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Vol. II ¶ 1

A26 B153(148) C52130(2.1) D39

《孫子算經卷中》
今有一十八分之一十二，問約之得幾何？答曰：三分之二。術曰：置十八分在下，一十二分在上。副置二位，以少減多，等數得六為法，約之即得。

一十八分之十二：
twelve eighteenths; lit. twelve of eighteen shares; or portions

副 : secondarily

位 : places — not quite places as in place values. I think ~~孫子 has forgotten~~ that 12 & 18 are 2-digit numbers.

Master 孫's Computational Classic: Volume II

lit. Middle Volume

Now we have twelve eighteenths. We ask how much resulteth, upon reducing it?
Answer saith: two thirds.
Method saith: put the eighteen shares below, and the twelve shares above. Put secondarily the two places, and diminish the greater by the lesser. For equal quantities we obtain six as the common divisor, and reducing them, we are done.

$$\frac{12}{18} = \frac{2}{3}$$

$18 - 12 = 6$

$12 - 6 = 6$

This is the subtraction-only version of the Euclidean algorithm for gcd (greatest common divisor).

Hence $\frac{12}{18} = \frac{12 \div 6}{18 \div 6} = \frac{2}{3}$.

To paraphrase: put a second copy of each number to the side, subtract the smaller from the greater, and you'll get six for an "equal quantity", which is the (common) divisor.

In my opinion this particular description of the algorithm lacks clarity; ~~it is missing "until you get equal quantities"~~ it is missing "keep subtracting until" before the mention of "equal quantities".

A better description is found in《九章算術》, Nine Chapters on Computational Methods, in〈方田〉, which has the same problem $\frac{12}{18}$, along with $\frac{49}{91}$.

https://ctext.org/nine-chapters/fang-tian#n51071

https://ctext.org/library.pl?if=en&file=77747&page=13

Annotations here also by 李淳風 et al. Annotation punctuation is mine.

今有十八分之十二，問約之得幾何？

又有九十一分之四十九。問約之得幾何？

答曰：三分之二。

答曰：十三分之七。

約分按：約分者，物之數量，不可悉全，必以分言之；分之為數，繁則難用。設有四分之二者，繁而言之，亦可為八分之四；約而言之，則二分之一也。雖則異辭，至於為數，亦同歸爾。法實相推，動有參差，故為術者先治諸分。術曰：可半者半之，不可半者，副置分母、子之數，以少減多，更相減損，求其等也。以等數約之。等數約之，即除也，其所以相減者，皆等數之重疊，故以等數約之。

Now we have twelve eighteenths. We ask how much resulteth, upon reducing it? Answer saith: two thirds.

And we also have forty-nine ninety-firsts. We ask how much resulteth, upon reducing it? Answer saith: seven thirteenths.

The Method of Reducing Fractions (Note: Reducing fractions — when number of objects cannot be whole, we must speak of them using fractions. A fraction being a quantity, if complicated, is difficult to utilise. Suppose we have two fourths. Complicating it in speaking of it, it may also be four eighths; reducing it in speaking of it, one half. Although different in their terms; as to the quantities they are, these do return the same value. Divisors and dividends, in calculation with each other have unevenness in their motions; therefore we perform the method, first administering it unto the fractions.) saith: those which can be halved: halve them. Those which cannot be halved: put secondarily the quantities of denominator and numerator of the fraction. Diminish the greater by the lesser, and further subtract them from each other, seeking their being equal. Reduce them using the equal quantity.

(To reduce them with the equal quantity, is to divide. Those which have been mutually subtracted are all repeated pilings of the equal quantity. Therefore we use the equal quantity to reduce them.

(my understanding: different representations lead to inconsistencies. Reduce fractions first.)

減損: ~~subtract from~~ ~~i.e. diminish~~ erode

諸：之於

辭: terms (I think) (translates unexpectedly well)

約: reducing; or simplifying

全: whole; ~~or complete~~ or intact)

重疊: repeated pilings (I think this means multiples)

END §1