

causal_order^{4,23}

$$\text{causal_order}(L;R;P;Q) \equiv_{\text{def}} \forall i:\mathbb{N}_{<\|L\|}. Q(i) \Rightarrow (\exists j:\mathbb{N}_{<\|L\|}. j \leq i \ \& \ P(j) \ \& \ R(j,i))$$

clarification:

$$\text{causal_order}(L;R;P;Q) \equiv_{\text{def}} \forall i:\{0..\|L\|^{-}\}. Q(i) \Rightarrow (\exists j:\{0..\|L\|^{-}\}. j \leq i \ \& \ P(j) \ \& \ R(j,i))$$