474. [V. 1. a. δ.] In the same paper (*v.* Note 473) another question asks for the value of $(23{\cdot}7 \times 0{\cdot}315)^2$ to three significant figures.

May I enquire how a boy is to determine the degree of accuracy in such a question, unless he assumes that the given numbers are correct to three significant figures, in which case the answer cannot be relied upon as being correct to three figures? PSEUDO-ACCURACY.

475. [V. 1. a. δ.] *The Use of Brackets in Arithmetic.*

The Committee on the Teaching of Arithmetic in Public Schools say in their last report (*Gazette*, viii. 238):

> "The only convention that should be required is that which governs the interpretation of such expressions as $10\frac{1}{2} - 2\frac{1}{4} \times 1\frac{1}{3} + 3\frac{5}{6}$. This same convention is used in Algebra; *e.g.* in $a - bc + d$."

The second sentence is obviously incorrect: the corresponding expression in algebra would not be $a - bc + d$, but

$$a - b \times c + d.$$

The argument of the Committee would have been more logical if they had said:

> "In algebra we are able to dispense with brackets in some cases by dispensing with the sign of multiplication; thus, instead of $a - (b \times c) + d$ we can write $a - bc + d$. We cannot do this in arithmetic—we cannot, for instance, replace $7 - (2 \times 3) + 1$ by $7 - 23 + 1$—and therefore we must use brackets in all cases of ambiguity."

What I have never been able to understand is why there should be all this fuss about introducing a couple of brackets. They are not troublesome to write or print, and they avoid the necessity of learning by rote the arbitrary and (to the young student) apparently meaningless rule that "multiplications and divisions are to be performed before additions and subtractions." I write with some feeling; for, as a boy, I never could remember the rule, and I always had to look it up before going in for an arithmetic examination.

Mr. C. S. Jackson and Mr. A. Lodge have tried (*ibid.* 246-8) to defend the rule. They both seem to think that any objection that applies to $a - b \times c + d$ applies also to $a - bc + d$. Mr. Jackson seems to suggest (middle of p. 247) that the young student either must learn that $17 - 3 \times 4$ means $17 - (3 \times 4)$ or must be led to suppose that it is capable of two interpretations: he omits the third possibility, that it should never be used at all. Mr. Lodge says that the interpretation of $a \times b + c \times d + e \times f$ as meaning $(a \times b) + (c \times d) + (e \times f)$ rather than $a \times (b + c) \times (d + e) \times f$ is "absolutely fundamental." In what way "fundamental"? It is true, probably, that most of our calculations result in the addition or subtraction of terms that are obtained by multiplication or division, rather than the other way round; but this is a matter of experience, which the young pupil has not had. I cannot see in what way the fact (if it is a fact) can be regarded as forming part of the foundation of algebraical reasoning.

If some particular boy finds a difficulty in understanding that $ab - c$ does not mean $a(b - c)$, why not let him write it $(ab) - c$?

It is not, as Mr. Lodge seems to think, a question of "carelessness." It is, so far as the pupil is concerned, a question of overloading the memory by burdening it with a useless rule. If a boy's memory must be exercised, why not teach him something more useful, such as "She went into the garden to cut a cabbage to make an apple-pie"? And, so far as the teacher is concerned, it is a question of discriminating between the unessential and the essential. W. F. SHEPPARD.