Can anybody suggest for long division a method of setting out which does away with this confusion? The weakness of N. de Q. Dodds' method (p. 181) is that the divisor is placed too far away from the working.

There seem to be two lines of approach:

(1) Abolish the ÷ sign and set down division by the fraction $\frac{18}{3}$ or the half-bracket 3)18. No change in setting out of long division would be needed, but I agree with Mr. Dodds that "divide by" is better than "divide into."

(2) Abolish the 3)18 method. A method would have to be devised for setting out long division so that the divisor is either on the left or underneath the dividend. Can anybody devise such a method?

Riccarton H. S., Chch. N.Z. Yours etc., UNA DROMGOOLE

To the Editor of the *Mathematical Gazette*

DEAR SIR,

Dr. Easthope says in his letter published in the Mathematical Gazette for December 1960 that one cannot always impose *real* frictionless constraints appropriate to Bertrand's Theorem. Would he accept a massless structure as *real*? Since a frictionless constraint is really the idealisation of a constraint of low friction and is accepted as *real*, a massless structure, the idealisation of a structure of small mass, should, one would think, also be accepted as *real*. If massless material is allowed it is perfectly possible to provide constraints which will allow motions as close as we please to the free motion. Thus his example, the simple rod whose instantaneous centre is outside the rod, may be provided with a massless link. One end of the link is pinned to any point of the rod, the other to any point in space. By choosing the latter point at or near the centre of rotation of the final free motion one may obtain constrained motions identical with the free motion or as close to it as one pleases.

Massless constraints of this kind do no work in a small displacement of the system. They can only acquire energy by attaining infinite velocity; and this they cannot do because of the finite velocities of the massive bodies to which they are attached. Such massless constraints are in many cases—probably in all cases for which the initial state is one of rest—equivalent to constraints not involving massless bodies. For example, the massless link just described exerts the same constraint (for two-dimensional motion) as a frictionless peg attached to the rod and sliding in a circular slot cut in the plane on which the rod is resting.

The constraints considered in Bertrand's Theorem must be compatible with the initial motion. To satisfy Dr. Easthope's criterion they must also be capable of variation so that "the constrained motion differs by as little as one pleases from the motion of the free system." Since the instantaneous motion of a rigid body is simply a screwing motion about some axis, a massless constraint compatible with this may obviously be applied to any rigid body of the system. This constraining structure may then be carried as a whole on another structure which permits rotations about and sliding along an arbitrary axis. By choosing this latter axis close to the screw axis of the final free motion of the same rigid body, we can produce constrained motions as close as we please to the free motion. Thus satisfactory *real* constraints can be provided. The kinetic energy of the free motion is therefore equal to the maximum of the energies of possible constrained motions; and is a stationary value of these energies. Incidentally, because of an error of sign, the formula in Dr. Easthope's letter shows the free energy to be a minimum.

Yours etc., A. J. HARRIS

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REVIEWS

A Companion to School Mathematics. By F C. BOON. Pp. 302. 30s. 1960. (Longmans, Green and Co. Ltd.)

In 1903 F C. Boon received the princely salary of £80 for his year's work as tutor at Trinity College, Carmarthen. The College records give no other appreciation of the work done by Mr. Boon but if this book is any indication of the life and vitality of the teaching of the man who later became the Principal Mathematical Master at Dulwich College then the Students of his period were very fortunate.

This book was first published in 1924 and was a treasured possession of the older generation of teachers. Now it has been re-printed with a Foreword by Mr. A. P. Rollett and a new Bibliography.

Students of Mathematics have text books to keep them on the narrow examination route. They need something else as well. The exploration of byways which make all the difference between arid, pure knowledge and the more rounded, happy experience of the student who can see the power and ramifications of ideas, their origin and the very human beings who originated them. We have all tried, or wanted to try, to do this but often, more particularly in the early days of teaching, failed to get the time, the sources and dare I say it, sometimes the inspiration.

Without going into details (See the review by Mr. C. O. Tuckey, The Mathematical Gazette, Vol XII No. 175, March 1925) here is just the book. It should be in the possession of every teacher of Mathematics and available in every library, and this includes Public Libraries. Certainly every Senior boy in School and Training College Student should be offered the opportunity of dipping into it.

It has a short but excellent bibliography of books of a kindred spirit which should also be in every library.

It is well printed and bound and likely to withstand the eager wear and tear that should be its lot.

D. D. REES

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