Define $\beta : R \to R$ by

$$\beta\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} a & nc \\ b/n & d \end{pmatrix}.$$

A direct calculation shows that β is an involution on R. An involution γ on S can be defined similarly. Now consider the transpose map $t : R \to S$, which is an anti-isomorphism. By composing $R \xrightarrow{\beta} R \xrightarrow{t} S$, we obtain an isomorphism $\alpha' : R \to S$ given by

$$\alpha'\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} a & b/n \\ nc & d \end{pmatrix}.$$