

# l63\_oppcat\_1

(TMGXgyi77gGLD6XdJq3iypX7r2X2iSctYiD)

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Let  $v2\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v11\_struct\_0 : \iota \Rightarrow o$  be given. Let  $v2\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v3\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v4\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v5\_cat\_1 : \iota \Rightarrow o$  be given. Let  $v6\_cat\_1 : \iota \Rightarrow o$  be given. Let  $l1\_cat\_1 : \iota \Rightarrow o$  be given. Let  $m2\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $m1\_subset\_1 : \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $u1\_struct\_0 : \iota \Rightarrow \iota$  be given. Let  $k2\_oppcat\_1 : \iota \Rightarrow \iota$  be given. Let  $k3\_funct\_2 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $u4\_struct\_0 : \iota \Rightarrow \iota$  be given. Let  $k10\_oppcat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k7\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_oppcat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k3\_oppcat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $v1\_funct\_1 : \iota \Rightarrow o$  be given. Let  $v1\_funct\_2 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k1\_zfmisc\_1 : \iota \Rightarrow \iota$  be given. Let  $k2\_zfmisc\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k5\_oppcat\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $m1\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow o$  be given. Let  $k3\_graph\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_graph\_1 : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k4\_tarski : \iota \Rightarrow \iota \Rightarrow \iota$  be given. Let  $k9\_xtuple\_0 : \iota \Rightarrow \iota$  be given. Let  $u1\_cat\_1 : \iota \Rightarrow \iota$  be given. Let  $k1\_cat\_1 : \iota \Rightarrow \iota \Rightarrow \iota \Rightarrow \iota$  be given. Assume the following.

$$\begin{aligned}
& \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\
& X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\
& X0) \wedge (l1\_cat\_1 X0))))))) \Rightarrow (\forall X1. ((\neg v2\_struct\_0 X1) \wedge (( \\
& \neg v11\_struct\_0 X1) \wedge ((v2\_cat\_1 X1) \wedge ((v3\_cat\_1 X1) \wedge ((v4\_cat\_1 \\
& X1) \wedge ((v5\_cat\_1 X1) \wedge ((v6\_cat\_1 X1) \wedge (l1\_cat\_1 X1))))))) \Rightarrow (\forall X2. \\
& (m2\_cat\_1 X2 X0 X1) \Rightarrow (\forall X3. (m1\_subset\_1 X3 (u1\_struct\_0 X0)) \Rightarrow \\
& (\forall X4. (m1\_subset\_1 X4 (u1\_struct\_0 X1)) \Rightarrow ((k3\_funct\_2 ( \\
& u4\_struct\_0 X0) (u4\_struct\_0 X1) X2 (k4\_cat\_1 X0 X3) = k4\_cat\_1 X1 \\
& X4) \Rightarrow (k3\_funct\_2 (u1\_struct\_0 X0) (u1\_struct\_0 X1) (k7\_cat\_1 X0 \\
& X1 X2) X3 = X4))))))
\end{aligned} \tag{1}$$

Assume the following.

$$\begin{aligned}
& \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\
& X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\
& X0) \wedge (l1\_cat\_1 X0))))))) \Rightarrow (\forall X1. (m1\_subset\_1 X1 (u1\_struct\_0 \\
& X0)) \Rightarrow (k2\_oppcat\_1 X0)) \Rightarrow (k3\_oppcat\_1 X0 (k4\_oppcat\_1 X0 X1) = X1))
\end{aligned} \tag{2}$$

Assume the following.

$$\begin{aligned}
& \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\
& X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\
& X0) \wedge (l1\_cat\_1 X0))))))) \Rightarrow (\forall X1.((\neg v2\_struct\_0 X1) \wedge (( \\
& \neg v11\_struct\_0 X1) \wedge ((v2\_cat\_1 X1) \wedge ((v3\_cat\_1 X1) \wedge ((v4\_cat\_1 \\
& X1) \wedge ((v5\_cat\_1 X1) \wedge ((v6\_cat\_1 X1) \wedge (l1\_cat\_1 X1))))))) \Rightarrow (\forall X2. \\
& ((v1\_funct\_1 X2) \wedge ((v1\_funct\_2 X2 (u4\_struct\_0 X0) (u4\_struct\_0 \\
& X1)) \wedge (m1\_subset\_1 X2 (k1\_zfmisc\_1 (k2\_zfmisc\_1 (u4\_struct\_0 \\
& X0) (u4\_struct\_0 X1)))))) \Rightarrow (\forall X3.(m1\_subset\_1 X3 (u4\_struct\_0 \\
& X0)) \Rightarrow (k3\_funct\_2 (u4\_struct\_0 (k2\_oppcat\_1 X0)) (u4\_struct\_0 \\
& X1) (k10\_oppcat\_1 X0 X1 X2) (k5\_oppcat\_1 X0 X3) = k3\_funct\_2 (u4\_struct\_0 \\
& X0) (u4\_struct\_0 X1) X2 X3)))
\end{aligned} \tag{3}$$

Assume the following.

$$\begin{aligned}
& \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\
& X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\
& X0) \wedge (l1\_cat\_1 X0))))))) \Rightarrow (\forall X1.(m1\_subset\_1 X1 (u1\_struct\_0 \\
& X0)) \Rightarrow (k4\_cat\_1 X0 X1 = k4\_cat\_1 (k2\_oppcat\_1 X0) (k3\_oppcat\_1 X0 \\
& X1)))
\end{aligned} \tag{4}$$

Assume the following.

$$\begin{aligned}
& \forall X0. \forall X1. (((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\
& ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\
& ((v6\_cat\_1 X0) \wedge (l1\_cat\_1 X0))))))) \wedge ((\neg v2\_struct\_0 X1) \wedge ((\neg \\
& v11\_struct\_0 X1) \wedge ((v2\_cat\_1 X1) \wedge ((v3\_cat\_1 X1) \wedge ((v4\_cat\_1 X1) \wedge \\
& ((v5\_cat\_1 X1) \wedge ((v6\_cat\_1 X1) \wedge (l1\_cat\_1 X1)))))))))) \Rightarrow (\forall X2. \\
& (m2\_cat\_1 X2 X0 X1) \Rightarrow ((v1\_funct\_1 X2) \wedge ((v1\_funct\_2 X2 (u4\_struct\_0 \\
& X0) (u4\_struct\_0 X1)) \wedge (m1\_subset\_1 X2 (k1\_zfmisc\_1 (k2\_zfmisc\_1 \\
& (u4\_struct\_0 X0) (u4\_struct\_0 X1)))))))
\end{aligned} \tag{5}$$

Assume the following.

$$\begin{aligned}
& \forall X0. \forall X1. \forall X2. (((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 \\
& X0) \wedge (l1\_cat\_1 X0))) \wedge ((m1\_subset\_1 X1 (u1\_struct\_0 X0)) \wedge (m1\_subset\_1 \\
& X2 (u1\_struct\_0 X0)))) \Rightarrow (\forall X3.(m1\_cat\_1 X3 X0 X1 X2) \Rightarrow (m1\_subset\_1 \\
& X3 (u4\_struct\_0 X0)))
\end{aligned} \tag{6}$$

Assume the following.

$$\begin{aligned}
& \forall X0. \forall X1. (((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\
& ((v2\_cat\_1 X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge \\
& ((v6\_cat\_1 X0) \wedge (l1\_cat\_1 X0))))))) \wedge (m1\_subset\_1 X1 (u1\_struct\_0 \\
& (k2\_oppcat\_1 X0)))) \Rightarrow (m1\_subset\_1 (k4\_oppcat\_1 X0 X1) (u1\_struct\_0 \\
& X0))
\end{aligned} \tag{7}$$

Assume the following.

$$\begin{aligned} & \forall X0. \forall X1. (((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge \\ & ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 X0) \wedge (l1\_cat\_1 X0)))))) \wedge (m1\_subset\_1 \\ & X1 (u1\_struct\_0 X0)) \Rightarrow (m1\_cat\_1 (k4\_cat\_1 X0 X1) X0 X1 X1) \end{aligned} \quad (8)$$

Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge (l1\_cat\_1 X0)))))))) \Rightarrow (\forall X1. (m1\_subset\_1 X1 (u4\_struct\_0 \\ & X0)) \Rightarrow (k5\_oppcat\_1 X0 X1 = X1)) \end{aligned} \quad (9)$$

Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge (l1\_cat\_1 X0)))))))) \Rightarrow (\forall X1. (m1\_subset\_1 X1 (u1\_struct\_0 \\ & X0)) \Rightarrow (k3\_oppcat\_1 X0 X1 = X1)) \end{aligned} \quad (10)$$

Assume the following.

$$\begin{aligned} & \forall X0. ((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge (l1\_cat\_1 X0)))))))) \Rightarrow (\forall X1. ((\neg v2\_struct\_0 X1) \wedge (( \\ & \neg v11\_struct\_0 X1) \wedge ((v2\_cat\_1 X1) \wedge ((v3\_cat\_1 X1) \wedge ((v4\_cat\_1 \\ & X1) \wedge ((v5\_cat\_1 X1) \wedge ((v6\_cat\_1 X1) \wedge (l1\_cat\_1 X1)))))))) \Rightarrow (\forall X2. \\ & ((v1\_funct\_1 X2) \wedge ((v1\_funct\_2 X2 (u4\_struct\_0 X0) (u4\_struct\_0 \\ & X1)) \wedge (m1\_subset\_1 X2 (k1\_zfmisc\_1 (k2\_zfmisc\_1 (u4\_struct\_0 \\ & X0) (u4\_struct\_0 X1)))))) \Rightarrow ((m2\_cat\_1 X2 X0 X1) \Leftrightarrow ((\forall X3. ( \\ & m1\_subset\_1 X3 (u1\_struct\_0 X0)) \Rightarrow (\exists X4. (m1\_subset\_1 X4 \\ & (u1\_struct\_0 X1) \wedge (k3\_funct\_2 (u4\_struct\_0 X0) (u4\_struct\_0 \\ & X1) X2 (k4\_cat\_1 X0 X3) = k4\_cat\_1 X1 X4))) \wedge ((\forall X3. (m1\_subset\_1 \\ & X3 (u4\_struct\_0 X0)) \Rightarrow ((k3\_funct\_2 (u4\_struct\_0 X0) (u4\_struct\_0 \\ & X1) X2 (k4\_cat\_1 X0 (k3\_graph\_1 X0 X3)) = k4\_cat\_1 X1 (k3\_graph\_1 \\ & X1 (k3\_funct\_2 (u4\_struct\_0 X0) (u4\_struct\_0 X1) X2 X3))) \wedge (k3\_funct\_2 \\ & (u4\_struct\_0 X0) (u4\_struct\_0 X1) X2 (k4\_cat\_1 X0 (k4\_graph\_1 X0 \\ & X3)) = k4\_cat\_1 X1 (k4\_graph\_1 X1 (k3\_funct\_2 (u4\_struct\_0 X0) ( \\ & u4\_struct\_0 X1) X2 X3)))))) \wedge (\forall X3. (m1\_subset\_1 X3 (u4\_struct\_0 \\ & X0)) \Rightarrow (\forall X4. (m1\_subset\_1 X4 (u4\_struct\_0 X0)) \Rightarrow ((k4\_tarski \\ & X4 X3 \in k9\_xtuple\_0 (u1\_cat\_1 X0)) \Rightarrow (k3\_funct\_2 (u4\_struct\_0 X0) \\ & (u4\_struct\_0 X1) X2 (k1\_cat\_1 X0 X3 X4) = k1\_cat\_1 X1 (k3\_funct\_2 \\ & (u4\_struct\_0 X0) (u4\_struct\_0 X1) X2 X3) (k3\_funct\_2 (u4\_struct\_0 \\ & X0) (u4\_struct\_0 X1) X2 X4)))))))))) \end{aligned} \quad (11)$$

**Theorem 1**

$$\begin{aligned} & \forall X0.((\neg v2\_struct\_0 X0) \wedge ((\neg v11\_struct\_0 X0) \wedge ((v2\_cat\_1 \\ & X0) \wedge ((v3\_cat\_1 X0) \wedge ((v4\_cat\_1 X0) \wedge ((v5\_cat\_1 X0) \wedge ((v6\_cat\_1 \\ & X0) \wedge (l1\_cat\_1 X0)))))))) \Rightarrow (\forall X1.((\neg v2\_struct\_0 X1) \wedge (( \\ & \neg v11\_struct\_0 X1) \wedge ((v2\_cat\_1 X1) \wedge ((v3\_cat\_1 X1) \wedge ((v4\_cat\_1 \\ & X1) \wedge ((v5\_cat\_1 X1) \wedge ((v6\_cat\_1 X1) \wedge (l1\_cat\_1 X1)))))))) \Rightarrow (\forall X2. \\ & (m2\_cat\_1 X2 X0 X1) \Rightarrow (\forall X3.(m1\_subset\_1 X3 (u1\_struct\_0 ( \\ & k2\_oppcat\_1 X0))) \Rightarrow (k3\_funct\_2 (u4\_struct\_0 (k2\_oppcat\_1 X0)) \\ & (u4\_struct\_0 X1) (k10\_oppcat\_1 X0 X1 X2) (k4\_cat\_1 (k2\_oppcat\_1 \\ & X0) X3) = k4\_cat\_1 X1 (k3\_funct\_2 (u1\_struct\_0 X0) (u1\_struct\_0 \\ & X1) (k7\_cat\_1 X0 X1 X2) (k4\_oppcat\_1 X0 X3)))))) \end{aligned}$$