

$$L_M := \text{Left Ideals of } M \forall M \in Ob(Monoid)$$

$$\begin{aligned}
L_M = \{M, \emptyset\} \wedge (e \in X \implies X = M \forall X \in L_M) &\implies \\
\{X \in L_M \mid e \notin X\} = \{\emptyset\} &\implies \\
\forall x \in M, \exists y \in M \mid x \times y = e &\implies \\
M \in Ob(Grp) &
\end{aligned}
\tag{from}$$

$$\begin{aligned}
M \in Ob(Grp) &\implies \\
\forall x \in M, \exists y \in M \mid x \times y = e &\implies \\
\forall X \in L_M \setminus \emptyset, e \in X &\implies \\
\forall X \in L_M \setminus \emptyset, X = M &\implies \\
L_M = \{M, \emptyset\} &
\end{aligned}
\tag{to}$$

$$L_M = \{M, \emptyset\} \cong M \in Ob(Grp)$$