Definition (Transpose of a relation). Let $R \subseteq \mathbf{A} \times \mathbf{B}$ be a relation. The *transpose* (or *opposite*, or *reverse*) of R is the relation given by:

$$R^{\intercal} := \{\langle y, x\rangle \in \mathbf{B} \times \mathbf{A} \mid \langle x, y\rangle \in R\}.$$

note that $R^{\intercal} : \mathbf{B} \to \mathbf{A}$, while $R : \mathbf{A} \to \mathbf{B}$.