

$$\text{Tr}_{\mathbf{P}, \mathbf{Q}}^{\mathbf{R}}(\mathbf{d}) : \mathbf{P}^{\text{op}} \times \mathbf{Q} \rightarrow_{\mathbf{Pos}} \mathbf{Bool},$$

$$\langle p^*, q \rangle \mapsto \bigvee_{r \in \mathbf{R}} \mathbf{d}(\langle p, r \rangle^*, \langle q, r \rangle).$$