COMPUTATION SIMPLIFIED

By T.P. Atkinson

Editors' Note: E.A. Smith is the principal of Alcomdale School, a three-room school 35 miles northwest of Edmonton. Mr. Smith teaches the pupils of Grades VI, VII, and VIII and also handles the mathematics program in Grades III, IV, and V.

On April 6, I was privileged to visit Alcomdale School to observe a group of children in Grades III, IV, V and VI doing computation in a manner somewhat different from that currently in style in Alberta schools. Although I witnessed examples involving the four fundamental operations and concepts of fractions and rates as well, I shall report on only addition and subtraction of whole numbers. Even this restricted topic would require pages for an adequate report. Consequently, I must be selective in the ideas I present, and I assume full responsibility for my choice.

To introduce these ideas, I quote from an extensive development that Mr. Smith has prepared:

> I have two purposes in mind while preparing this material. First, I attempt to bring order and simplicity to the present computational chaos by the systematic extension of the basic mathematical laws; second, I try to make it possible for the average child to do simple everyday computation in his head.

In achieving his objectives, Mr. Smith makes extensive use of basic facts of addition and of the commutative and associative properties. To determine the sum of 8 and 6, a Grade III girl reasoned:

$$\begin{aligned} 8 + 6 &= 8 + (2 + 4) \\ &= (8 + 2) + 4 \\ &= 10 + 4 \\ &= 14 \end{aligned}$$

She did not explain it or write it down in just the same manner.

Similarly, others thought out examples such as

$$\begin{aligned} 17 + 5 &= 17 + (3 + 2) \\ &= (17 + 3) + 2 \\ &= 20 + 2 \\ &= 22 \end{aligned}$$

and

$$\begin{aligned} 18 + 19 &= 18 + (10 + 9) \\ &= (18 + 10) + 9 \\ &= 28 + 9 \\ &= 28 + (2 + 7) \\ &= 30 + 7 \\ &= 37 \end{aligned}$$

Understandings and skills of the kind just illustrated make addition of several two-digit numbers relatively easy for the Grade III pupils. Here is an example that was demonstrated for me. Mr. Smith wrote the column of numerals on the chalkboard.

24 48 62 75	Reading from the bottom up, a Grade III boy announced the sums 75, 135, 137, 177, 185, 205, 209 in less time than it takes me to write them. Another checked his final sum by reading from the top down 24, 64, 72, 132, 134, 204, 209.

I leave to the reader the analysis of the mathematical principles being used. The procedure is extended to numbers expressed with three or more digits in Grades IV, V and VI.

248 679 584 263	Read from the bottom up: 263, 763, 843, 847, 1447, 1517, 1526, 1726, 1766, 1774. Read from the top down: 248, 848, 918, 927, 1427, 1507, 1511, 1711, 1771, 1774.

To perform subtraction in the manner in which Mr. Smith teaches it, one must think of a regrouping different from that which is the basis of the conventional algorithm. For example, 26 - 12 involves 20 - 10 = 10; 10 - 2 = 8 and 8 + 6 = 14. The procedure seems to work; a Grade VI pupil had no difficulty in going through the process 6174 - 3825 by the steps 3000, 2200, 2180, 2175, 2275, 2345, 2349.

Mr. Smith comments in his paper that "carrying" and "borrowing" do not occur in the algorithms and that what he uses is the "left-handed" or algebraic approach to arithmetic. I was interested to note that at least some of the pupils were aware of the conventional algorithms for addition and subtraction. One Grade VI boy to whom I talked said, "I like Mr. Smith's way better except when I make a mistake and then it is harder to find."

As stated earlier, there is much more to the total approach than just addition and subtraction of whole numbers. Mr. Smith makes effective use of the distributive property of multiplication over addition, of the identity element expressed in a suitable form in handling fractions and ratios and of miscellaneous relationships such as that expressed by $5 \times n = 10 \times \frac{1}{2}n$.

Irrespective of whether or not I agree with Mr. Smith's objectives or his techniques, I am prepared to say that what I was able to sample in my one-hour visit leads me to agree with Mr. Smith when he states, in reference to his objectives: "However, there seem to be several interesting side effects. Perhaps the most important of these is a tendency on the part of the child to like instead of dislike arithmetic."

A REPORT FROM *TIME*

The March 17, 1967, issue of *Time* Magazine contained the following interesting item in its education column:

> Johnny doesn't add very well. According to results of a major survey of math instruction in twelve nations released last week, the US is startlingly remiss in teaching its children how to add, subtract or solve calculus problems. Despite US prestige as the world's leading technological power, American 13-year-olds ranked a low eleventh in their understanding of math - outscoring only children from Sweden, and lagging well behind those from Japan. (Canada was not included in the study.)

This result occured in spite of the modern mathematics programs, or it is <u>because of</u> the modern mathematics programs. It appears that Mr. Smith's ideas are most timely.