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Correspondence: Income-Tax Algebra

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INCOME-TAX ALGEBRA

Editor, THE JOURNAL OF ACCOUNTANCY:

SIR: In the October issue of THE JOURNAL, F. W. Thornton criticised my article on "income-tax algebra" which appeared in the June issue. His criticism is in general fallacious, but in one instance it is valid. In my article I made the unqualified statement that "algebra is necessary" where state and federal income taxes must be computed simultaneously. His criticism of this statement is valid because, as a matter of fact, problems of this type may be solved by (1) algebra, (2) pure arithmetical approximation, or (3) arithmetical approximation based on geometrical progression.

Mr. Thornton used the third method, which is based on the following familiar formula:

$$x=y[(m)+(m^2\cdot n)+(m^3\cdot n^2)+\ .\ .\ .\ \text{etc. to infinity}]$$

or

$$\text{Federal tax} = \$296{,}000.00[(13\tfrac{3}{4}\%)+(13\tfrac{3}{4}\%^2\times 2\%)+(13\tfrac{3}{4}\%^3\times 2\%^2)\ .\ .\ .]$$
$$= \quad 40{,}812.24$$

The fallacy in his criticism that algebra is slow as compared to his "arithmetical solution" is immediately obvious to anyone who can distinguish between the development of a formula and the application of that formula to specific problems after it has once been developed. Mr. Thornton cited page 446 and so it appears that he is laboring under the mistaken idea that I must make all the algebraic computations shown there every time I solve a problem similar to example I. He should have read page 448 where I developed a general formula which provides an "arithmetical solution" similar to his. After all, where did he get the idea embodied in his "arithmetical solution"? It is a formula, of course, and if Mr. Thornton did not develop it, then someone else did. Now after a general formula has been developed anyone may use it without recourse to the reasoning originally involved in its development. One merely applies the general formula, or as Mr. Thornton describes it, one merely makes an "arithmetical solution." Here, then, is the "arithmetical solution" based on my general formula:

2% of $200,000.00	= $ 4,000.00	
Less 2% of 13¾% (or .00275) of $300,000.00	= 825.00	
Difference	= $ 3,175.00	
Divided difference by 100% − (2% of 13¾%) or 99.725%	= $ 3,183.75	= state tax
13¾% of ($300,000.00 less $3,183.75)	= $40,812.23	= federal tax

"And that is all."

Compare this to his solution and it will be obvious that one is just as good as the other. As a matter of fact, neither of our solutions could be termed purely arithmetical as both are based on a formula, and of course if any new factor is introduced, as in example II, page 448, then his formula as well as mine must be changed slightly to effect a solution. The pure arithmetical solution of example I is as follows:

State tax		*Federal tax*	
Base $200,000.00		Base $300,000.00	
(2) 2% of base	= $4,000.00	(1) 13¾% of base	= $41,250.00
(4) Less 2% of $40,700.00	= 814.00	(3) Less 13¾% of $4,000.00	= 550.00
	$3,186.00		$40,700.00
(6) Less 2% of $111.93	= 2.24	(5) Plus 13¾% of $814.00	= 111.93
	$3,183.76	(7) Plus 13¾% of $2.24	= .30
(8) Less 2% of $0.30	= .01		
State tax	= $3,183.75	Federal tax	= $40,812.23

(Numbers in parenthesis show order of steps taken.)

In some cases pure arithmetical approximation, as shown above, is satisfactory and even desirable, but in other cases it is better to develop a general formula algebraically. The general formula then will indicate an "arithmetical solution" which anyone may apply.

In his criticism Mr. Thornton states that, "It (algebra) is not desirable because our work should be understood by clients." If our work must be understood by the client, then the extent of our professional service will be limited by the client's intelligence. Does a doctor refuse to operate because his patient can not understand the surgical technique involved? I agree with Mr. Thornton only to this extent: When there are two ways of doing a thing and when these two ways are equally efficient from the professional viewpoint, then the method selected should be that one more easily understood by the client. Perhaps this is what he meant to say. Even so, can it be assumed without question that Mr. Thornton could explain his rather involved technique with greater success than I could explain my high-school algebra? If the client can really understand why a resultant should be worn down by repeatedly multiplying by 13¾% of 2%, then I should think that the client could understand high-school algebra.

The graduated tax problem introduced by Mr. Thornton is easy. Here is my "arithmetical solution," which is merely the application of a general algebraic formula:

$100,000.00 at 12½%	= $12,500.00	
100,000.00 at 14%	= 14,000.00	
96,000.00 at 15%	= 14,400.00	
	$40,900.00	
40,900.00 divided by (100% less 2% of 15%)	= $41,023.07	= federal tax

"And that is all."

It was not the purpose of my article to be instructive, but merely to advocate a simplification of the income-tax laws relative to computations required of the taxpayer. Of course, if our policy is "The more complicated the laws, the better for us," then I withdraw my remarks.

Here is the type of problem that will face the Iowa corporation in 1936 under present laws to be in effect at that time:

State

Assume taxable income of $200,000 before deducting (1) federal income tax, (2) federal excess-profits tax, and (3) contributions of $15,000 (limited to 15% of net income before deducting such contributions).

State rate of 2% flat.

Federal

Assume adjusted declared value of $1,000,000. Assume taxable income of $300,000 before deducting (1) state income tax and (2) contributions of $15,000. (NOTE.—The 1935 act provides that in determining the net income subject to excess-profits tax, the income tax for the taxable year may be deducted.)

Required.—Under the present Iowa law and the revenue act of 1935, compute federal and state income taxes.

May I suggest that the reader work this problem and then decide whether or not some simplification is advisable.

Finally, a word in defense of algebra. To me, algebra is a language which facilitates the expression of certain involved relationships. It is no more a "prop" to our reasoning power than is arithmetic or any set of prescribed symbols or rules of expression. One might just as well say that the English language is a "prop" to our reasoning power—it facilitates thinking and the conveyance of thought. An eminent mathematician's reaction to Mr. Thornton's definition of algebra reminded me of the accountant's usual reaction to the comment that "the adjustment for depreciation is a mere bookkeeping entry."

Yours truly,

HARRY H. WADE.

Iowa City, Iowa, November 5, 1935.