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Quick Computations

BY W. R. GALT DUANE

ACCOUNTANTS and others are often confronted with the necessity of making computations involving multiplication or division of large numbers. For example, a cost-per-unit figure may have to be carried out to six decimal places in order to assure accuracy when the figure is to be applied to a large number of units, as in the wholesale milk business. Unless one has access to a calculating machine, numerous multiplications and divisions of numbers composed of five or more digits may prove arduous and may make the time consumed unreasonably long. It is also probable that resulting mental fatigue will give rise to errors and therefore necessitate careful checking.

If the same number is to be used in a series of computations the following system will save a great deal of time:

I. MULTIPLICATION

Suppose the number 230527 is to be multiplied by 1.8612, by .31048, and by .0631. First make a table of nine lines numbered 1 to 9. On the first line write the number to be multiplied, and on the second line twice this number, thus:

1. 230527
2. 461054

Add these together to form the third line, thus:

1. 230527
2. 461054
3. 691581

Form the fourth line by doubling line 2. The table will now look like this:

1. 230527
2. 461054
3. 691581
4. 922108

Line 5 is made by adding lines 2 and 3 together. At this point it is well to

check line 5 by adding lines 1 and 4, thus providing a proof of all computations to this point.

Line 6 is computed by doubling line 3, line 7 by adding lines 3 and 4, and so on until the table is completed as follows:

1. 230527
2. 461054
3. 691581
4. 922108
5. 1152635
6. 1383162
7. 1613689
8. 1844216
9. 2074743

To perform the actual multiplication, write the first multiplier (which is 1.8612 in the example given) vertically thus:

1
8
6
1
2

To the right of the first digit "1" place the number found on line 1 in the table thus:

1 230527
8
6
1
2

The next digit "8" is represented in the table by 1844216. This number is written in below the first in such a way that its last digit to the right is one space to the right of the first number as follows:

1 230527
8 1844216
6
1
2

Similarly the other digits of the multiplier are filled in, in each case one

space to the right. When all are filled in they will appear as follows:

1	230527
8	1844216
6	1383162
1	230527
2	461054

These are then footed and the decimal inserted in proper place, in this case four places from the right, giving 429056.8524 the desired figure. The completed computation appears as follows:

1	230527
8	1844216
6	1383162
1	230527
2	461054
<hr/>	
	429056.8524

The second multiplier in the example given (.31048) will produce the following:

3	691581
1	230527
0	0
4	922108
8	1844216
<hr/>	
	71574.02296

The third multiplier will result in:

0	
6	1383162
3	691581
1	230527
<hr/>	
	14546.2537

It will be noted that in the above example line 9 was unnecessary, since this digit did not appear in any of the multipliers. It is generally quicker, however, to make the complete table than to take time to see if any such digits may be eliminated.

II. DIVISION

Suppose a number is to be divided into a series of numbers. This is necessary, for example, in figuring the percentage to the sales of various items

on a profit-and-loss statement. For convenience in illustration let us assume that the number to be divided is the one used in the example given above to demonstrate the multiplication method, namely 230527, and that this number is to be divided into the following: 429056.8524; 71574.02296; and 14546.2537.

First make a table as before with 9 lines as follows:

1.	230527
2.	461054
3.	691581
4.	922108
5.	1152635
6.	1383162
7.	1613689
8.	1844216
9.	2074743

Next write down the first dividend thus:

429056.8524

Now look in the table for a number whose first digit or digits will be less than the first digit or digits of this number. Quick inspection shows 1 to be the desired number. Accordingly, the number on line 1 is filled in under the dividend and the figure "1" which will be part of the quotient, is placed above its last digit thus:

	1
	429056.8524
	230527

Now subtract as follows:

	1
	429056.8524
	230527
<hr/>	
	198529

Next consult the table for a number whose first digit or digits will be less than the first digit or digits of this remainder. Inspection immediately shows 8 to be the desired number without the necessity of bringing down digits from above and experimenting with 7, 8, or 9 as is often necessary in the usual method of long division. The figure "8" is now written in as in the case of

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the first digit, and the subtraction made so that the computation now appears as follows:

$$\begin{array}{r}
 1.8 \\
 429056.8524 \\
 \underline{230527} \\
 198529 \\
 \underline{1844216} \\
 141082
 \end{array}$$

It will be noted that if the figures are neatly arranged it is not necessary to bring down the digit "8" of the dividend in order to subtract the last digit "6" from it as is normally done in long division.

Operations are continued in the same manner until the computation is completed and the quotient (1.8612) obtained thus:

$$\begin{array}{r}
 1.8612 \\
 429056.8524 \\
 \underline{230527} \\
 198529 \\
 \underline{1844216} \\
 141082 \\
 \underline{1383162} \\
 27663 \\
 \underline{230527} \\
 46105 \\
 \underline{461054}
 \end{array}$$

The division of the second number in the example given, namely 71574.02296, is similarly worked out. After the first two digits of the quotient have been found the computation appears as follows:

$$\begin{array}{r}
 .31 \\
 71574.02296 \\
 \underline{691581} \\
 24159 \\
 \underline{230527} \\
 11065
 \end{array}$$

Inspection now shows that 4 is the number whose first digits are less than those of the remainder, and that it must be placed as follows:

$$\begin{array}{r}
 .31 \\
 71574.02296 \\
 \underline{691581} \\
 24159 \\
 \underline{230527} \\
 11065 \\
 922108
 \end{array}$$

Since this number extends two spaces beyond the preceding remainder, its line number "4" will fall above the digit "9" in the dividend, and the space thus skipped must be filled in with a zero. The computation at this point, therefore, appears as follows:

$$\begin{array}{r}
 .3104 \\
 71574.02296 \\
 \underline{691581} \\
 24159 \\
 \underline{230527} \\
 11065 \\
 922108
 \end{array}$$

When completed the computation will produce the quotient .31048, thus:

$$\begin{array}{r}
 .31048 \\
 71574.02296 \\
 \underline{691581} \\
 24159 \\
 \underline{230527} \\
 11065 \\
 922108 \\
 \underline{184421} \\
 1844216
 \end{array}$$

The third dividend in the example given will similarly result in the quotient .0631.

It takes much longer to describe this method of streamlined multiplication and division than it does to make the

actual computations. With a little practice computations like the above, both the preliminary building up of the table and the application of the numbers thus obtained, can be done almost as fast as one can write down the figures. Obviously, it would not be practical to go

through the above routine of making a table for a single multiplication or division, but where the same number is to be used in a series of computations, there will be a great saving of time and less chance of error when the above method is employed.