Hint for Problem 286

Before you try to show that $\overline{\overline{\sigma}}$ actually is a permutation of the colorings, it would be useful to verify the second part of the definition of a group action, namely that $\overline{\overline{\sigma}} \circ \overline{\overline{\varphi}} = \overline{\overline{\sigma} \circ \overline{\varphi}}$