

MATHEMATICS IN KALEIDOSCOPES

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ABSTRACT

A kaleidoscope is an optical instrument, typically a children's toy, in which colored crystals are placed at the end of a long prism of mirrors. The reflection of these crystals in the mirrors create a beautiful assortment of colors and patterns. This phenomenon is an example of motions of the plane being generated by reflections. In mathematics, these reflections form a group, called a reflection group. There is one physical chamber in the kaleidoscope, which is reflected in the mirrors to create several non-overlapping virtual chambers that cover the plane. Any such chamber in the kaleidoscope is an example of a fundamental domain for the reflection group. In this talk, I will describe some reflection groups and fundamental domains in three different spaces, focusing on the dimension two. These spaces are the Euclidean plane, the two-dimensional sphere, and the hyperbolic (or Lobachevskian) plane, which have zero, positive, and negative constant curvature, respectively.