Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0					
a_1					
a_2					
a_3					

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\ldots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\ldots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\ldots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\ldots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\ldots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\dots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\dots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\dots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\dots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

$$c_0 = a_0b_0$$

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\dots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\dots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\dots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\dots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

$$c_0 = a_0b_0$$

$$c_1 = a_1b_0 + a_0b_1$$

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\dots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\dots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\dots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\dots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

$$c_0 = a_0b_0$$
$$c_1 = a_1b_0 + a_0b_1$$
$$c_2 = a_2b_0 + a_1b_1 + a_0b_2$$

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\dots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\dots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\dots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\dots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

$$c_0 = a_0b_0$$
$$c_1 = a_1b_0 + a_0b_1$$
$$c_2 = a_2b_0 + a_1b_1 + a_0b_2$$
$$c_3 = a_3b_0 + a_2b_1 + a_1b_2 + a_0b_3$$

Cauchy product

Problem: Series representation of the product $\left(\sum_{n=0}^{\infty} a_n\right)\left(\sum_{n=0}^{\infty} b_n\right)$

	b_0	b_1	b_2	b_3	$\dots$
a_0	a_0b_0	a_0b_1	a_0b_2	a_0b_3	$\dots$
a_1	a_1b_0	a_1b_1	a_1b_2	a_1b_3	$\dots$
a_2	a_2b_0	a_2b_1	a_2b_2	a_2b_3	$\dots$
a_3	a_3b_0	a_3b_1	a_3b_2	a_3b_3	$\dots$
$\vdots$	$\vdots$	$\vdots$	$\vdots$	$\vdots$	

$$
\begin{aligned}
c_0 &= a_0b_0 \\
c_1 &= a_1b_0 + a_0b_1 \\
c_2 &= a_2b_0 + a_1b_1 + a_0b_2 \\
c_3 &= a_3b_0 + a_2b_1 + a_1b_2 + a_0b_3 \\
&\vdots \\
c_n &= \sum_{k+l=n} a_k b_l
\end{aligned}
$$