

Fully Truncated Simplices

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If you truncate an equilateral triangle $\{3\}$ to its edge midpoints you get another, smaller $\{3\}$. If you truncate a regular tetrahedron $\{3, 3\}$ to its edge midpoints, you get (a little unexpectedly) a regular octahedron $\{3, 4\}$. In higher ranks, the fully truncated n -simplex \mathcal{T}_n is no longer regular, though it is uniform with facets of two types.

We want to understand the minimal regular cover \mathcal{R}_n of \mathcal{T}_n , which in turn means we need to understand its monodromy group $M_n := \text{Mon}(\mathcal{T}_n)$. For $n \geq 4$, we ‘know’ that this group has Schläfli type $\{3, 12, 3, \dots, 3\}$ and the impressive order

$$\frac{[(n+1)!]^{n-1} \cdot (n-1)!}{2^{n-2}}$$

I will discuss all this and report on the current state of my confusion amongst all this fun. (How can one call mathematics ‘work’?)