$$z{:}g \in D{\times}G \xrightarrow[\text{mult}]{} C \ni {}^{z}C_{g}$$

$${}^{z}C_{g\acute{g}} = {}^{z}C_{g}\ {}^{zg}C_{\acute{g}}$$

GCD

$${}^{zg}C_{wg} = {}^{w}\overset{*}{C}_{g}\ {}^{z}C_{w}\ {}^{z}C_{g} \in C^{\mathbb{C}}$$

$$\begin{array}{ccc}
C^{\chi}\bowtie D^{\nu} & \xrightarrow[{}^{z}D^{\nu}_{w}]{{}^{z}C^{\chi}_{w}} & C^{\chi}\bowtie D^{\nu} \\
{\scriptstyle {}^{z}C^{\chi}_{g}\,|\,{}^{z}D^{\nu}_{g}}\ \Big\uparrow & & \Big\downarrow\ {\scriptstyle {}^{w}\overset{*}{C}{}^{\chi}_{g}\,|\,{}^{w}\overset{*}{D}{}^{\nu}_{g}} \\
C^{\chi}\bowtie D^{\nu} & \xrightarrow[{}^{zg}D^{\nu}_{wg}]{{}^{zg}C^{\chi}_{wg}} & C^{\chi}\bowtie D^{\nu}
\end{array}$$

$$\text{LHS} = {}^{o}_{C}\overset{*}{\mathfrak{g}}_{zg}\, I\, {}^{o}_{C}\mathfrak{g}_{zg} = {}^{o}_{C}\underbrace{k\overset{*}{\mathfrak{g}}_{z}g}\, I\, {}^{o}_{C}\underbrace{k\mathfrak{g}_{z}g} = \overbrace{{}^{o}_{C}k\,{}^{o}_{C}\mathfrak{g}_{z}\,{}^{z}_{C}g}^{*}\, I\, {}^{o}_{C}k\ {}^{o}_{C}\mathfrak{g}_{z}\ {}^{z}_{C}g = {}^{z}_{C}\overset{*}{g}\ {}^{o}_{C}\overset{*}{\mathfrak{g}}_{z}\ {}^{o}_{C}\overset{*}{k}\, I\, {}^{o}_{C}k\ {}^{o}_{C}\mathfrak{g}_{z}\ {}^{z}_{C}g = {}^{z}_{C}\overset{*}{g}\ {}^{o}_{C}\overset{*}{\mathfrak{g}}_{z}\, I\, {}^{o}_{C}\mathfrak{g}_{z}\ {}^{z}_{C}g = \text{RHS}$$