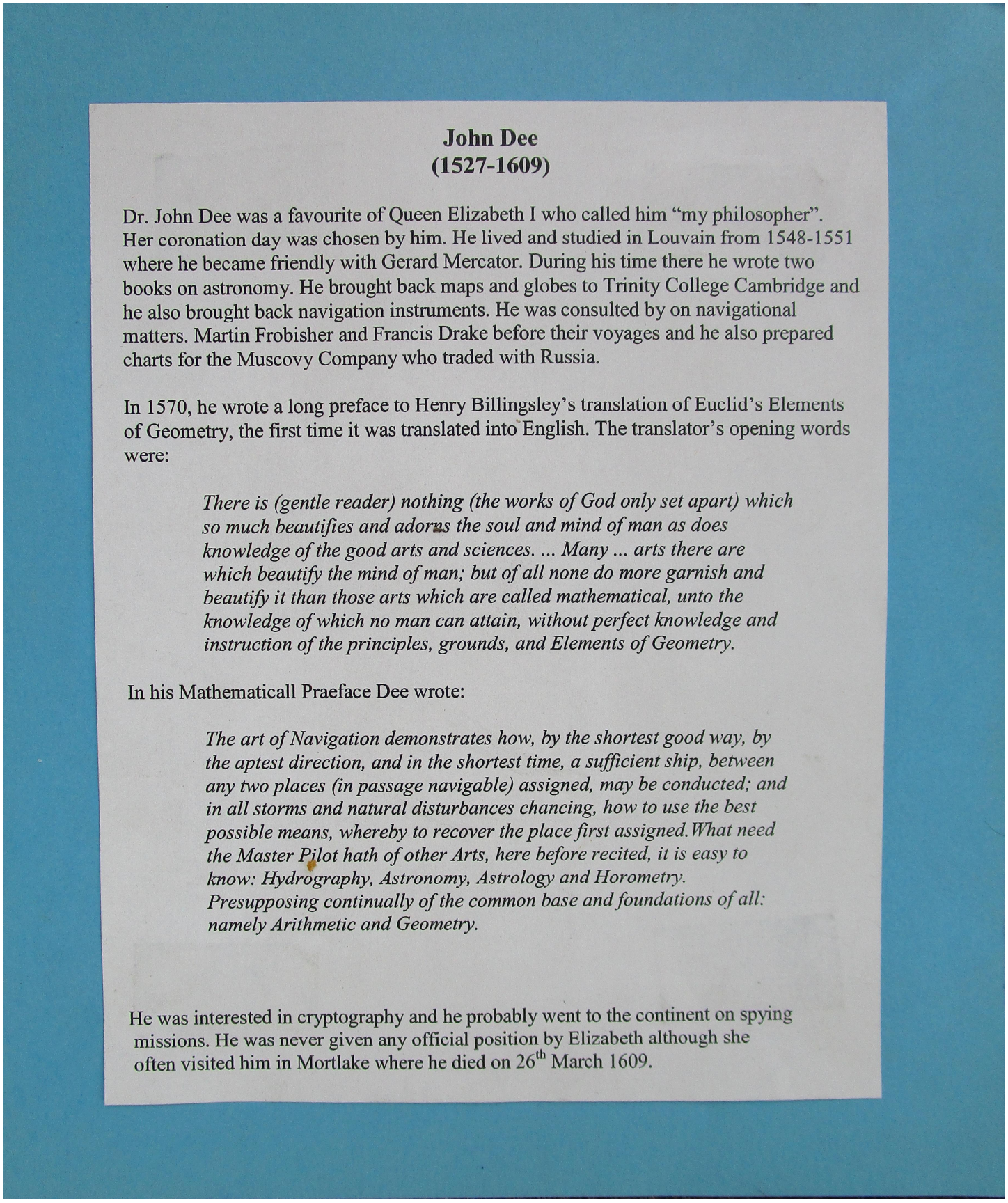


Figure 7: Arithmetic accompanied by counters or jetons, akin to the methods referred to by Robert Recorde (for Jetons, see elsewhere in this catalog)



John Dee
(1527-1609)

Dr. John Dee was a favourite of Queen Elizabeth I who called him "my philosopher". Her coronation day was chosen by him. He lived and studied in Louvain from 1548-1551 where he became friendly with Gerard Mercator. During his time there he wrote two books on astronomy. He brought back maps and globes to Trinity College Cambridge and he also brought back navigation instruments. He was consulted by on navigational matters. Martin Frobisher and Francis Drake before their voyages and he also prepared charts for the Muscovy Company who traded with Russia.

In 1570, he wrote a long preface to Henry Billingsley's translation of Euclid's Elements of Geometry, the first time it was translated into English. The translator's opening words were:

> *There is (gentle reader) nothing (the works of God only set apart) which so much beautifies and adorns the soul and mind of man as does knowledge of the good arts and sciences. ... Many ... arts there are which beautify the mind of man; but of all none do more garnish and beautify it than those arts which are called mathematical, unto the knowledge of which no man can attain, without perfect knowledge and instruction of the principles, grounds, and Elements of Geometry.*

In his Mathematicall Praeface Dee wrote:

> *The art of Navigation demonstrates how, by the shortest good way, by the aptest direction, and in the shortest time, a sufficient ship, between any two places (in passage navigable) assigned, may be conducted; and in all storms and natural disturbances chancing, how to use the best possible means, whereby to recover the place first assigned. What need the Master Pilot hath of other Arts, here before recited, it is easy to know: Hydrography, Astronomy, Astrology and Horometry. Presupposing continually of the common base and foundations of all: namely Arithmetic and Geometry.*

He was interested in cryptography and he probably went to the continent on spying missions. He was never given any official position by Elizabeth although she often visited him in Mortlake where he died on 26th March 1609.

Figure 8: John Dee, philosopher to Queen Elizabeth I

Figure 9: John Dee

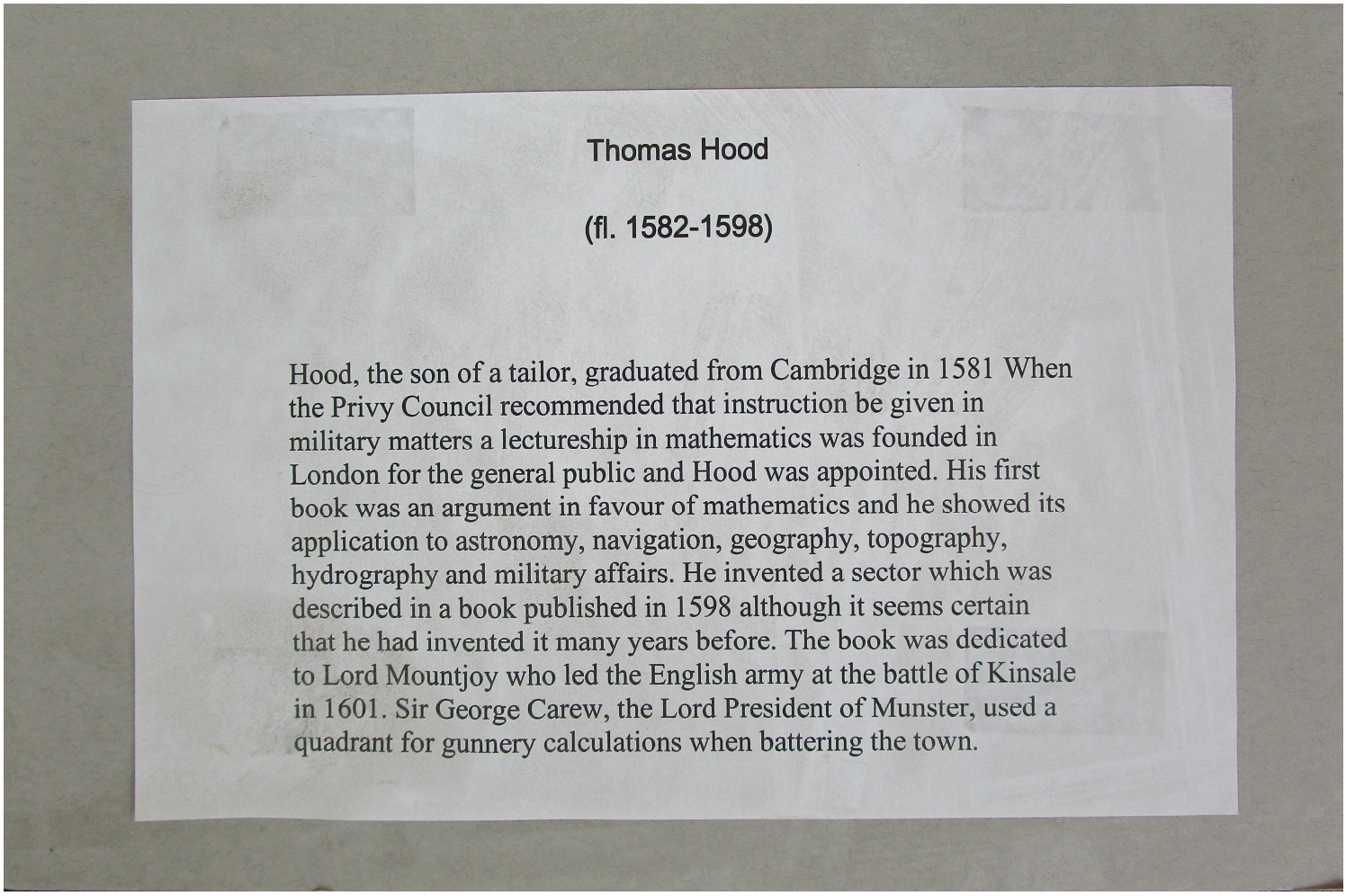


Figure 10: Thomas Hood, inventor of the Sector

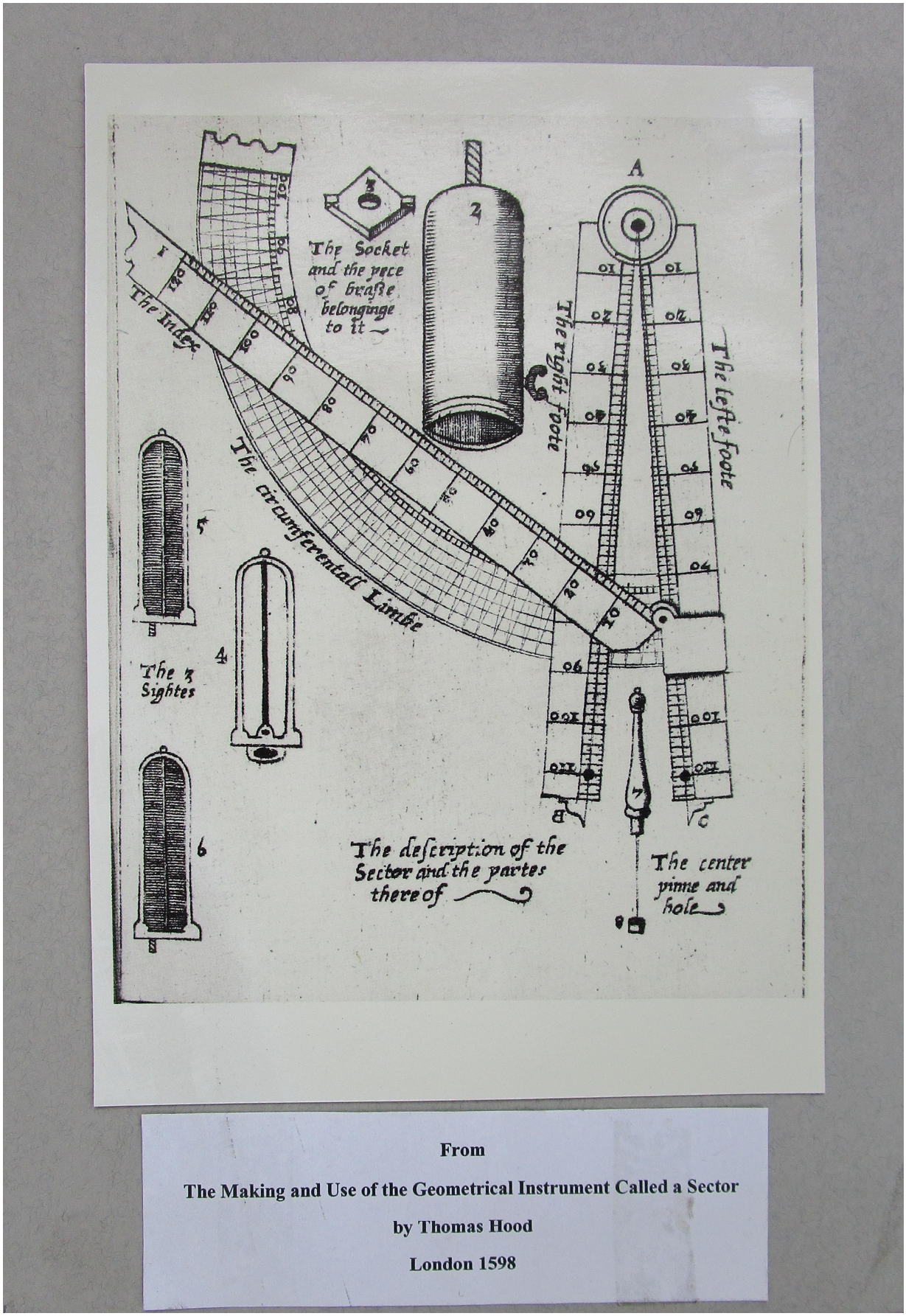
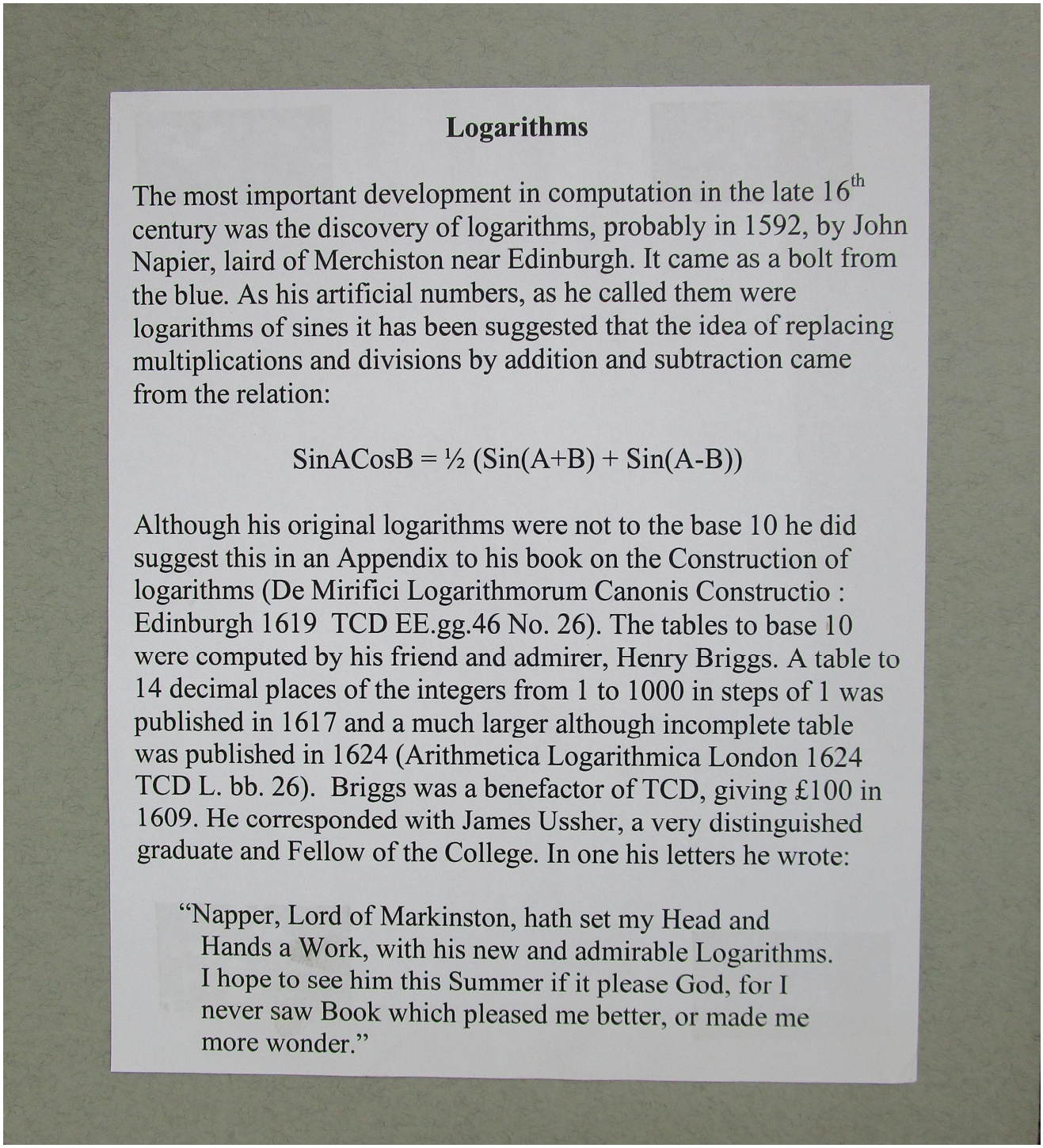


Figure 11: How to make and use a Sector, by Thomas Hood

Figure 12: Illustration of both sides of a Sector

Figure 13: Sir George Carew using a Quadrant for gunnery calculations during the Battle of Kinsale, 1601

Figure 14: 'Usus Et Fabrica Circin Cvivsdam Proportionis, Per quem omnia ferè tum Euclidis, tú Mathematicoru omnium problemata facili negotio resoluuntur', by Opera & Studio Balthesaris Caprae, c.1607, on fabrication and use of Sectors, suppressed by University of Padua 2 months after publication after complaint by Galileo that it was a plagiarized translation from his own work



Logarithms

The most important development in computation in the late 16th century was the discovery of logarithms, probably in 1592, by John Napier, laird of Merchiston near Edinburgh. It came as a bolt from the blue. As his artificial numbers, as he called them were logarithms of sines it has been suggested that the idea of replacing multiplications and divisions by addition and subtraction came from the relation:

$$\mathrm{SinACosB} = \tfrac{1}{2}\,(\mathrm{Sin}(A+B) + \mathrm{Sin}(A-B))$$

Although his original logarithms were not to the base 10 he did suggest this in an Appendix to his book on the Construction of logarithms (De Mirifici Logarithmorum Canonis Constructio : Edinburgh 1619 TCD EE.gg.46 No. 26). The tables to base 10 were computed by his friend and admirer, Henry Briggs. A table to 14 decimal places of the integers from 1 to 1000 in steps of 1 was published in 1617 and a much larger although incomplete table was published in 1624 (Arithmetica Logarithmica London 1624 TCD L. bb. 26). Briggs was a benefactor of TCD, giving £100 in 1609. He corresponded with James Ussher, a very distinguished graduate and Fellow of the College. In one his letters he wrote:

> "Napper, Lord of Markinston, hath set my Head and Hands a Work, with his new and admirable Logarithms. I hope to see him this Summer if it please God, for I never saw Book which pleased me better, or made me more wonder."

Figure 15: Napier's Logarithms

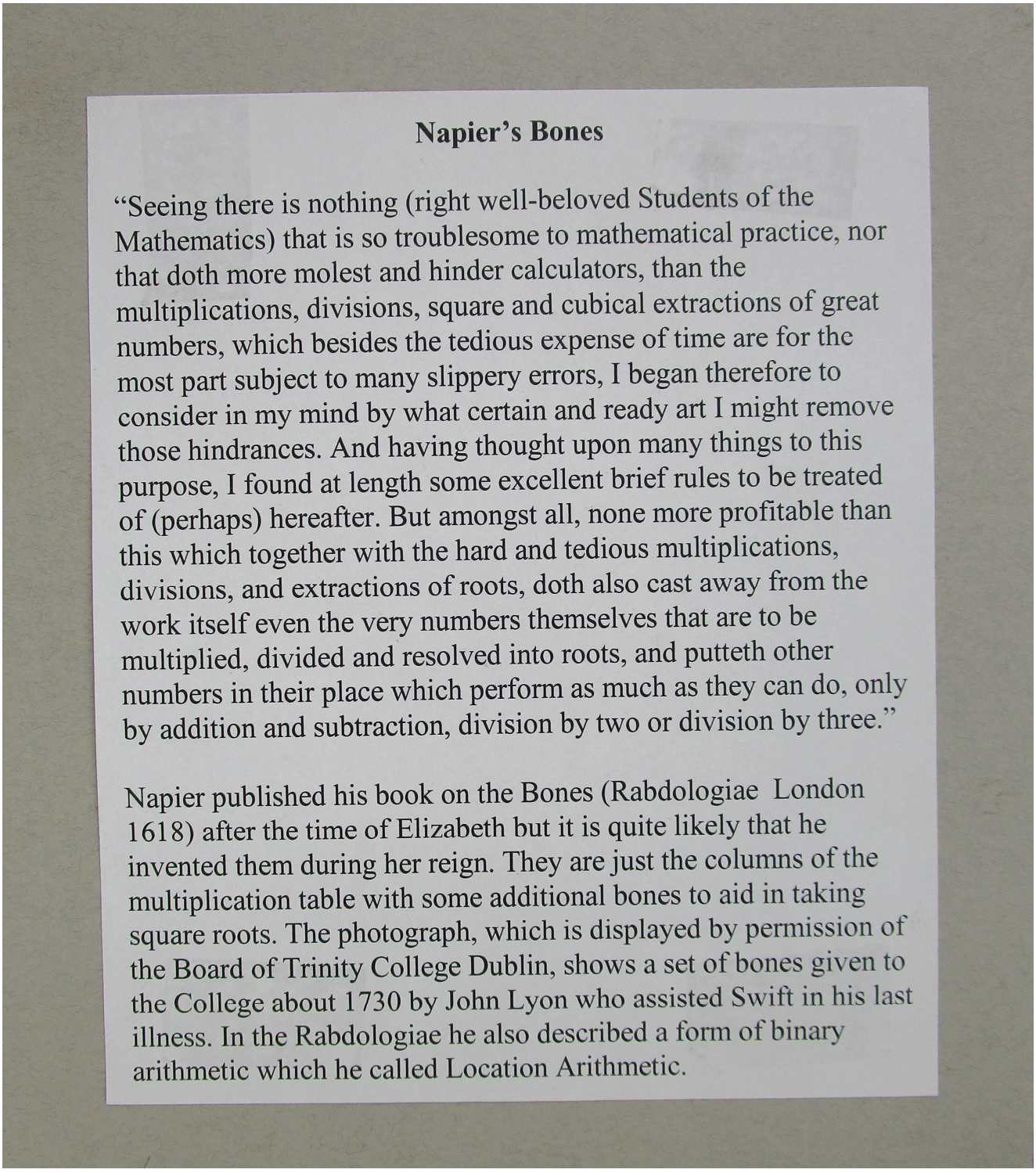


Figure 16: Napier's Bones

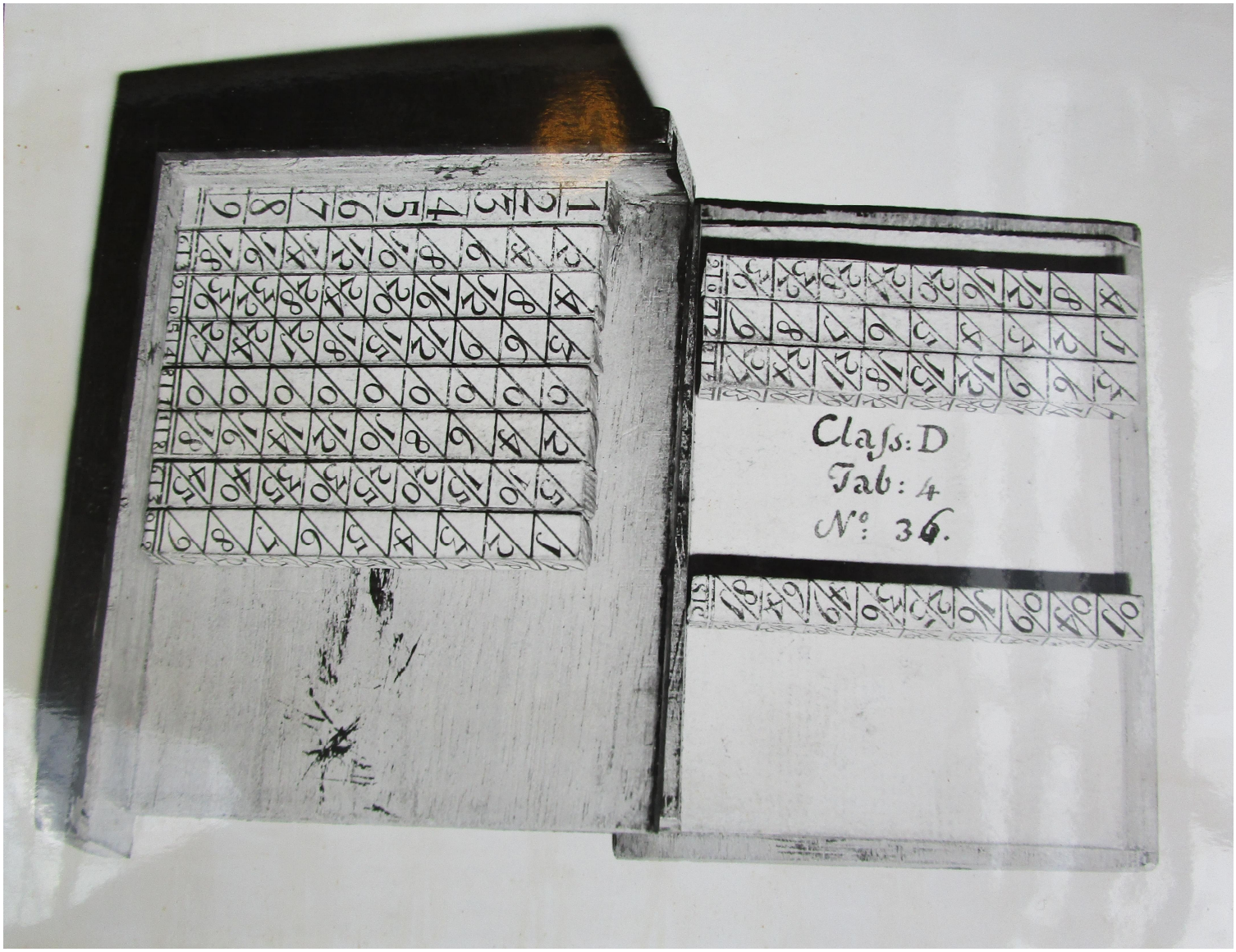


Figure 17: Napier's Bones