Non-relations that require discussion - the well-definedness of the "shielding" procedure.

A preliminary: Writing \( B^+ \) in terms of \( R, R^{-}, \Phi_{33}, \Phi_{22}, \Phi_{11} \).

Relations: 1. The symmetries of \( T_{(a)} \) & \( B \).

2. Invariance under \( R_{234} \).

3. Compatibility with \( d, u, \# \).

4. Idempotence.

\[
\begin{align*}
R^{-} &= \Phi_{33} & R^{-} &= \Phi_{22} & B^{+} &= \Phi_{11} & B^{-} &= \Phi_{11} \\
R &= \Phi_{33} & B &= \Phi_{22} & X^{+} &= \Phi_{11} & X^{-} &= \Phi_{11}
\end{align*}
\]

Sweedler notation:

\[
\Phi_{123} \cdot (1 \otimes \Delta \otimes 1) (\Phi) \cdot \Phi_{234} = (\Delta \otimes 1 \otimes 1) (\Phi) \cdot (1 \otimes 1 \otimes \Delta)(\Phi)
\]

\[
(\Phi_{12} \Phi_{23} \Phi_{31} \Phi_{21} \Phi_{32} \Phi_{21} \Phi_{32} \Phi_{21}, \Phi_{33} \Phi_{33}) = (\Phi_{13} \Phi_{13} \Phi_{13} \Phi_{13} \Phi_{13} \Phi_{13} \Phi_{13} \Phi_{13})
\]

Idempotence for \( \Delta \):

- Seems like the empty equation, \( \Phi = \Phi_{33} \)

Idempotence for \( R \):

(also trivial)
This is:

\[ \begin{array}{c}
\text{tet} \\
\end{array} \]

\[ \begin{array}{c}
\text{triangle}
\end{array} \]

Claim there is no automorphism of tet that carries

\[ \begin{array}{c}
\text{tet}
\end{array} \]

to

\[ \begin{array}{c}
\text{triangle}
\end{array} \]

is obvious.
Aside: Can I generate $A_4$ using elements of order 2?

$$(12)(34) \cdot (13)(24) = (14)(23) \quad \text{No.}$$