Diagram 1 of 11. Not set up and not solved.

Diagrams 2 and 3 of 11. Set up but not solved.

$M \in F\mathbb{C}\mathbf{sp}$ is given by $a \xrightarrow{i} m \xleftarrow{o} a'$ with $x \in F(m)$.

$N \in F\mathbb{C}\mathbf{sp}$ is given by $b \xrightarrow{i'} n \xleftarrow{o'} b'$ with $y \in F(n)$.

$U_a \in F\mathbb{C}\mathbf{sp}$ is given by $a \xrightarrow{\mathrm{id}} a \xleftarrow{\mathrm{id}} a$ with $\perp_a \in F(a)$.

$$
\begin{tikzcd}
\begin{array}{c} a{+}b{\to}(a{+}b){+}_{a+b}(m{+}n){\leftarrow}a'{+}b' \\ F(\psi)\phi_{a+b,m+n}(\phi_{m,n}(x,y),\perp_{a+b}){\in}F((a{+}b){+}_{a+b}(m{+}n)) \end{array} & (M\otimes N)\odot(U_{a+b}) \arrow[r, "\mathrm{id}\odot\mu"] \arrow[d, "r"'] & (M\otimes N)\odot(U_a\otimes U_b) \arrow[d, "\chi"] & \begin{array}{c} a{+}b{\to}(a{+}b){+}_{a+b}(m{+}n){\leftarrow}a'{+}b' \\ F(\psi)\phi_{a+b,m+n}(\phi_{m,n}(x,y),\phi_{a,b}(\perp_a,\perp_b)){\in}F((a{+}b){+}_{a+b}(m{+}n)) \end{array} \\
\begin{array}{c} a{+}b{\to}m{+}n{\leftarrow}a'{+}b' \\ \phi_{m,n}(x,y){\in}F(m{+}n) \end{array} & M\otimes N & (M\odot U_a)\otimes(N\odot U_b) \arrow[l, "r\otimes r"'] & \begin{array}{c} a{+}b{\to}(a{+}_a m){+}(b{+}_b n){\leftarrow}a'{+}b' \\ \phi_{a+_a m,b+_b n}(F(\psi)\phi_{a,m}(\perp_a,x),F(\psi)\phi_{b,n}(\perp_b,y)){\in}F((a{+}_a m){+}(b{+}_b n)) \end{array}
\end{tikzcd}
$$

Down:

$$
\begin{tikzcd}
& F(0)\times(F(m)\times F(n)) \arrow[r, "1\times\phi_{m,n}"] & F(0)\times(F(m+n) \arrow[r, "F(!_{a+b})\times 1"] \arrow[dr, "\phi_{0,m+n}"'] & F(a+b)\times F(m+n) \arrow[r, "\phi_{a+b,m+n}"] & F((a+b)+(m+n)) \arrow[r, "F(\psi)"] & F((a+b)+_{a+b}(m+n)) \arrow[dd, "F(\kappa)"] \\
1 \arrow[ur, bend left, "\phi_0\times(x\times y)"] \arrow[dr, bend right, "x\times y"'] & \overset{\lambda_{M\otimes N}}{\cong} & & F(0+(m+n)) \arrow[ur, "F(!_{a+b}+1)"] \arrow[drr, "F(\ell)"'] & \cong & \\
& F(m)\times F(n) \arrow[rrrr, "\phi_{m,n}"] & & & & F(m+n)
\arrow[from=1-3, to=1-4, phantom, shift right=6, "\overset{\phi_{!_{a+b},1}}{\cong}"]
\end{tikzcd}
$$

Right, down and then left:

$$
\begin{tikzcd}
& F(0)\times(F(m)\times F(n)) \arrow[r, "1\times\phi_{m,n}"] & F(0)\times F(m+n) \arrow[rr, "F(!_{a+b})\times 1"] & & F(a+b)\times F(m+n) \arrow[r, "\phi_{a+b,m+n}"] & F((a+b)+(m+n)) \arrow[r, "F(\psi)"] & F((a+b)+_{a+b}(m+n)) \arrow[d, "F(\mathrm{id})"] \\
& (F(0)\times F(0))\times(F(m)\times F(n)) \arrow[u, "\phi_{0,0}\times 1"] \arrow[r, "(F(!_a)\times F(!_b))\times 1"] & (F(a)\times F(b))\times(F(m)\times F(n)) \arrow[rr, "\phi_{a,b}\times\phi_{m,n}"] \arrow[urr, "\phi_{a,b}\times\phi_{m,n}"] \arrow[d, "1\times\phi\times 1"'] \arrow[ddd, bend right=60, "\overset{1\times\mu\times 1}{\cong}", "1\times\beta\times 1"'] & & F(a+b)\times F(m+n) \arrow[r, "\phi_{a+b,m+n}"] & F((a+b)+(m+n)) \arrow[r, "F(\psi)"] \arrow[ddl, "F(1+\beta+1)"'] & F((a+b)+_{a+b}(m+n)) \arrow[ddd, "F(\kappa')"] \\
& & F(a)\times F(b+m)\times F(n) \arrow[r, "1\times\phi"] \arrow[d, "1\times F(\beta)\times 1"'] & F(a)\times F((b+m)+n) \arrow[d, "1\times F(\beta+1)"] \arrow[urr, "\phi"] & & & \\
1 \arrow[uuur, bend left, "\phi_0\times(x\times y)"] \arrow[uur, "(\phi_0\times\phi_0)\times(x\times y)"] \arrow[dr, "(\phi_0\times x)\times(\phi_0\times y)"'] \arrow[dddr, bend right, "x\times y"'] & & F(a)\times F(m+b)\times F(n) \arrow[r, "1\times\phi"] & F(a)\times F((m+b)+n) \arrow[r, "\phi"] & F((a+m)+(b+n)) \arrow[drr, bend left, "F(\psi+\psi)"] & & \\
& (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "(F(!_a)\times 1)\times(F(!_b)\times 1)"] \arrow[dr, "\phi_{0,m}\times\phi_{0,n}"] & (F(a)\times F(m))\times(F(b)\times F(n)) \arrow[u, "1\times\phi\times 1"] \arrow[rr, "\phi_{a,m}\times\phi_{b,n}"] & & F(a+m)\times F(b+n) \arrow[u, "\phi\times\phi"] \arrow[r, "F(\psi)\times F(\psi)"] & F(a+_a m)\times F(b+_b n) \arrow[r, "\phi_{a+_a m,b+_b n}"] & F((a+_a m)+(b+_b n)) \arrow[dd, "F(\kappa'')"] \\
& & F(0+m)\times F(0+n) \arrow[rr, "F(\ell)\times F(\ell)"'] \arrow[urr, "F(!_a+1)\times F(!_b+1)"] & & F(m)\times(n) \arrow[drr, "\phi_{m,n}"] & & \\
& F(m)\times F(n) \arrow[rrrrr, "\phi_{m,n}"] & & & & & F(m+n)
\arrow[from=4-1, to=1-2, phantom, "\overset{\phi}{\cong}"]
\arrow[from=1-2, to=2-3, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"]
\arrow[from=1-5, to=2-6, phantom, "\cong"]
\arrow[from=2-3, to=3-4, phantom, "\cong"]
\arrow[from=3-3, to=4-4, phantom, "\overset{\phi_{\beta,1}}{\cong}"]
\arrow[from=2-5, to=4-5, phantom, "\overset{\phi_{1,\beta+1}}{\cong}"]
\arrow[from=4-3, to=5-5, phantom, "\cong"]
\arrow[from=4-5, to=5-6, phantom, "\overset{\phi_{\psi,\psi}}{\cong}"]
\arrow[from=2-6, to=5-7, phantom, "\cong"]
\arrow[from=5-3, to=6-3, phantom, "\overset{\phi_{!_a,1}\times\phi_{!_b,1}}{\cong}"]
\arrow[from=6-5, to=5-7, phantom, "\cong"]
\arrow[from=5-2, to=7-2, phantom, "\overset{\lambda_M\times\lambda_N}{\cong}"]
\end{tikzcd}
$$

Diagram 4 of 11. Not set up and not solved.

Diagram 5 of 11. Set up but not solved.

$$a, b, c \in (\mathsf{A}, +, 0)$$

$$\begin{tikzcd}
\perp_{(a+b)+c} \in F((a+b)+c) & U_{(a+b)+c} \arrow[r, "\mu_\beta"] \arrow[d, "\mu"'] & U_{a+(b+c)} \arrow[d, "\mu"] & \perp_{a+(b+c)} \in F(a+(b+c)) \\
\phi_{a+b,c}(\perp_{a+b}, \perp_c) \in F((a+b)+c) & U_{a+b} \otimes U_c \arrow[d, "\mu"'] & U_a \otimes U_{b+c} \arrow[d, "\mu"] & \phi_{a,b+c}(\perp_a, \perp_{b+c}) \in F(a+(b+c)) \\
\phi_{a+b,c}(\phi_{a,b}(\perp_a, \perp_b), \perp_c) \in F((a+b)+c) & (U_a \otimes U_b) \otimes U_c \arrow[r, "\beta'"] & U_a \otimes (U_b \otimes U_c) & \phi_{a,b+c}(\perp_a, \phi_{b,c}(\perp_b, \perp_c)) \in F(a+(b+c))
\end{tikzcd}$$

All the left cospans are $(a + b) + c \to (a + b) + c \leftarrow (a + b) + c$ and all the right cospans are $a + (b + c) \to a + (b + c) \leftarrow a + (b + c)$.

Right and then down:

$$\begin{tikzcd}
 & F(0) \arrow[rrr, "F(!_{(a+b)+c})"] \arrow[drrr, phantom, "\cong"] & & & F((a+b)+c) \arrow[d, "F(\alpha)"] \\
 & F(0) \arrow[rrr, "F(!_{a+(b+c)})"] & & & F(a+(b+c)) \arrow[dd, "F(\mathrm{id})"] \\
1 \arrow[uur, bend left, "\phi_0"] \arrow[ur, "\phi_0"] \arrow[dr, "\phi_0 \times \phi_0"'] \arrow[ddr, bend right, "\phi_0 \times (\phi_0 \times \phi_0)"'] \arrow[r, phantom, "\overset{\phi}{\cong}"] & {} \arrow[rrr, phantom, "\overset{\phi_{!_a,!_{b+c}}}{\cong}"] & & & {} \\
{} \arrow[r, phantom, "\overset{\phi}{\cong}"', shift right=4] & F(0) \times F(0) \arrow[uu, "\phi_{0,0}"'] \arrow[r, "F(!_a) \times F(!_{b+c})"] \arrow[dr, phantom, "\overset{\phi_{!_b!_c}}{\cong}"] & F(a) \times F(b+c) \arrow[rr, "\phi_{a,b+c}"] & & F(a+(b+c)) \arrow[d, "F(\mathrm{id})"] \\
 & F(0) \times (F(0) \times F(0)) \arrow[u, "1 \times \phi_{0,0}"'] \arrow[r, "F(!_a) \times (F(!_b) \times F(!_c))"] & F(a) \times (F(b) \times F(c)) \arrow[u, "1 \times \phi_{b+c}"'] \arrow[r, "1 \times \phi_{b+c}"] & F(a) \times F(b+c) \arrow[r, "\phi_{a,b+c}"] & F(a+(b+c))
\end{tikzcd}$$

Down and then right:

$$\begin{tikzcd}
 & F(0) \arrow[rrr, "F(!_{(a+b)+c})"] & & & F((a+b)+c) \arrow[d, "F(\mathrm{id})"] \\
{} \arrow[r, phantom, "\overset{\phi}{\cong}"] & F(0) \times F(0) \arrow[u, "\phi_{0,0}"'] \arrow[r, "F(!_{a+b}) \times F(!_c)"] \arrow[urrr, phantom, "\overset{\phi_{!_{a+b},!_c}}{\cong}"] & F(a+b) \times F(c) \arrow[rr, "\phi_{a+b,c}"] & & F((a+b)+c) \arrow[dd, "F(\mathrm{id})"] \\
1 \arrow[uur, bend left, "\phi_0"] \arrow[ur, "\phi_0"] \arrow[dr, "\phi_0^2 \times \phi_0"'] \arrow[ddr, bend right, "\phi_0 \times (\phi_0 \times \phi_0)"'] \arrow[r, phantom, "\overset{\phi}{\cong}"] & {} \arrow[r, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] & {} & & {} \\
 & (F(0) \times F(0)) \times F(0) \arrow[uu, "\phi_{0,0}"'] \arrow[r, "(F(!_a) \times F(!_b)) \times F(!_c)"] \arrow[d, "\alpha'"] & (F(a) \times F(b)) \times F(c) \arrow[uu, "\phi_{a,b} \times 1"'] \arrow[r, "\phi_{a,b} \times 1"] \arrow[d, "\alpha'"] & F(a+b) \times F(c) \arrow[r, "\phi_{a+b,c}"] \arrow[d, phantom, "\cong"] & F(a+(b+c)) \arrow[d, "F(\alpha)"] \\
 & F(0) \times (F(0) \times F(0)) \arrow[r, "F(!_a) \times (F(!_b) \times F(!_c))"] & F(a) \times (F(b) \times F(c)) \arrow[r, "1 \times \phi_{b+c}"] & F(a) \times F(b+c) \arrow[r, "\phi_{a,b+c}"] & F(a+(b+c))
\end{tikzcd}$$

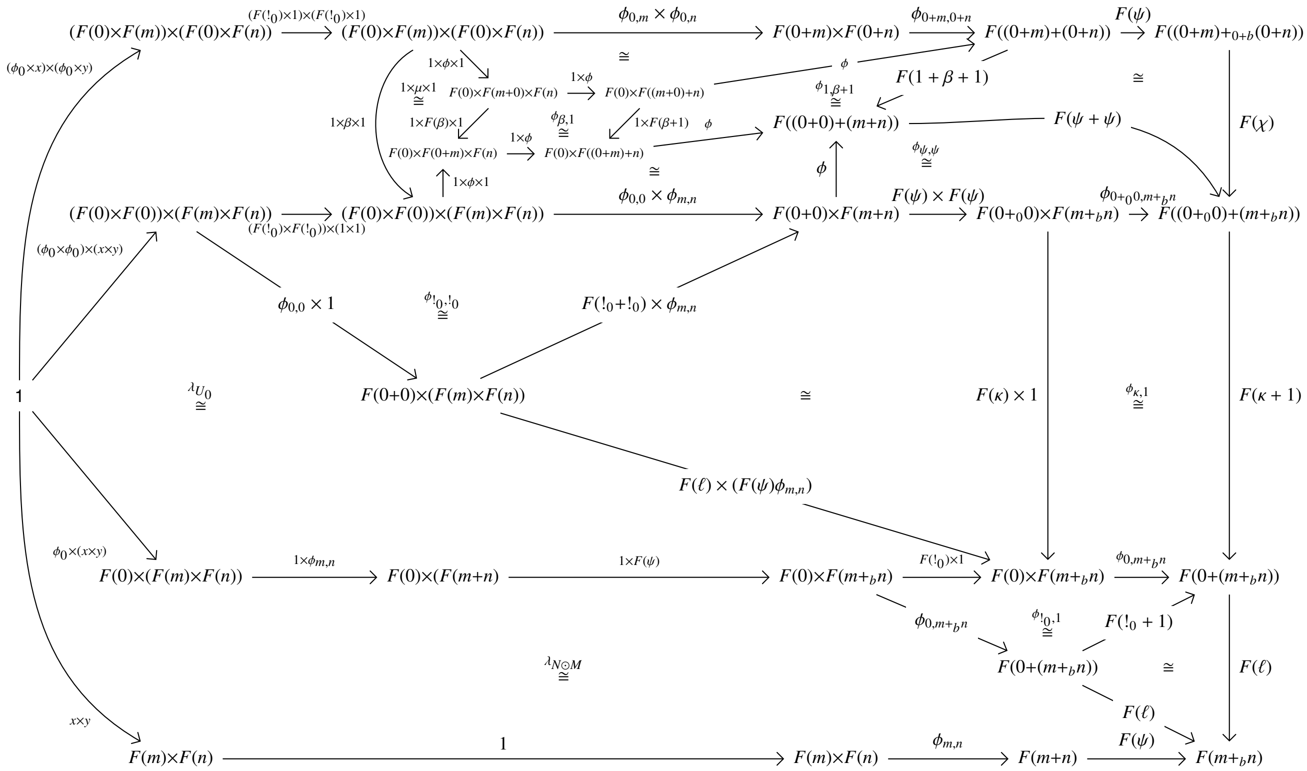
Diagrams 6 and 8 of 11. Set up but not solved.
$M \in F\mathbb{C}\mathbf{sp}$ is given by $a \xrightarrow{i} m \xleftarrow{o} b$ with $x \in F(m)$.
$N \in F\mathbb{C}\mathbf{sp}$ is given by $b \xrightarrow{i'} n \xleftarrow{o'} c$ with $y \in F(n)$.
$U_0 \in F\mathbb{C}\mathbf{sp}$ is given by $0 \xrightarrow{!} 0 \xleftarrow{!} 0$ with $\perp_0 \in F(0)$.

$$\begin{tikzcd}
\substack{0+a\to(0+m)+_{0+b}(0+n)\leftarrow 0+c \\ (\perp_0\oplus y)\odot(\perp_0\oplus x)\in F((0+m)+_{0+b}(0+n))} & (U_0\otimes N)\odot(U_0\otimes M) \arrow[r, "\chi"] \arrow[d, "\lambda_N\odot\lambda_M"'] & (U_0\odot U_0)\otimes(N\odot M) \arrow[d, "\lambda_{U_0}\otimes\mathrm{id}_{N\odot M}"] & \substack{0+a\to(0+_0 0)+(m+_b n)\leftarrow 0+c \\ (\perp_0\odot\perp_0)\oplus(y\odot x)\in F((0+_0 0)+(m+_b n))} \\
\substack{a\to m+_b n\leftarrow c \\ y\odot x\in F(m+_b n)} & N\odot M & U_0\otimes(N\odot M) \arrow[l, "\lambda_{N\odot M}"'] & \substack{0+a\to 0+(m+_b n)\leftarrow 0+c \\ \perp_0\oplus(y\odot x)\in F(0+(m+_b n))}
\end{tikzcd}$$

Down:

$$\begin{tikzcd}
 & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "(F(!_0)\times 1)\times(F(!_0)\times 1)"] \arrow[dr, "\phi_{0,m}\times\phi_{0,n}"'] \arrow[ddr, phantom, "\overset{\lambda_M\times\lambda_N}{\cong}"] & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "\phi_{0,m}\times\phi_{0,n}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}\times\phi_{!_0,1}}{\cong}"] & F(0+m)\times F(0+n) \arrow[r, "\phi_{0+m,0+n}"] \arrow[dd, "F(\ell)\times F(\ell)"] \arrow[ddr, phantom, "\overset{\phi_{\ell,\ell}}{\cong}"] & F((0+m)+(0+n)) \arrow[r, "F(\psi)"] \arrow[dd, "F(\ell+\ell)"] \arrow[ddr, phantom, "\cong"] & F((0+m)+_{0+b}(0+n)) \arrow[dd, "F(\ell+_\ell \ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times x)\times(\phi_0\times y)"] \arrow[dr, bend right, "x\times y"'] & & F(0+m)\times F(0+n) \arrow[ur, "F(!_0+1)\times F(!_0+1)"] \arrow[dr, "F(\ell)\times F(\ell)"'] \arrow[r, phantom, "\cong"] & & & \\
 & F(m)\times F(n) \arrow[rr, "1"] & & F(m)\times F(n) \arrow[r, "\phi_{m,n}"] & F(m+n) \arrow[r, "F(\psi)"] & F(m+_b n)
\end{tikzcd}$$

Right, down and then left:



(Scratch work) As a check, let us compute the decoration maps $\lambda_N\colon U_0 \otimes N \to N$ and $\lambda_M\colon U_0 \otimes M \to M$ and compose them via $\odot$. The maps λ_N and λ_M are given explicitly in the paper.

$\lambda_M \colon U_0 \otimes M \to M$

$$
\begin{tikzcd}
 & F(0)\times F(m) \arrow[r, "F(!_0)\times 1"] \arrow[dr, "\phi_{0,m}"'] & F(0)\times F(m) \arrow[rr, "\phi_{0,m}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}}{\cong}"] & & F(0+m) \arrow[dd, "F(\ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times x)"] \arrow[dr, bend right, "x"'] & \cong & F(0+m) \arrow[urr, "F(!_0+1)"] \arrow[drr, "F(\ell)"'] & \cong & \\
 & F(m) \arrow[rrr, "1"] & & & F(m)
\end{tikzcd}
$$

$\lambda_N \colon U_0 \otimes N \to N$

$$
\begin{tikzcd}
 & F(0)\times F(n) \arrow[r, "F(!_0)\times 1"] \arrow[dr, "\phi_{0,n}"'] & F(0)\times F(n) \arrow[rr, "\phi_{0,n}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}}{\cong}"] & & F(0+n) \arrow[dd, "F(\ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times y)"] \arrow[dr, bend right, "y"'] & \cong & F(0+n) \arrow[urr, "F(!_0+1)"] \arrow[drr, "F(\ell)"'] & \cong & \\
 & F(n) \arrow[rrr, "1"] & & & F(n)
\end{tikzcd}
$$

To construct $\lambda_N \odot \lambda_M \colon (U_0 \otimes N) \odot (U_0 \otimes M) \to N \odot M$, we first tensor the above two diagrams:

$$
\begin{tikzcd}
 & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "(F(!_0)\times 1)\times(F(!_0)\times 1)"] \arrow[dr, "\phi_{0,m}\times\phi_{0,n}"'] & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[rr, "\phi_{0,m}\times\phi_{0,n}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}\times\phi_{!_0,1}}{\cong}"] & & F(0+m)\times F(0+n) \arrow[dd, "F(\ell)\times F(\ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times x)\times(\phi_0\times y)"] \arrow[dr, bend right, "x\times y"'] & \cong & F(0+m)\times F(0+n) \arrow[urr, "F(!_0+1)\times F(!_0+1)"] \arrow[drr, "F(\ell)\times F(\ell)"'] & \cong & \\
 & F(m)\times F(n) \arrow[rrr, "1"] & & & F(m)\times F(n)
\end{tikzcd}
$$

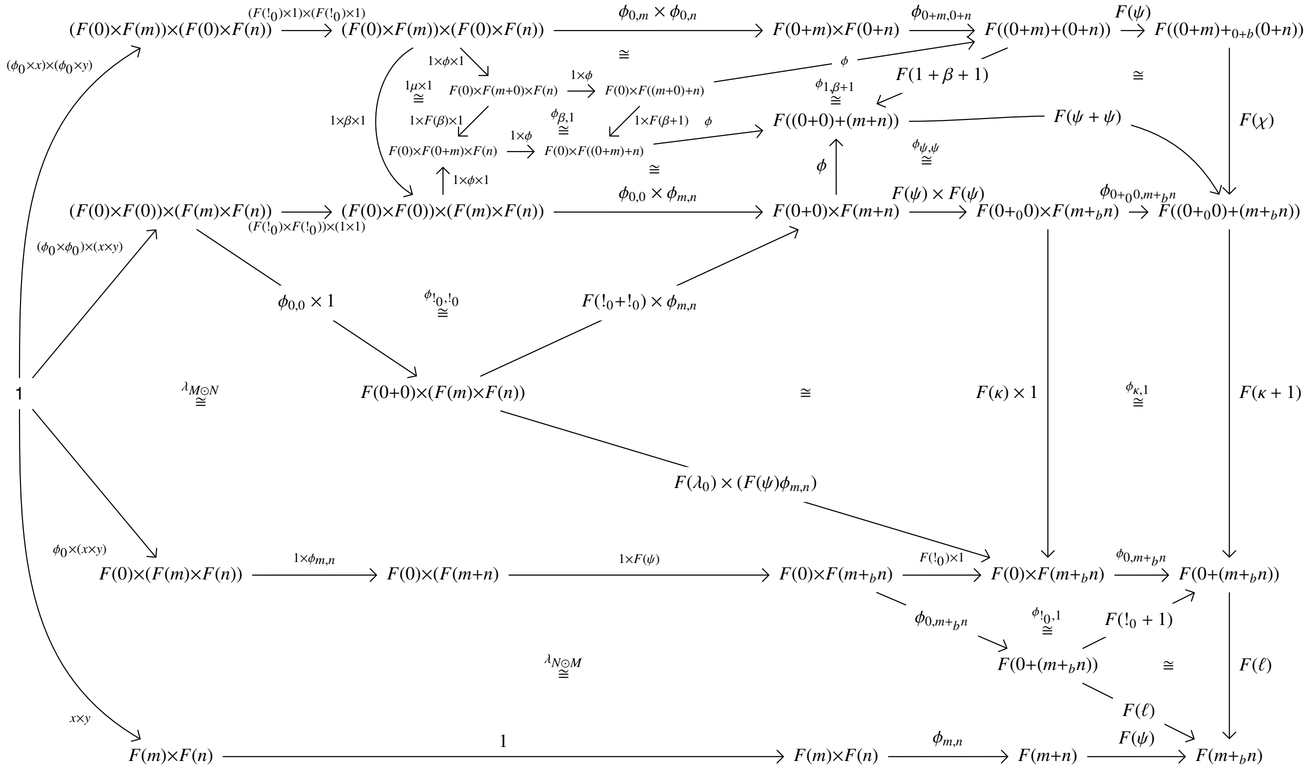
Next, we paste with a square due to pseudonaturality of ϕ:

$$
\begin{tikzcd}
 & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "(F(!_0)\times 1)\times(F(!_0)\times 1)"] \arrow[dr, "\phi_{0,m}\times\phi_{0,n}"'] & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[rr, "\phi_{0,m}\times\phi_{0,n}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}\times\phi_{!_0,1}}{\cong}"] & & F(0+m)\times F(0+n) \arrow[r, "\phi_{0+m,0+n}"] \arrow[dd, "F(\ell)\times F(\ell)"] \arrow[ddr, phantom, "\overset{\phi_{\ell,\ell}}{\cong}"] & F((0+m)+(0+n)) \arrow[dd, "F(\ell+\ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times x)\times(\phi_0\times y)"] \arrow[dr, bend right, "x\times y"'] & \cong & F(0+m)\times F(0+n) \arrow[urr, "F(!_0+1)\times F(!_0+1)"] \arrow[drr, "F(\ell)\times F(\ell)"'] & \cong & & \\
 & F(m)\times F(n) \arrow[rrr, "1"] & & & F(m)\times F(n) \arrow[r, "\phi_{m,n}"] & F(m+n)
\end{tikzcd}
$$

Finally, we paste with a square due to pseudonaturality of F to obtain the map $\lambda_N \odot \lambda_M \colon (U_0 \otimes N) \odot (U_0 \otimes M) \to N \odot M$:

$$
\begin{tikzcd}
 & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[r, "(F(!_0)\times 1)\times(F(!_0)\times 1)"] \arrow[dr, "\phi_{0,m}\times\phi_{0,n}"'] & (F(0)\times F(m))\times(F(0)\times F(n)) \arrow[rr, "\phi_{0,m}\times\phi_{0,n}"] \arrow[d, phantom, "\overset{\phi_{!_0,1}\times\phi_{!_0,1}}{\cong}"] & & F(0+m)\times F(0+n) \arrow[r, "\phi_{0+m,0+n}"] \arrow[dd, "F(\ell)\times F(\ell)"] \arrow[ddr, phantom, "\overset{\phi_{\ell,\ell}}{\cong}"] & F((0+m)+(0+n)) \arrow[r, "F(\psi)"] \arrow[dd, "F(\ell+\ell)"] \arrow[ddr, phantom, "\cong"] & F((0+m)+_{0+b}(0+n)) \arrow[dd, "F(\ell+_\ell \ell)"] \\
1 \arrow[ur, bend left, "(\phi_0\times x)\times(\phi_0\times y)"] \arrow[dr, bend right, "x\times y"'] & \cong & F(0+m)\times F(0+n) \arrow[urr, "F(!_0+1)\times F(!_0+1)"] \arrow[drr, "F(\ell)\times F(\ell)"'] & \cong & & & \\
 & F(m)\times F(n) \arrow[rrr, "1"] & & & F(m)\times F(n) \arrow[r, "\phi_{m,n}"] & F(m+n) \arrow[r, "F(\psi)"] & F(m+_b n)
\end{tikzcd}
$$

Next, we compute the right, down and then left route:



$$
\begin{tikzcd}
 & F(0)\times F(0) \arrow[rr, "F(!_0)\times F(!_0)"] \arrow[drr, "\phi_{0,0}"'] & & F(0)\times F(0) \arrow[rr, "\phi_{0,0}"] & & F(0+0) \arrow[r, "F(\psi)"] & F(0+_0 0) \arrow[dd, "F(\kappa)"] \\
1 \arrow[ur, bend left, "\phi_0\times\phi_0"] \arrow[dr, bend right, "\phi_0"'] & \arrow[r, phantom, "\overset{\lambda_M}{\cong}"] & & F(0+0) \arrow[r, phantom, "\overset{\phi_{!_0,!_0}}{\cong}"] \arrow[urr, "F(!_0+!_0)"] \arrow[drrr, "F(\lambda_0)"'] & & \cong & \\
 & F(0) \arrow[rrrrr, "\mathrm{id}"] & & & & & F(0)
\end{tikzcd}
$$

Diagrams 7 and 9 of 11. Set up and solved.

$$F\colon (\mathsf{A}, +, 0) \to (\mathbf{Cat}, \times, 1)$$
$$a \in (\mathsf{A}, +, 0)$$

$0 + a \to 0 + a \leftarrow 0 + a$

$\perp_{0+a \in F(0+a)}$

$$\begin{tikzcd}
U_{0+a} \arrow[r, "\mu"] \arrow[dr, "U_{\lambda_a}"'] & U_0 \otimes U_a \arrow[d, "\lambda_{U_a}"] \\
& U_a
\end{tikzcd}$$

$0 + a \to 0 + a \leftarrow 0 + a$

$\phi_{0,a}(\perp_0, \perp_a) \in F(0 + a)$

$a \to a \leftarrow a$

$\perp_a \in F(a)$

Right and then down:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{0+a})"] \arrow[d, phantom, ""] & & F(0{+}a) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, phantom, shift left=4ex, "\overset{\phi}{\cong}"] \arrow[r, phantom, shift right=4ex, "\overset{\phi}{\cong}"] & F(0){\times}F(0) \arrow[u, "\phi_{0,0}"'] \arrow[d, "\phi_{0,0}"] \arrow[r, "F(!_0)\times F(!_a)"] \arrow[r, phantom, shift left=4ex, "\overset{\phi_{!_0,!_a}}{\cong}"] \arrow[r, phantom, shift right=4ex, "\overset{\phi_{!_0,!_a}}{\cong}"'] & F(0){\times}F(a) \arrow[ur, "\phi_{0,a}"] \arrow[r, "\phi_{0,a}"] \arrow[r, phantom, shift left=4ex, "="] & F(0{+}a) \arrow[d, "F(\lambda)"] \\
 & F(0) \arrow[urr, "F(!_{0+a})"] \arrow[rr, "F(!_a)"] & & F(a) \arrow[ul, phantom, "\cong"]
\end{tikzcd}$$

Diagonally:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{0+a})"] \arrow[dd, "F(\mathrm{id})"] \arrow[ddrr, phantom, "="] & & F(0{+}a) \arrow[dd, "F(\lambda)"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, phantom, "="] & & & \\
 & F(0) \arrow[uurr, "F(!_{0+a})"] \arrow[rr, "F(!_a)"] & & F(a) \arrow[uull, phantom, "\cong"]
\end{tikzcd}$$

Removing the lower right $\cong$ which is the same in each diagram:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{0+a})"] & & F(0{+}a) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, phantom, shift left=4ex, "\overset{\phi}{\cong}"] \arrow[r, phantom, shift right=4ex, "\overset{\phi}{\cong}"] & F(0){\times}F(0) \arrow[u, "\phi_{0,0}"'] \arrow[d, "\phi_{0,0}"] \arrow[r, "F(!_0)\times F(!_a)"] \arrow[r, phantom, shift left=4ex, "\overset{\phi_{!_0,!_a}}{\cong}"] \arrow[r, phantom, shift right=4ex, "\overset{\phi_{!_0,!_a}}{\cong}"'] & F(0){\times}F(a) \arrow[ur, "\phi_{0,a}"] \arrow[r, "\phi_{0,a}"] \arrow[r, phantom, shift left=4ex, "="] & F(0{+}a) \\
 & F(0) \arrow[urr, "F(!_{0+a})"] & &
\end{tikzcd}$$

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{0+a})"] \arrow[dd, "F(\mathrm{id})"] \arrow[ddrr, phantom, "="] & & F(0{+}a) \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, phantom, "="] & & & \\
 & F(0) \arrow[uurr, "F(!_{0+a})"] & &
\end{tikzcd}$$

The second diagram is then an identity, so our problem reduces to showing that the following diagram is also an identity:

$$\begin{tikzcd}
& F(0) \arrow[rr, "F(!_{0+a})"] && F(0+a) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] \arrow[dr, phantom, "\overset{\phi}{\cong}"'] & F(0)\times F(0) \arrow[u, "\phi_{0,0}"'] \arrow[d, "\phi_{0,0}"] \arrow[r, "F(!_0)\times F(!_a)"] & F(0)\times F(a) \arrow[ur, "\phi_{0,a}"] \arrow[r, "\phi_{0,a}"] \arrow[u, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] \arrow[dl, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] & F(0+a) \arrow[u, phantom, "="] \\
& F(0) \arrow[urr, "F(!_{0+a})"] &&
\end{tikzcd}$$

Removing the diagonal $\phi_{0,a}$:

$$\begin{tikzcd}
& F(0) \arrow[rr, "F(!_{0+a})"] && F(0+a) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] \arrow[dr, phantom, "\overset{\phi}{\cong}"'] & F(0)\times F(0) \arrow[u, "\phi_{0,0}"'] \arrow[d, "\phi_{0,0}"] \arrow[r, "F(!_0)\times F(!_a)"] & F(0)\times F(a) \arrow[r, "\phi_{0,a}"] \arrow[u, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] \arrow[dl, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] & F(0+a) \\
& F(0) \arrow[urr, "F(!_{0+a})"] &&
\end{tikzcd}$$

This diagram is clearly the same as:

$$\begin{tikzcd}
& F(0) \arrow[drr, "F(!_{0+a})"] && \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] \arrow[dr, phantom, "\overset{\phi}{\cong}"'] & F(0)\times F(0) \arrow[u, "\phi_{0,0}"'] \arrow[d, "\phi_{0,0}"] \arrow[r, "F(!_0)\times F(!_a)"] \arrow[u, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] \arrow[d, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] & F(0)\times F(a) \arrow[r, "\phi_{0,a}"] & F(0+a) \\
& F(0) \arrow[urr, "F(!_{0+a})"'] &&
\end{tikzcd}$$

The top half of the diagram and the bottom half of the diagram are the same but in reverse order. **I believe these cancel and yield an identity.**

Diagram 10 of 11. Set up and solved (Christina).

$M_1 \in F\mathbb{C}\mathbf{sp}$ is given by $a \xrightarrow{i_1} m_1 \xleftarrow{o_1} b$ with $x_1 \in F(m_1)$.
$M_2 \in F\mathbb{C}\mathbf{sp}$ is given by $b \xrightarrow{i_2} m_2 \xleftarrow{o_2} c$ with $x_2 \in F(m_2)$.
$N_1 \in F\mathbb{C}\mathbf{sp}$ is given by $a' \xrightarrow{i'_1} n_1 \xleftarrow{o'_1} b'$ with $y_1 \in F(n_1)$.
$N_2 \in F\mathbb{C}\mathbf{sp}$ is given by $b' \xrightarrow{i'_2} n_2 \xleftarrow{o'_2} c'$ with $x_2 \in F(n_2)$.

$$\begin{tikzcd}
\begin{array}{c} a{+}a' \to (m_1{+}n_1){+}_{b+b'}(m_2{+}n_2) \leftarrow c{+}c' \\ \scriptstyle F(\psi)\phi_{m_1+n_1,m_2+n_2}(\phi_{m_1,n_1}(x_1,y_1),\phi_{m_2,n_2}(x_2,y_2)) \in F((m_1+n_1)+_{b+b'}(n_1+n_2)) \end{array} & (M_2{\otimes}N_2){\odot}(M_1{\otimes}N_1) \arrow[r, "\beta\odot\beta"] \arrow[d, "\chi"'] & (N_2{\otimes}M_2){\odot}(N_1{\otimes}M_1) \arrow[d, "\chi"] & \begin{array}{c} a'{+}a \to (n_1{+}m_1){+}_{b'+b}(n_2{+}m_2) \leftarrow c'{+}c \\ \scriptstyle F(\psi)\phi_{n_1+m_1,n_2+m_2}(\phi_{n_1,m_1}(y_1,x_1),\phi_{n_2,m_2}(y_2,x_2)) \in F((n_1+m_1)+_{b'+b}(n_1+m_2)) \end{array} \\
\begin{array}{c} a{+}a' \to (m_1{+}_b m_2){+}(n_1{+}_{b'} n_2) \leftarrow c{+}c' \\ \scriptstyle \phi_{m_1+_b m_2,n_1+_{b'}m_2}(F(\psi)\phi_{m_1,m_2}(x_1,x_2),F(\psi)\phi_{n_1,n_2}(y_1,y_2)) \in F((m_1+_b m_2)+(n_1+_{b'}n_2)) \end{array} & (M_2{\odot}M_1){\otimes}(N_2{\odot}N_1) \arrow[r, "\beta"] & (N_2{\odot}N_1){\otimes}(M_2{\odot}M_1) & \begin{array}{c} a'{+}a \to (n_1{+}_{b'} n_2){+}(m_1{+}_b m_2) \leftarrow c'{+}c \\ \scriptstyle \phi_{n_1+_{b'}n_2}(F(\psi)\phi_{n_1,n_2}(y_1,y_2),F(\psi)\phi_{m_1,m_2}(x_1,x_2)) \in F((n_1+_{b'}n_2)+(m_1+_b m_2)) \end{array}
\end{tikzcd}$$

Down and then right:

$$\begin{tikzcd}[column sep=small]
& (F(m_1){\times}F(n_1)){\times}(F(m_2){\times}F(n_2)) \arrow[rr, "\phi_{m_1,n_1}\times\phi_{m_2,n_2}"] \arrow[dr, "1\times\phi\times1"] \arrow[ddd, "1\times\beta\times1"'] & & F(m_1{+}n_1){\times}F(m_2{+}n_2) \arrow[rr, "\phi_{m_1+n_1,m_2+n_2}"] \arrow[d, phantom, "\cong"] & & F((m_1{+}n_1){+}(m_2{+}n_2)) \arrow[r, "F(\psi)"] \arrow[dd, "F(1+\beta+1)"] \arrow[dr, phantom, "\cong"] & F((m_1{+}n_1){+}_{b+b'}(m_2{+}n_2)) \arrow[ddd, "F(\chi)"] \\
& \arrow[r, phantom, "1\times\mu\times1 \cong"] & F(m_1){\times}F(n_1{+}m_2){\times}F(n_2) \arrow[rr, "1\times\phi"] \arrow[d, "1\times F(\beta)\times1"'] & \arrow[d, phantom, "\phi_{\beta,1} \cong"] & F(m_1){\times}F((n_1{+}m_2){+}n_2) \arrow[ur, "\phi"] \arrow[d, "1\times F(\beta+1)"] \arrow[r, phantom, "\phi_{1,\beta} \cong"] & {} & \\
& & F(m_1){\times}F(m_2{+}n_1){\times}F(n_2) \arrow[rr, "1\times\phi"'] & {} \arrow[d, phantom, "\cong"] & F(m_1){\times}F((m_2{+}n_1){+}n_2) \arrow[r, "\phi"] & F(m_1{+}((m_2{+}n_1){+}n_2)) \arrow[dr, "F(\psi+\psi)"] \arrow[d, phantom, "\phi_{\psi,\psi} \cong"] & \\
1 \arrow[r, "(x_1\times x_2)\times(y_1\times y_2)"] \arrow[uuur, bend left, "(x_1\times y_1)\times(x_2\times y_2)"] \arrow[dr, bend right, "y_1\times y_2\times x_1\times x_2"'] & (F(m_1){\times}F(m_2)){\times}(F(n_1){\times}F(n_2)) \arrow[rr, "\phi_{m_1,m_2}\times\phi_{n_1,n_2}"'] \arrow[ur, "1\times\phi\times1"] \arrow[d, "\beta"] & & F(m_1{+}m_2){\times}F(n_1{+}n_2) \arrow[rr, "F(\psi)\times F(\psi)"] \arrow[urr, "\phi_{m_1+m_2,n_1+n_2}"] & & F(m_1{+}_b m_2){\times}F(n_1{+}_{b'} n_2) \arrow[r, "\phi_{m_1+_b m_2,n_1+_{b'}n_2}"] \arrow[d, "\beta"] \arrow[dr, phantom, "\mu_{m_1+_b m_2,n_1+_{b'}n_2} \cong"] & F((m_1{+}_b m_2){+}(n_1{+}_{b'} n_2)) \arrow[d, "F(\beta)"] \\
& F(n_1){\times}F(n_2){\times}F(m_1){\times}F(m_2) \arrow[rr, "\phi_{n_1,n_2}\times\phi_{m_1,m_2}"'] & & F(n_1{+}n_2){\times}F(m_1{+}m_2) \arrow[rr, "F(\psi)\times F(\psi)"'] & & F(n_1{+}_{b'} n_2){\times}F(m_1{+}_b m_2) \arrow[r, "\phi_{n_1+_{b'}n_2,m_1+_b m_2}"'] & F((n_1{+}_{b'} n_2){+}(m_1{+}_b m_2))
\end{tikzcd}$$

Right and then down:

$$\begin{tikzcd}[column sep=small]
& (F(m_1){\times}F(n_1)){\times}(F(m_2){\times}F(n_2)) \arrow[rr, "\phi_{m_1,n_1}\times\phi_{m_2,n_2}"] \arrow[d, "\beta\times\beta"] \arrow[rr, phantom, shift right=6ex, "\mu_{m_1,n_1}\times\mu_{m_2,n_2} \cong"] & & F(m_1{+}n_1){\times}F(m_2{+}n_2) \arrow[rr, "\phi_{m_1+n_1,m_2+n_2}"] \arrow[d, "F(\beta)\times F(\beta)"] \arrow[rr, phantom, shift right=6ex, "\phi_{\beta,\beta} \cong"] & & F((m_1{+}n_1){+}(m_2{+}n_2)) \arrow[r, "F(\psi)"] \arrow[d, "F(\beta+\beta)"] \arrow[r, phantom, shift right=6ex, "\cong"] & F((m_1{+}n_1){+}_{b+b'}(m_2{+}n_2)) \arrow[d, "F(\beta+_\beta\beta)"] \\
1 \arrow[r, "(y_1\times x_1)\times(y_2\times x_2)"] \arrow[ur, bend left, "(x_1\times y_1)\times(x_2\times y_2)"] \arrow[ddddr, bend right, "y_1\times y_2\times x_1\times x_2"'] & (F(n_1){\times}F(m_1)){\times}(F(n_2){\times}F(m_2)) \arrow[rr, "\phi_{n_1,m_1}\times\phi_{n_2,m_2}"] \arrow[dr, "1\times\phi\times1"] \arrow[ddd, "1\times\beta\times1"'] & & F(n_1{+}m_1){\times}F(n_2{+}m_2) \arrow[rr, "\phi_{n_1+m_1,n_2+m_2}"] \arrow[d, phantom, "\cong"] & & F((n_1{+}m_1){+}(n_2{+}m_2)) \arrow[r, "F(\psi)"] \arrow[dd, "F(1+\beta+1)"] \arrow[dr, phantom, "\cong"] & F((n_1{+}m_1){+}_{b'+b}(n_2{+}m_2)) \arrow[ddd, "F(\chi)"] \\
& \arrow[r, phantom, "1\times\mu\times1 \cong"] & F(n_1){\times}F(m_1{+}n_2){\times}F(m_2) \arrow[rr, "1\times\phi"] \arrow[d, "1\times F(\beta)\times1"'] & \arrow[d, phantom, "\phi_{\beta,1} \cong"] & F(n_1){\times}F((m_1{+}n_2){+}m_2) \arrow[ur, "\phi"] \arrow[d, "1\times F(\beta+1)"] \arrow[r, phantom, "\phi_{1,\beta} \cong"] & {} & \\
& & F(n_1){\times}F(n_2{+}m_1){\times}F(m_2) \arrow[rr, "1\times\phi"'] & {} \arrow[d, phantom, "\cong"] & F(n_1){\times}F((n_2{+}m_1){+}m_2) \arrow[r, "\phi"] & F(n_1{+}((n_2{+}m_1){+}m_2)) \arrow[dr, "F(\psi+\psi)"] \arrow[d, phantom, "\phi_{\psi,\psi} \cong"] & \\
& F(n_1){\times}F(n_2){\times}F(m_1){\times}F(m_2) \arrow[rr, "\phi_{n_1,n_2}\times\phi_{m_1,m_2}"'] \arrow[ur, "1\times\phi\times1"] & & F(n_1{+}n_2){\times}F(m_1{+}m_2) \arrow[rr, "F(\psi)\times F(\psi)"'] \arrow[urr, "\phi_{n_1+n_2,m_1+m_2}"] & & F(n_1{+}_{b'} n_2){\times}F(m_1{+}_b m_2) \arrow[r, "\phi_{n_1+_{b'}n_2,m_1+_b m_2}"'] & F((n_1{+}_{b'} n_2){+}(m_1{+}_b m_2))
\end{tikzcd}$$

Diagram 11 of 11. Set up but not solved.

$$a, b \in (\mathsf{A}, +, 0)$$

$$\begin{tikzcd}
U_{a+b} \arrow[r, "\mu_{a,b}"] \arrow[d, "U_\beta"'] & U_a \otimes U_b \arrow[d, "\beta'"] \\
U_{b+a} \arrow[r, "\mu_{b,a}"] & U_b \otimes U_a
\end{tikzcd}$$

The top two underlying cospans are

$$a + b \rightarrow a + b \leftarrow a + b$$

and the bottom two underyling cospans are

$$b + a \rightarrow b + a \leftarrow b + a$$

Right and then down:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] & & F(a{+}b) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[dr, bend right, "\phi\times\phi"'] \arrow[ur, phantom, "\overset{\phi}{\cong}"] & F(0){\times}F(0) \arrow[u, "\phi_{0,0}"'] \arrow[r, "F(!_a)\times F(!_b)"] \arrow[d, "\beta"] \arrow[ur, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] & F(a){\times}F(b) \arrow[r, "\phi_{a,b}"] \arrow[ur, "\phi_{a,b}"] \arrow[d, "\beta"'] \arrow[dr, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(a{+}b) \arrow[d, "F(\beta)"] \\
 & F(0){\times}F(0) \arrow[r, "F(!_b)\times F(!_a)"] & F(b){\times}F(a) \arrow[r, "\phi_{b,a}"] & F(b{+}a)
\end{tikzcd}$$

Down and then right:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] \arrow[d, "\mathrm{id}"] \arrow[drr, phantom, "\cong"] & & F(a{+}b) \arrow[d, "F(\beta)"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi"] \arrow[dr, bend right, "\phi\times\phi"'] \arrow[dr, phantom, "\overset{\phi}{\cong}"] & F(0) \arrow[rr, "F(!_{b+a})"] \arrow[dr, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] & & F(b{+}a) \arrow[d, "F(\mathrm{id})"] \\
 & F(0){\times}F(0) \arrow[u, "\phi_{0,0}"'] \arrow[r, "F(!_b)\times F(!_a)"] & F(b){\times}F(a) \arrow[r, "\phi_{b,a}"] \arrow[ur, "\phi_{b,a}"] & F(b{+}a)
\end{tikzcd}$$

First we remove the lower left commuting quarter circle in the ‘right and then down’ diagram as well as the upper left commuting quarter circle in the ‘down and then right’ diagram:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] & & F(a{+}b) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] & F(0){\times}F(0) \arrow[u, "\phi_{0,0}"'] \arrow[r, "F(!_a)\times F(!_b)"] \arrow[d, "\beta"] \arrow[ur, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] & F(a){\times}F(b) \arrow[r, "\phi_{a,b}"] \arrow[ur, "\phi_{a,b}"] \arrow[d, "\beta"'] \arrow[dr, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(a{+}b) \arrow[d, "F(\beta)"] \\
 & F(0){\times}F(0) \arrow[r, "F(!_b)\times F(!_a)"] & F(b){\times}F(a) \arrow[r, "\phi_{b,a}"] & F(b{+}a)
\end{tikzcd}$$

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] \arrow[d, "\mathrm{id}"] \arrow[drr, phantom, "\cong"] & & F(a+b) \arrow[d, "F(\beta)"] \\
1 \arrow[r, "\phi"] \arrow[dr, bend right, "\phi\times\phi"'] \arrow[dr, phantom, "\overset{\phi}{\cong}"] & F(0) \arrow[rr, "F(!_{b+a})"] \arrow[dr, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] & & F(b+a) \arrow[d, "F(\mathrm{id})"] \\
 & F(0)\times F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_b)\times F(!_a)"] & F(b)\times F(a) \arrow[ur, "\phi_{b,a}"] \arrow[r, "\phi_{b,a}"] & F(b+a)
\end{tikzcd}$$

Next we remove the lower left commuting square with sides β in the first diagram and remove the $\mathrm{id}\colon F(0) \to F(0)$ morphism in the second diagram:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] \arrow[dr, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] & & F(a+b) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] & F(0)\times F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_a)\times F(!_b)"] & F(a)\times F(b) \arrow[ur, "\phi_{a,b}"] \arrow[r, "\phi_{a,b}"] \arrow[d, "\beta"'] \arrow[dr, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(a+b) \arrow[d, "F(\beta)"] \\
 & & F(b)\times F(a) \arrow[r, "\phi_{b,a}"] & F(b+a)
\end{tikzcd}$$

$$\begin{tikzcd}
 & & & F(a+b) \arrow[d, "F(\beta)"] \\
1 \arrow[r, "\phi"] \arrow[dr, bend right, "\phi\times\phi"'] \arrow[dr, phantom, "\overset{\phi}{\cong}"] & F(0) \arrow[urr, "F(!_{a+b})"] \arrow[rr, "F(!_{b+a})"] \arrow[dr, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] & \arrow[ur, phantom, "\cong"] & F(b+a) \arrow[d, "F(\mathrm{id})"] \\
 & F(0)\times F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_b)\times F(!_a)"] & F(b)\times F(a) \arrow[ur, "\phi_{b,a}"] \arrow[r, "\phi_{b,a}"] & F(b+a)
\end{tikzcd}$$

Next we assume that our pseudofunctor F is normalized, meaning that $F(\mathrm{id})$ is an identitiy, and remove the commuting triangle with sides $\phi_{a,b}$ in the first diagram and the commuting triangle with sides $\phi_{b,a}$ in the second diagram:

$$\begin{tikzcd}
 & F(0) \arrow[rr, "F(!_{a+b})"] \arrow[dr, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] & & F(a+b) \arrow[d, "F(\mathrm{id})"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[r, "\phi\times\phi"] \arrow[ur, phantom, "\overset{\phi}{\cong}"] & F(0)\times F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_a)\times F(!_b)"] & F(a)\times F(b) \arrow[r, "\phi_{a,b}"] \arrow[d, "\beta"'] \arrow[dr, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(a+b) \arrow[d, "F(\beta)"] \\
 & & F(b)\times F(a) \arrow[r, "\phi_{b,a}"] & F(b+a)
\end{tikzcd}$$

$$\begin{tikzcd}
 & & & F(a+b) \arrow[d, "F(\beta)"] \\
1 \arrow[r, "\phi"] \arrow[dr, bend right, "\phi\times\phi"'] \arrow[dr, phantom, "\overset{\phi}{\cong}"] & F(0) \arrow[urr, "F(!_{a+b})"] \arrow[rr, "F(!_{b+a})"] \arrow[dr, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] & \arrow[ur, phantom, "\cong"] & F(b+a) \\
 & F(0)\times F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_b)\times F(!_a)"] & F(b)\times F(a) \arrow[ur, "\phi_{b,a}"] &
\end{tikzcd}$$

Next we remove the left quarter circle containing $\overset{\phi}{\cong}$ from each diagram:

$$\begin{tikzcd}
F(0) \arrow[rr, "F(!_{a+b})"] & & F(a+b) \arrow[d, "F(\mathrm{id})"] \\
F(0){\times}F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_a)\times F(!_b)"] & F(a){\times}F(b) \arrow[u, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] \arrow[r, "\phi_{a,b}"] \arrow[d, "\beta"'] & F(a+b) \arrow[d, "F(\beta)"] \\
& F(b){\times}F(a) \arrow[r, "\phi_{b,a}"] \arrow[ur, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(b+a)
\end{tikzcd}$$

$$\begin{tikzcd}
& & F(a+b) \arrow[d, "F(\beta)"] \\
F(0) \arrow[urr, "F(!_{a+b})"] \arrow[rr, "F(!_{b+a})"] & \arrow[ur, phantom, "\cong"] & F(b+a) \\
F(0){\times}F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_b)\times F(!_a)"] & F(b){\times}F(a) \arrow[ur, "\phi_{b,a}"] \arrow[ul, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] &
\end{tikzcd}$$

Making each diagram into a rectangle and removing the $F(\mathrm{id})$ from the first diagram:

$$\begin{tikzcd}
F(0) \arrow[rrr, "F(!_{a+b})"] & & & F(a+b) \arrow[d, "F(\beta)"] \\
F(0){\times}F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_a)\times F(!_b)"] & F(a){\times}F(b) \arrow[u, phantom, "\overset{\phi_{!_a,!_b}}{\cong}"] \arrow[urr, "\phi_{a,b}"] \arrow[r, "\beta"] & F(b){\times}F(a) \arrow[r, "\phi_{b,a}"] \arrow[ur, phantom, "\overset{\mu_{a,b}}{\cong}"] & F(b+a)
\end{tikzcd}$$

$$\begin{tikzcd}
F(0) \arrow[rr, "F(!_{a+b})"] \arrow[drr, "F(!_{b+a})"] & & F(a+b) \arrow[d, "F(\beta)"] \arrow[d, phantom, "\cong"'] \\
F(0){\times}F(0) \arrow[u, "\phi_{0,0}"] \arrow[r, "F(!_b)\times F(!_a)"] & F(b){\times}F(a) \arrow[ul, phantom, "\overset{\phi_{!_b,!_a}}{\cong}"] \arrow[r, "\phi_{b,a}"] & F(b+a)
\end{tikzcd}$$

Are these two diagrams the same?

Some useful maps

Given $a \in (\mathsf{A}, +, 0)$, the map $U_{\lambda_a}\colon U_{0+a} \to U_a$ is given by:

$$\begin{tikzcd}
& F(0) \arrow[rr, "F(!_{0+a})"] \arrow[dd, "F(\mathrm{id})"] & & F(0{+}a) \arrow[dd, "F(\lambda_a)"] \\
1 \arrow[ur, bend left, "\phi"] \arrow[dr, bend right, "\phi"'] & & \arrow[r, phantom, "\cong"] & \\
& F(0) \arrow[uurr, "F(!_{0+a})"] \arrow[rr, "F(!_a)"'] & & F(a)
\end{tikzcd}$$

where the $\cong$ is given by pseudonaturality of F: we have a unique map in $!_a\colon 0 \to a$ in A but also a map $\lambda_a{\circ}!_{0+a}\colon 0 \to a$ where λ_a is the left unitor of $(\mathsf{A}, +, 0)$, and so $F(!_a) = F(\lambda_a{\circ}!_{0+a}) \cong F(\lambda_a)F(!_{0+a})$.

The left unitor $\lambda'_{U_a}\colon U_0 \otimes U_a \to U_a$ is given by:

$$\begin{tikzcd}
& F(0){\times}F(0) \arrow[r, "F(!_0) \times F(!_a)"] \arrow[dd, "\phi_{0,0}"] & F(0){\times}F(a) \arrow[r, "\phi_{0,a}"] & F(0{+}a) \arrow[dd, "F(\lambda_a)"] \\
1 \arrow[ur, bend left, "\phi \times \phi"] \arrow[dr, bend right, "\phi"'] \arrow[r, phantom, "\overset{\phi}{\cong}"] & \arrow[r, phantom, "\overset{\phi_{!_0,!_a}}{\cong}"] & \arrow[r, phantom, "\cong"] & \\
& F(0) \arrow[uurr, "F(!_{0+a})"] \arrow[rr, "F(!_a)"'] & & F(a)
\end{tikzcd}$$

where the $\cong$ in the lower right is the same as the one in the first diagram.

For an arbitrary M, the left unitor $\lambda'_M\colon U_0 \otimes M \to M$ is given by:

$$\begin{tikzcd}
& F(0){\times}F(m) \arrow[r, "F(!_0) \times 1"] \arrow[dr, "\phi_{0,m}"] & F(0){\times}F(m) \arrow[r, "\phi_{0,m}"] & F(0{+}m) \arrow[dd, "F(\lambda_m)"] \\
1 \arrow[ur, bend left, "\phi_0 \times x"] \arrow[dr, bend right, "x"'] \arrow[r, phantom, "\overset{\lambda_M}{\cong}"] & & F(0{+}m) \arrow[ur, "F(!_0 + 1)"] \arrow[dr, "F(\lambda_m)"] \arrow[u, phantom, "\overset{\phi_{!_0,1}}{\cong}"] \arrow[r, phantom, "\cong"] & \\
& F(m) \arrow[rr, "\mathrm{id}"] & & F(m)
\end{tikzcd}$$

For an arbitrary M given by $a \to (m, x) \leftarrow b$, the map $\lambda_M\colon U_b \odot M \to M$ is given by:

$$\begin{tikzcd}
& F(m){\times}F(0) \arrow[r, "1 \times F(!_b)"] \arrow[dr, "\phi_{m,0}"] & F(m){\times}F(b) \arrow[r, "\phi_{m,b}"] & F(m{+}b) \arrow[r, "F(\psi)"] & F(m{+_b}b) \arrow[dd, "F(\kappa)"] \\
1 \arrow[ur, bend left, "x \times \phi_0"] \arrow[dr, bend right, "x"'] \arrow[r, phantom, "\overset{\lambda_M}{\cong}"] & & F(m{+}0) \arrow[ur, "F(1{+}!_b)"] \arrow[drr, "F(\lambda_m)"] \arrow[u, phantom, "\overset{\phi_{1,!_b}}{\cong}"] & \arrow[r, phantom, "\cong"] & \\
& F(m) \arrow[rrr, "\mathrm{id}"] & & & F(m)
\end{tikzcd}$$

In particular, if $M = U_0$ above, then the map $\lambda_{U_0}\colon U_0 \odot U_0 \to U_0$ is given by:

$$\begin{tikzcd}
& F(0){\times}F(0) \arrow[r, "F(!_0) \times F(!_0)"] \arrow[dr, "\phi_{0,0}"] & F(0){\times}F(0) \arrow[r, "\phi_{0,0}"] & F(0{+}0) \arrow[r, "F(\psi)"] & F(0{+_0}0) \arrow[dd, "F(\kappa)"] \\
1 \arrow[ur, bend left, "\phi_0 \times \phi_0"] \arrow[dr, bend right, "\phi_0"'] \arrow[r, phantom, "\overset{\lambda_M}{\cong}"] & & F(0{+}0) \arrow[ur, "F(!_0{+}!_0)"] \arrow[drr, "F(\lambda_0)"] \arrow[u, phantom, "\overset{\phi_{!_0,!_0}}{\cong}"] & \arrow[r, phantom, "\cong"] & \\
& F(0) \arrow[rrr, "\mathrm{id}"] & & & F(0)
\end{tikzcd}$$