Variations on this theme are Alligation Partial and Alligation Total. Single and Double Position or the Rule of False is the method given in *Early Nineteenth Century Mathematics* by W. More on p. 27, No. 355 of the *Mathematical Gazette*.

The book certainly justifies the rhyme

"The Rule of Three Doth puzzle me."

since this is the definition of the Rule of Three Inverse.

Inverse proportion is, when more requires less and less requires more. More requires less, is when the third term is greater than the first and requires the fourth term to be less than the second. And less requires more is when the third term is less than the first, and requires the fourth term to be greater than the second.

It is interesting to note that in the chapter on exchange it says At Paris, Lyons, Bordeaux, etc., they keep Accounts in livres, sous, and deniers and also in francs and cents. A livre and a franc were each worth 10d., though par was 25 francs to the pound sterling.

I have two other old Arithmetic books, a seventh edition of *Comes Commercii* or the *Traders Companion* published in 1740. This is mainly a book of tables which seems to have been published first in 1722.

The other is Dr. Willcockes and Messrs. Fryer's United, new and Improved System of Arithmetical and Mental Calculations which is a fourth edition published 1834. There are 19 pages of testimonials, 11 pages of names of the people who have been Mr. Fryer's pupils and 2 poetical Eulogiums addressed to the public!! This book is not of a high standard—this is the best example.

British and French Currency

We are indebted to a gentleman, who has resided a considerable time in France, for the following short method of bringing French currency into British, and British currency into French currency or francs.

Rule to bring francs into British pounds sterling.—Cut off the last two figures and multiply the remainder by 4, the product will be the answer in pounds.

Note: 25 francs are £1. British.

Example: In 5624 francs how many pounds?

$$\begin{array}{l} 56 \mid 24 \text{ francs.} \\ \underline{4} \\ \pounds 224 \text{ and } 24 \text{ francs} = \pounds 224\ \ 19\text{s. } 2\text{d.} \end{array}$$

There is no explanation as to how the 24 francs becomes 19s. 2d.

Yours faithfully, Mary E. Townley

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To the Editor of the *Mathematical Gazette*

Dear Sir,—Miss Dromgoole's letter in the October *Gazette* shows that she has traced the cause of confusion in elementary division to the

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placing of the divisor, but I feel sure that, more precisely, it is the appearance of the divisor on the *left* that is the root of the trouble.

This I had in mind in the 10-minute talk to the London Branch which was the origin of my article, my essential theme being " a complete breakaway from the traditional way ", that is " abolish the half-bracket and the misuse of ' into ' "; for it is only the use of these that ever gets the divisor on the left.

Pupils will have learned earlier to put the sign $\times$ with a multiplier on the right, and then to rewrite the multiplier underneath when the working is to start; so it should be quite natural to put the sign $\div$ with a divisor on the right, and to rewrite with the divisor underneath in fraction form. There is certainly no call to abolish sign $\div$, which will often be used demanding the reverse process to $\times$.

With the best cooperation of all concerned it is almost impossible to convey through the medium of print what can be conveyed with chalk and blackboard. One most important detail of which this is true is the *order* in which symbols are formed and numbers written.

Pupils should be *taught* to form the sign $\div$ so that they see first $\cdot$ then $\dot{-}$ and finally $\div$, and similarly to write $245 \div 7$ so that they see first ^{245} then $\overline{}^{\!245}$ and finally $\frac{245}{7}$. Let teacher and pupils be writing at the same time, slowly enough to be sure that the right order is achieved, with a special eye on the left-handers. In this way when we say " 245 divided by 7 ", we can write, at the same time, $245 \div 7$ or $\frac{245}{7}$ and in either case we write first the number we say first. This surely will avoid the difficulty.

The criticism of the long division layout is scarcely valid, for in the traditional method the divisor and dividend get further and further apart as the work proceeds, and on the blackboard or in the exercise book the working would not be so far away as the printed page 181 suggests. It could be kept separate just by a line drawn down the page, and to begin with the divisor could be written at each stage, on the *right* of the dividend of course, and it would be omitted as soon as sufficient skill is acquired.

$593841 \div 29$	593841
$=\dfrac{593841}{29}$	58
$=20477\frac{8}{29}$	138 ÷ 29
	116
	224 ÷ 29
	203
	211 ÷ 29
	203
	8

It is important that the left-hand side appears as it would if we knew the 29-times table, and I believe this is sound preparation for later work such as the following:

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	No.	log.
$\dfrac{523\cdot7 \times 3\cdot872}{96\cdot01}$	523·7	2·7191 +
	3·872	0·5879 +
	96·01	1·9823 −
$\simeq$21 1	21 12	1·3247

To achieve reform would require some effort for the teacher to change fixed habits, and the pupils would have to be persuaded that the method in the text-book is old-fashioned and that the new way is better.

Yours, N. de Q. Dodds

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To the Editor of the *Mathematical Gazette*

Dear Sir,—Dr. Buckley (*Math. Gaz.*, XLV, p. 186) asks for other views regarding the teaching of the method of virtual work.

In my opinion, it is best to commence by defining a virtual displacement of a mechanical system as *a purely imaginary displacement of the particles of the system during which the forces (both internal and external) acting upon them remain unchanged in magnitude and direction.* The displacement is then accepted as hypothetical from the outset since, for an actual displacement, the forces of the system will not generally remain constant. The method of virtual work is then seen clearly for what it is: a device to facilitate the writing down of the equation of equilibrium $\sum \mathbf{F} \cdot \delta\mathbf{r} = 0$ (which is true for quite arbitrary $\delta\mathbf{r}$, since $\mathbf{F} = 0$ for each particle) by interpreting this equation physically as an equation of work. This form of definition permits the use of displacements inconsistent with the constraints and displacements leading to deformation of components of the system, for the purposes of calculating constraining or internal forces respectively. If the virtual displacement is taken to be always consistent with the constraints, the calculation of a reaction at a constraint has to be carried through indirectly by imagining the constraint removed and replaced by a force. One effort of the imagination at the outset eliminates the necessity for this pretence.

Thus, in the case of the particle on the rough inclined plane, I have no objection to the particle being pushed into the plane or lifted off it in a virtual displacement. The normal reaction R remains steady during either displacement, no matter how it would vary in practice and the work it does is Rd, where d is the displacement (positive for motion off the plane). I also have no objection to the particle being displaced up the plane, though the frictional force would then reverse for an actual displacement.

It must, of course, be explained to students why a displacement consistent with the constraints is often the most convenient, but if this feature is incorporated in the definition of a virtual displacement, I think there is a loss of flexibility in the application of this idea which