$$\operatorname{Tr}_{\mathbf{A},\mathbf{B}}^{\mathbf{C}}(\mathbf{f}): \mathbf{A}^{\operatorname{op}} \times \mathbf{B} \to_{\mathbf{Pos}} \mathbf{Bool}$$

$$\langle a^*, b \rangle \mapsto \sqrt{\mathbf{f}(\langle a, c \rangle^*, \langle b, c \rangle)}.$$