Iohn Dansie

A Mathematicall Manuel

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Any man that can but add and
substract, may learne to multiply
and divide in two houres by
Rabdologia, without any trou-
ble at all to the memorie.

London 1627

Hier wiedergegeben Vorwort und Abschnitt Rabdologie bis S. 15

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Dansie: A Mathematicall Manuel

A Mathematicall Manuel:

Wherein

Is handled Arithmeticke, planimetry, stereometry, and the embatelling of armies.

Whereby

Any man that can but add and substract, may learne to multiply and divide in two houres by *Rabdologie*, without any trouble at all to the memorie.

Whereunto

Is annexed the measuring of Superficies, Solids, the gageing of Caske, with invention of proportionall numbers, fitted to the subdivisions of gageing Rods; and the embattelling of armies according to the discipline nowadays.

Written by *Iohn Dansie* student in the Mathematiques.

LONDON,
Printed by WILLIAM IONES for *Richard Cartwright*. 1627.

Lectori Rabdologiæ.

ARdua qui numeras, quadratis v-
tere virgis;
Multipla cum quotumis quæis opus
inde leges.
Multiplica, atque seca, radices ex-
trahe fidens:
Certa, cita, et facilis, dixeris, ista
via est.

Patricius Sandęus.

Ad Lectorem.

MVltiplicare iuuat, numeros vel
scindere, Lector?
Vt factus subitò prodeat atque Quotus:
Siue Geometricas vis mensurare figuras?
Hic disces celerem, persacilemque
viam. Andreus Iunius.

Quæ terrere solent ab amore Me-
thesecos; illa
Hæc parno inuenies esse remota libro.

To

To the right worſhipfull, Sr. *Paul Pinder*, Sr. *Iohn Wolſtenholme* Knights: *Charles Cokaine*, and *Abraham Iacob* Eſquires. Farmors of his Maties generall Cuſtomes.

Right worſhipfull,

THis Orphane comming vnto me attired in a foraigne habit, & ſpeaking a language thogh ancient, yet in theſe parts not vulgarly vnderſtood; diſcovering not onely by thoſe exterior appearances, but by other remonſtrances of ſingular Art, to containe in him ſomething more then ordinary: I (as a well-willer to the ſcience principally by him profeſſed) gaue him friendly

enterteinment. And finding that by his means great benefit might accrew vnto all studious of that science, haue seriously laboured in such sort to instruct him to speake our naturall *Idiome*, that those whose palates haue not tasted the delightfull variety of his language might neither be frustrated of their vertuous desire, nor deprived of so generall a good: hauing with as much art and industry as I could inuested and decked him with such commodious and necessary applications, as may most aduantage their accept.

But being now to appeare in publique, and to plung himself into the conuersation of not onely various but contrary natures and dispositions, as a stranger destitute both of meanes either to winne fauour, or repulse iniuries, I haue made bould to present him vnto

your worshipps, as particular patrons of that science he professeth, humbly crauing that you will vouchsafe to entitle him yours, that through your countenance & patronage, hee may find a more grateful acceptance and welcome; as also be protected against the calumnies of censorious *Critiks*: And as hereby you shall immortalize your names amongst the patrons of the vertuous, & engage the studious of our nation to admire your care in the preseruation of so generall a benefit: So shall you animate me to attempt matters of a deeper straine; and most strictly oblige me.

Your worshipps,

In all duty to command.

IOHN DANSIE.

To the Reader.

I Haue presented vnto thy view the vse of a dead mans bones: which being first inuented & published in Latine by that ingenious Mathematician the ho. L. Iohn Nepere Baron of Merchiston, is now translated into our language; hoping that this home-spunne habit shall not any wayes darken the luster of their deserving merit.

Whereunto I haue also added the mensuration of Superficies, Solids concaues, regular gageing of Caske very necessary for all such merchants as deale either for wines, oyles, or any other liquids; with exquisite discriptions of instruments to gage the said Caske: And new

inuented

To the Reader.

inuented numbers accommodated to their seuerall subdiuisions from 8 parts to 20 parts in an inch. Also the embattelling of Armies, necessary to be understood of all such as vindicate that name of a Souldiour, intending hereafter to bee more ample in that discipline, or in some Nauticall contemplation. And lastly the application of all these vnto the admirable tables of Logarithmes, whereby their abundant vse in matters of consequence plainely emergeth, and that euen vnto the vnlearned, whose Arithmeticall breeding doth not exceede addition and substraction.

And herein haue I laboured with all sedulity and diligence to crowde all these subiects into this little Enchiridion, or Mathematicall

What is Rabdologie?

R*Abdologia, est ars computandi per virgulas numeratrices.* Rab*dologie* (saith the Author) is the art of counting, by numbring rodds, sticks, or as they are vulgarly called *Napeirs bones*?

Of what are these bones fabricated or made, and of what forme are they?

THe matter these bones are made of is box, ebonie, brasse, siluer, &c. The forme of them is precisely square; the length about 3. inches: and the breadth about the tenth part of the length. So that when 10. of these bones are tabulated or laid downe close one to another, their forme may resemble an exact square: and if to these

10 you adde 10 more, and tabulate those 20, then will their forme represent a paralellogram or oblong square, whose breadth shalbe double to their length: And if to these 20 you adde 10 more, and tabulate those 30, then shall their breadth be triple to their length, &c.

For what vse serue these Rodds?

THe vse of them is Arithmeticall aymeing cheifly at the most difficult parts of that art: viz. multiplication, diuision, extraction of the square & cubique Roots whose intricate operations, these little moueables doth so facillitate, that the meanest capacity may in 2 houres learne to multiply and diuide, which are the parts indeauored in this little manuell.

How are these bones figured particularly and generally?

First

FIrst in the summitie or highest part betweene the 2 first parallels, of euery particular bone there is one simple figure or Cipher; so that euery *bone* conteineth 4 sides, and consequently 4 figures in the highest Collumes or diuisions. In generall; 10 stickes hath 40 sides and 40 figures in the highest diuisions: fower of them are 0000, fower vnites, or 1111, fower 2222, fower 3333 &c. And whatsoeuer the initiall figure is in the summity or highest collume at the topp: the figure or figures in the second collume descending, is double to the first: And the figure or figures in the third collume descending is triple to the figure in the first: And the figure or figures in the fourth collume is quadruple to the figure in the first: And so increasing and descending in an Arithmeticall progression til you come to the last

number

number in the bottome; which is noncuple to the first that is as 9 to 1.

PROBLEME I.

How these bones are to bee tabulated or laid downe when you do either multiply or diuide by them.

SVppose you haue a summe giuen you to be multiplyed: As for example, let the yeare of our Lord 1627 be giuen to bee multiplyed: Because this summe consisteth of 4 figures; therefore you are to chuse 4 *bones*, that haue in the highest collume these 4 figures giuen: then tabulate or lay downe these 4 rodds or bones close together, so that if you begin at the left hand, and count to the right hand, in the vppermost collume of these 4 bones, you may reade the summe propounded, viz. 1627:

And

And thus may you tabulate any summe; which being so, it is then prepared to be multiplied.

PROB. 2.

How these rodds do appeare when they are tabulated: and how the product, or multiplex, of euery Collume is to be read.

THe rodds being tabulated as before: The surface or superficies of them towards thine Eye will resemble the forme or figure of a glasse window; For the parallell lines, and the diagonall lines intersecting one another, doth diuide the superficies into *Rhomboydes* like the panes in some glasse-windowes. Now you are to reade the mulipl:x of euery collume from your right hand to your left hand, according as the figures are

placed

placed in euery *Rhomboydes* or diamond, remembring alwaies to add both the figures together in euery *Rhomboydes* or diamond: And if they doe exceed 10, you are to write the ouerplus of 10 and carry 1, to the next *Rhomboydes* towards your left hand. Note that the first towards your right hand, and the last towards your left hand are but halfe *Rhomboydes* or diamonds: but all the rest are whole ones, as appeareth by the diagram at the latter end of the booke.

PROB. 3.

How to multiply any summe propounded, by these bones.

FIrst consider that in multiplication there bee 3 rearmes, viz. multiplicand, multiplier, and product. As if 1627 be giuen to bee multiplied by 305, here 1627 is the multiplicand,

multiplicand, and 365 is the multiplier, and the number increased by their multiplication is called their product. Let 1627 the multiplicand then be tabulated by the 1 Prob: And let 365 be written with a line vnder-drawne as in the margent: then because 5. is the first figure that you are to multiply 1627 by, therefore looke vpon the fifth Colllume, and by the 2. Prob: beginning at the right hand, proceed to the left, (obseruing the *Rhomboydes* or panes) and you shall find the product of 5 to be 8135, that is 5 times 1627, which being set downe, you are then to multi by 6: therefore looke into the sixth Collume and there shall you reade the product of 6, which is 9762, which set downe orderly as in the example. Lastly you are to

365
8135
9762
4881
593855

to mult by 3: therefore looke vpon the third Collume, and there shall you reade 4881, which set downe also: And then adde those 3 particular productes together, which will be 593855, the product demanded: And thus may you multiply any summe propounded.

PROB. 4.

How to diuide any summe propounded by these bones.

FIrst consider that in diuision also there be 3 termes, viz. *Dividend, diuisor*, and *quotiens*: As if 593855 be giuen to be diuided by 365. Here 593855 is called the *diuidend*, 365 is called the *diuisor*, and that number which sheweth you how often the diuisor is conteined in the diuidend is called the *quotiens*. Let 365 then the diuisor be tabulated by the first Prob: which

which being done, let both diuidend and diuisor be set downe on paper as in the margent: then looke vpon the bones, & see what number you can find amongst the Collumes neerest to 593 the three first figures of your diuidend: alwayes remembring that you take not a number from the Collumes greater then the part of your diuidend which you are then in hand with: As here if you reade any of the Collumes of the bones as they are now tabulated, you shall find them all too great, the first onely excepted: 1 therefore is the figure to be put in the quotient: then substract 365 from 593, and the remainder will bee 228. Then are you to review the Collumes of the bones

2
9
2285
593855(1627
365005
21935
75
2

bones to find a number neerest to the last remainder 228, and one figure more towards the right hand, which will make the summe 2288: And if you reade the sixth Collum, you shall find 2190, which is the nearest lesse sume to 2288, & because you find 2190 in the sixth Collume: 6, therefore is the next figure for your quotient: then substract 2190 from 2288 rest 98, then for the third figure for your quotient, looke amongst the Collumes what number is neerest to 985: and in the second Collume you shall find 730 which is the neerest: and because you find that number in the second Collume; 2 therefore is the next figure for your quotient, then substract 730 from 985 Rest 255. Then looke vpon these pretty knackes once againe, and see what number you can find neerest to 2555: And if you cast your

cy:

eye vpon the seuenth Collume you shall finde the very number it selfe 2555: And be cause you found it in the seuenth Collume, therefore is the fourth and last figure for your quotient: then first subscribe 2555, and then substract it from your diuidend as before, and nothing remaines.

Thus haue you one example of multiplication and another of diuision, which well vnderstood, I dare bee bold to say that you may multiply or diuide any summe propounded. For a Gentleman giuing me a summe to multiply, and seeing me doe it, desired me to proue it by diuision, & when I had satisfied him, he importuned me to lend him the instruments vntill the morning: I granted his request; in the morning hee showed me 8 summes which he had both multiplyed & divided rightly. Yea but *alius alio*

prastat

prestat ingenio; and that I cannot denie: but surely that *alio* must be *sine ingenio*, to whom this easie instruction is not sufficient.

Admonition.

NOte if thou hast but 10 rodds that thou canst tabulate but fower figures of one especee or quantity: As fower 1111, fower 2222, fower 3333, fower 4444 &c. but if thou hast 20 rods, then thou maiest tabulate 8 figures of one especee or quantity: And if thou hast 30 rodds, then thou maiest tabulate 12 &c.

Prob. 5. *Of the rule of three forwards or direct.*

NOw according vnto method (which *Plato* saith is *anima veram*) comes the rule of three direct, and inuerse. And here I might

might make a long harueſt, & infer *montes parturiunt:* But ſurely it would bee altogether vnneceſſary, ſeeing that it conſiſtethof nothing elſe but multiplication and diuiſion. *Example:* Firſt of the rule of three forwards. If 18 doe giue me 36, what ſhall 54 giue me? And becauſe the rule is that you muſt multiply the ſecond by the third, (or the third by the ſecond) and divide that product by the firſt; Therefore multiply 36 by 54 (or 54 by 36) by the third Prob: and diuide that product by 18, by the fourth Prob: and the quotient will be 108. Which ſignifieth that, if 18 yeeldeth 36, 54 will yeeld 108 according to the reaſon giuen, which was that 18 did yeald 36. And againe becauſe 36 was purchaſed with 18, therefore is 108 purchaſed with 54 by the ſame reaſon. For reaſon is the habitude of

two numbers. *Exempla.* 7 and 8 makes 15, why? By reason of addition. 7 from 15 leaues 8, why? by reason of substraction. 7 times 8 is 56, why? By reason of multiplication. 56 doth conteine 8, 7 times, why? By reason of diuision. So that 2 numbers being giuen, a third is found by reason of addit: subst: mult: or diuision. For the foundation of Arithmetick is grounded vpon reason, and therefore is proportion defined to bee the similitude of reason, which doth consist of three numbers at the least, and therefore is called the rule of three.

Prob. 6. *Of the rule of three inverse or backwards.*

For the rule of three inverse you are to multiply the first by the second, or the second by the first; and

and to diuide that product by the third, and the quotient will resolue you. *Example.* If 27 workmen doe build an house in 365 dayes, how many dayes would 12 workmen haue beene about that edifice? First multiply 365 by 27, or 27 by 365, by the third Prob: then diuide that product by 12, according to the 4th Prob, & the quotient will be 821¼ dayes. And so long time would the 12 men haue beene about the same peece of worke, that the 27 men did in 365 dayes. And thus much for *Rabdologie.*

HItherto hath beene showne how to multiply and diuide by *Rabdologie.* Now followeth how to performe multiplication & diuision, by addition and substraction onely, by helpe of the tables of *Logarithmes.* The reason thereof is this,

end