Triple serial operators theory.

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0- Abstract:

In this paper you will see the theoretical structure of triple serial operators. I will build on this work in two of my previous papers to do an easy and clean explanation of what happens when you combine three linked variables in five independent operations.

1- Introduction:

You could see in my previous papers the relations of serial 1-variable operators and a constant in [1] Resume of the serial operators theory, and in 2-variable operators in [2] Double serial operators theory.
In the first paper I introduce the idea of an internal operation inside an external operation of a serial operators. We went from the summation of a sum of one variable and a constant, in symbols:

$$(1) \quad \sum_{n=a}^{b} n+k=+(a+k)+((a+1)+k)+((a+2)+k)+...+((b-2)+k)+((b-1)+k)+(b+k)$$

to the rootory of a root of one variable and a constant:

$$(2) \quad \mathop{\mathrm{Z}}_{n=a}^{b} \sqrt[k]{n}=\sqrt[\sqrt[k]{b}]{ANS}^{\sqrt[k]{b-1}}\sqrt{ANS}^{\sqrt[k]{b-2}}\sqrt{ANS}^{\sqrt[k]{...}}\sqrt{ANS}^{\sqrt[k]{a+2}}\sqrt{ANS}^{\sqrt[k]{a+1}}\sqrt{\sqrt[k]{a}}$$

In the second paper I went further and I explained from the consecutive summations of 2-variables operators being related in addition, in symbols:

$$(3) \quad \sum_{m=j} \sum_{n=i} i+j$$

to the consecutive rootories of 2-variables operators being related in a root:

$$(4) \quad \mathop{\mathrm{Z}}_{m=j} \mathop{\mathrm{Z}}_{n=i} \sqrt[j]{i}$$

In the first paper I presented 36 unique theoretical cases and in the second paper 216 unique theoretical cases. I obtained this numbers just multiplying.

2- Theory in triple serial operations:

In the triple operators we assume that we are working with 3-variables serial operators. First we are going to get the number of combinations. If we have three external or serial operators and two

internal or variable-related operations, we obtain the sum of five total operations (*). To obtain the result we just multiply or do the power (it will be the same result). $6\cdot6\cdot6\cdot6\cdot6=6^5=7776$. This result are the possible combinations with 3-variable operators and without any constant.
If we follow the logic of order that I followed in my second paper (sum, rest, product, division, power, root), we have this group of theoretical formulas:

$$(5)\quad \underset{o=k}{\Sigma}\underset{m=j}{\Sigma}\underset{n=i}{\Sigma}(i+j)+k\,,\ \underset{o=k}{\Sigma}\underset{m=j}{\Sigma}\underset{n=i}{\Sigma}(i+j)-k\,,\ \underset{o=k}{\Sigma}\underset{m=j}{\Sigma}\underset{n=i}{\Sigma}(i+j)\cdot k\ldots$$
$$\ldots\underset{o=k}{Z}\underset{m=j}{Z}\underset{n=i}{Z}(\sqrt[j]{i})\div k\,,\ \underset{o=k}{Z}\underset{m=j}{Z}\underset{n=i}{Z}(\sqrt[j]{i})^k,\ \underset{o=k}{Z}\underset{m=j}{Z}\underset{n=i}{Z}\sqrt[k]{\sqrt[j]{i}},$$

From the first case, the triple summation of two sums $\underset{o=k}{\Sigma}\underset{m=j}{\Sigma}\underset{n=i}{\Sigma}(i+j)+k$, to the last case, the triple rootory of two roots $\underset{o=k}{Z}\underset{m=j}{Z}\underset{n=i}{Z}\sqrt[k]{\sqrt[j]{i}},$ including both of them, we have the 7776 theoretical cases.

3- The first examples:

$$(6)\quad \sum_{o=3}^{5}\sum_{m=2}^{3}\sum_{n=1}^{4}(i+j)+k=\sum_{o=3}^{5}\sum_{m=2}^{3}(1+j+k)+(2+j+k)+(3+j+k)$$
$$+(4+j+k)=\sum_{o=3}^{5}((1+2+k)+(2+2+k)+(3+2+k)+(4+2+k))$$
$$+((1+3+k)+(2+3+k)+(3+3+k)+(4+3+k))=((1+2+3)+(2+2+3)+(3+2+3)+(4+2+3))$$
$$+((1+3+3)+(2+3+3)+(3+3+3)+(4+3+3))+((1+2+4)+(2+2+4)+(3+2+4)+(4+2+4))$$
$$+((1+3+4)+(2+3+4)+(3+3+4)+(4+3+4))+((1+2+5)+(2+2+5)+(3+2+5)+(4+2+5))$$
$$+((1+3+5)+(2+3+5)+(3+3+5)+(4+3+5))=(6+7+8+9)+(7+8+9+10)$$
$$+(7+8+9+10)+(8+9+10+11)+(8+9+10+11)+(9+10+11+12)=64+72+80=216$$

(7)

$$\sum_{o=2}^{3}\sum_{m=3}^{5}\sum_{n=4}^{5}(i+j)-k=\sum_{o=2}^{3}\sum_{m=3}^{5}((4+j)-k)+((5+j)-k)=\sum_{o=2}^{3}(((4+3)-k)+((5+3)-k))$$
$$+(((4+4)-k)+((5+4)-k))+(((4+5)-k)+((5+5)-k))=((4+3)-2)+((5+3)-2)$$
$$+((4+4)-2)+((5+4)-2)+((4+5)-2)+((5+5)-2)+((4+3)-3)+((5+3)-3)$$
$$+((4+4)-3)+((5+4)-3)+((4+5)-3)+((5+5)-3)=(5+6+6+7+7+8)$$
$$+(4+5+5+6+6+7)=39+33=72$$

$$(8)\quad \sum_{o=1}^{2}\sum_{m=3}^{4}\sum_{n=5}^{6}(i+j)\cdot k=\sum_{o=1}^{2}\sum_{m=3}^{4}((5+j)\cdot k)+((6+j)\cdot k)=\sum_{o=1}^{2}((5+3)\cdot k)+((6+3)\cdot k)$$
$$+((5+4)\cdot k)+((6+4)\cdot k)=(((5+3)\cdot 1)+((6+3)\cdot 1)+((5+4)\cdot 1)+((6+4)\cdot 1))$$
$$(((5+3)\cdot 2)+((6+3)\cdot 2)+((5+4)\cdot 2)+((6+4)\cdot 2))=(8+9+9+10)$$
$$+(16+18+18+20)=36+72=108$$

4- Conclusions:

As you could see in this paper, there are a lot of possible combinations. The calculus of the triple series can be very long even if the series are finite and with short numerical distance.

5- References:

[1] Resume of the serial operators theory. Juan Elias Millas Vera. https://vixra.org/abs/2109.0029

[2] Double serial operators theory. Juan Elias Millas Vera. https://vixra.org/abs/2109.0216