Abstract. The classical Hurwitz enumeration problem has a presentation in terms of transitive factorizations in the symmetric group. This presentation suggests a generalization from type $A$ to other finite reflection groups and, in particular, to type $B$. We study this generalization both from a combinatorial and a geometric point of view, with the prospect of providing a means of understanding more of the structure of the moduli spaces of maps with an $S_2$-symmetry. The type $A$ case has been well studied and connects Hurwitz numbers to the moduli space of curves. We conjecture an analogous setting for the type $B$ case that is studied here.