HENDERSON & HAMLIN'S LIGHTNING CALCULATOR

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649306534

Henderson & Hamlin's Lightning Calculator by J. A. Henderson

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

J. A. HENDERSON

HENDERSON & HAMLIN'S LIGHTNING CALCULATOR

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SAN FRANCISCO:
A. L. BANCROFT & CO., PRINTERS AND LITHOGRAPHERS,
721 Market Street, San Francisco.
1872.

PREFACE.

It is better to know everything about something, than something about everything.

Early ideas are not usually true ideas, but need to be revised and re-revised. Right means straight, and wrong means crooked. And knowing that thought kindles at the fire of thought, we do not hesitate or offer any apology for presenting to the Public some new seed-thoughts, and right methods of operation in business calculations. The practical utility of this book is found in the brevity and conciseness of its rules. Particular attention is invited to the grand improvements in the subjects of computing time, all possible cases in Interest, Squaring and Multiplying Numbers, Dividing and Multiplying Fractions, and an infinite number of methods of Extracting Square and Cube Root.

ADDITION.

To be able to add two, three, or four columns of figures at once is deemed by many to be a Herculean task, and only to be accomplished by the gifted few; or, in other words, by mathematical prodigies. If we can succeed in dispelling this illusion, it will more than repay us; and we feel very confident that we can, if the student will lay aside all prejudice, bearing steadily in mind that to become proficient in any new branch or principle, a little wholesome application is necessary. On the contrary, we cannot teach a student who takes no interest in the matter, one who will always be a drone in society. Such men have no need of this principle.

If two, three, or more columns can be carried up at a time, there must be some law or rule by which it is done. We have two principles of Addition; one for adding short columns, and one for adding very long columns. They are much alike, differing only in detail. When one is thoroughly learned, it is very easy to learn the second. By a little attention to the following example, much time in future will be saved.

ADDITION OF SHORT COLUMNS OF FIGURES.

Addition is the basis of all numerical operations, and is used in all departments of business. To aid the business man in acquiring facility and accuracy in adding short columns of figures, the following method is presented as the best:—

274
346
134
342
727
329
2352.

Process.—Commence at the right hand column, add thus: 16, 22, 32; then carry the 3 tens to the second column; then add thus: 7, 14, 25; carry the 2 hundreds to the third column, and add the same way: 12, 16, 21.

In this way you name the sum of two figures at once, which is quite as easy as it is to add one figure at a time. Never permit yourself, *for once*, to add up a column in this manner: 9 and 7 are 16, and 2 are 18 and 4 are 22, and 6 are 28, and 4 are 32. It is just as easy to name the result of two figures at once, and four times as rapid.

The following method is recommended for the

ADDITION OF LONG COLUMNS OF FIGURES.

In the addition of long columns of figures, which frequently occur in books of accounts, in order to add them with certainty, and, at the same time, with ease and expedition, study well the following method, which practice will render familiar, easy, rapid, and certain.

THE EASY WAY TO ADD.

EXAMPLE 2—EXPLANATION.

Commence at 9 to add, and add as near 20 as possible, thus: 9+2+4+3=18, place the 8 to the right of the 3, as in example; commence at 6 to add 6+4+8=18; place the 8 to the right of the 8, as in example; commence at 6 to add 6+4+7=17; place the 7 to the right of the 7, as in example; commence at 4 to add 4+9+3=16; place the 6 to the right of the 3, as in example; commence at 6 to add 6+4+7=17; place	7 4 6 3 9 4 6 8

the 7 to the right of the 7 as in example; now, having arrived at the top of the column, we add 3[8] and figures in the new column, thus: 7+6+7+8+8=36; place the right-hand figure of 36, which is a 6, under the original column, as in example, and add the left-hand figure, which is a 3, to the number of figures in the new column; there are 5 figures in the new column, therefore 3+5=8; prefix the 8 with the 6, under the original column, as in example; this makes 86, which is the sum of the column.

Remark 1.—If, upon arriving at the top of the column, there should be one, two or three figures whose sum will not equal 10, add them on to the sum of the figures of the new column, never placing an extra figure in the new column, unless it be an excess of units over ten.

Remark 2. — By this system of addition you can stop at any place in the column, where the sum of the figures will equal 10 or the excess of 10; but the addition will be more rapid by your adding as near 20 as possible, because you will save the forming of extra figures in your new column.

EXAMPLE—EXPLANATION.

2+6+7=15, drop 10, place the 5 to the right of the 7; 6+5+4=15, drop 10, place the 5 to the right of the 4, as in example; 8+3+7=18, drop 10, place the 8 to the right of the 7, as in example; now we have an extra figure, which is 4; add this 4 to the top figure of the new column, and this sum on the balance of the figures in the new column, thus: 4+8+5+5=22; place the right-hand figure of 22 under the original column, as in example, and add the left-hand figure of 22 to the number of figures in the new column, which are three, thus: 2+3=5; prefix this 5 to the figure 2, under the original column; this makes 52, which is the sum of the column.

4	
6	
3[8]	
4	
2	
9	
—	
86	
4	
6	
7[2]	
6	
2	
—	
52	

RULE.—*For adding two or more columns, commence at the right-hand, or units' column; proceed in the same manner as in adding one column; after the sum of the first column is obtained, add all except the right-hand figure of this sum to the second column, adding the second column the same way you added the first; proceed in like manner with all the columns, always adding to each successive column the sum of the column in the next lower order, minus the right-hand figure.*

N. B. The small figures which we place to the right of the column when adding are called *intergers*

The addition by intergers, or by forming a new column, as explained in the preceding examples, should be used only in adding very long columns of figures, say a long ledger column, where the footings of each column would be two or three hundred, in which case it is superior and much more easy than any other mode of addition; but in adding short columns it would be useless to form an extra column, where there is only, say six or eight figures to be added. In making short additions, the following suggestions will, we trust, be of use to the accountant who seeks for information on this subject.

In the addition of several columns of figures, where there are only four or five deep, or when their respective sums will range from twenty-five to forty, the accountant should commence with the unit column, adding the sum of the first two figures to the sum of the next two, and so on, naming only the results, that is, the sum of every two figures.

In the present example, in adding the unit column instead of saying 8 and 4 are 12 and 5 are 17 and 6 are 23, it is better to let the eye glide up the column, reading only, 8, 12, 17, 23; and still better, instead of making a separate addition for each figure, group the figures thus: 12 and 11 are 23, and proceed in like manner with each column. For short columns this is a very expeditious way, and indeed to be preferred, but for long columns, the addition by integers is the most useful, as the mind is relieved at intervals, and the mental labor of retaining the whole amount, as you add, is avoided, which is very important to any person whose mind is constantly employed in various commercial calculations

In adding a long column, where the figures are of a medium size, that is, as many 8s and 9s as there are 2s and 3s, it is better to add about three figures at a time, because the eye will distinctly see that many at once, and the ingenious student will in a short time, if he adds by integers, be able to read the amount of three figures at a glance, or as quick, we might say, as he would read a single figure.

	346
	235
	724
	598
Here we begin to add at the bottom of the unit column and add successively three figures at a time, and place their respective sums, minus 10, to the right of the last figure added; if the three figures do not make 10, add on more figures; if the three figures make 20 or more, only add two of the figures. The little figures that are placed to the right and left of the column are called integers. The integers in the present example, belonging to the units' column, are 4, 4, 5, 4, 6, which we add together making 23; place down 3 and add 2 to the number of integers, which gives 7, which we add to the tens and proceed as before.	803

Reason.—In the above example, every time we placed down an integer we discarded a ten, and when we set down the 3 in the answer we discarded two tens; hence, we add 2 on to the number of integers to ascertain how many tens were discarded; there being 5 integers, it made 7 tens, which we now add to the column of tens; on the same principle we might add between 20 and 30, always setting down a figure before we got to 30; then every integer set down would count for 2 tens, being discarded in the same way, it does in the present instance for one ten. When we add between 10 and 20, and in very long columns, it would be much better to go as near 30 as possible, and count 2 tens for every integer set down, in which case we would set down about one-half as

many integers as when we write an integer for every ten we discard.

When adding long columns in a ledger or day-book, and where the accountant wishes to avoid the writing of extra figures in the book, he can place a strip of paper alongside of the column he wishes to add, and write the integers on the paper, and in this way the column can be added as conveniently almost as if the integers were written in the book.

Perhaps, too, this would be as proper a time as any other to urge the importance of another good habit; I mean *that of making plain figures.* Some persons accustom themselves to making mere scrawls, and important blunders are often the result. If letters be badly made, you may judge from such as are known; but if one figure be illegible, its value cannot be inferred from the others. The vexation of the man who wrote for 2 or 3 monkeys, and had 203 sent him, was of far less importance than errors and disappointments sometimes resulting from this inexcusable practice.

We will now proceed to give some methods of proof. Many persons are fond of proving the correctness of work, and pupils are often instructed to do so, for the double purpose of giving them exercise in calculation and saving their teacher the trouble of reviewing their work.

There are special modes of proof of elementary operations, as by casting out threes or nines, or by changing the order of the operation, as in adding upward and then downward. In addition, some prefer reviewing the work by performing the Addition downward, rather than repeating the ordinary operation. This is better, for if a mistake be inadvertently made in any calculation, and the same routine be again followed, we are very liable to fall again into the same error. If, for instance, in running up a column of Addition you should say 84 and 8 are 93, you would be liable, in going over the same again, in the same way to slide insensibly into a similar error; but by beginning at a different point this is avoided.

This fact is one of the strongest objections to the plan of cutting off the upper line and adding it to the sum of the rest, and hence some cut off the lower line by which the spell is broken. The most thoughtless cannot fail to see that adding a line *to* the sum of the rest is the same as adding it in *with* the rest.

The mode of proof by casting out the nines and threes will be fully explained in a following chapter.

A very excellent mode of avoiding error in adding long columns is to set down the result of each column on some waste spot, observing to place the numbers successively a place further to the left each time, as in putting down the product figures in multiplication; and afterward add up the amount. In this way if the operator lose his count, he is not compelled to go back to units, but only to the foot of the column on which he is operating. It is also true that the brisk accountant, who thinks on what he is doing, is less liable to err than the dilatory one, who allows his mind to wander. Practice, too, will enable a person to

read accounts without naming each figure: thus, instead of saying 8 and 6 are 14, and 7 are 21 and 5 are 26, it is better to let the eye glide up the column, reading only 8, 14, 21, 26, etc.; and, still further, it is quite practicable to accustom one's self to group the figures in adding, and thus proceed very rapidly. Thus in adding the units' column, instead of adding a figure at a time, we see at a glance that 4 and 2 are 6, and that 5 and 3 are 8; then 6 and 8 are 14; we may then, if expert, add constantly the sum of two or three figures at a time, and with practice this will be found highly advantageous in long columns of figures; or two or three columns may be added at a time, as the practised eye will see that 24 and 62 are 86 almost as readily as that 4 and 2 are 6.

87
23
45
62
24
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MULTIPLICATION.

Multiplication, in its most general sense, is a series of additions of the same number; therefore, in multiplication, a number is repeated a certain number of times, and the result thus obtained is called the product. When the multiplicand and the multiplier are each composed of only two figures, to ascertain the product, we have the following

RULE. — *Set down the smaller factor under the larger, units under units, tens under tens. Begin with the unit figure of the multiplier, multiply by it, first the units of the multiplicand, setting the units of the product, and reserving the tens to be added to the next product; now multiply the tens of the multiplicand by the unit figure of the multiplier, and the units of the multiplicand by tens figure of the multiplier; add these two products together, setting down the units of their sum, and reserving the tens to be added to the next product; now multiply the tens of the multiplicand by the tens' figure of the multiplier, and set down the whole amount. This will be the complete product.*

Remark.—Always add in the tens that are reserved as soon as you form the first product.

EXAMPLE 1.—EXPLANATION.

1. Multiply the units of the multiplicand by the unit figure of the multiplier, thus: 1 × 4 is 4; set the 4 down as in example. 2. Multiply the tens in the multiplicand by the unit figure in the multiplier, and the units in the multiplicand by the tens figure in the multiplier, thus: 1×2 is 2; 3×4 are 12, add these two products together, 2 plus 12 are 14, set the 4 down as in example, and reserve the 1 to be added to the next product. 3. Multiply the tens in the multiplicand by the tens' figures in the multiplier, and add in the tens that were reserved, thus; 3×2 are 6, and 6 plus 1 equal 7; now set down the whole amount, which is 7.

24
31
—
744

EXAMPLE 1.—EXPLANATION.

Multiply first upper by units, 5×3 are 15, set down the 5, reserve the 1 to carry to the next product; now multiply second upper by units and first upper by tens, 5×2 are 10, plus 1 are 11, 4×3 are 12, add these products together; 11 plus 12 are 23, set down the 3, reserve the 2 to carry; now multiply third upper by units, and second upper by tens, add these two products together, always adding on the re-

123
45
—
5535