

# MAT2000 Project: Tilings

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A tiling is a covering of Euclidean space in a non-overlapping way using a set of basic tiles. Some sets of tiles only admit tilings that lack translational symmetry, and such tilings are called *aperiodic*. The study of aperiodic tilings is an active area of mathematics with connections to Fourier analysis and crystallography.

This project concerns the (non)existence of aperiodic tilings, and there are several possible directions. A first goal of this project could be to study tilings that use only one tile, so-called monotilings. If we require that this tile is convex and only allow translations, then a theorem of Venkov and McMullen states that aperiodic tilings do not exist. On the other hand, if rotations are allowed as well as translations, it was an open problem until recently whether aperiodic tilings exists; this is known as the Einstein problem.

**Suggested reading:** Aperiodic Order Volume 1: A Mathematical Invitation by Baake and Grimm, and *Convex bodies which tile space by translation* by P. McMullen (Mathematika, Volume 27, Issue 1, June 1980, pp. 113 - 121).

**Prerequisites:** MAT2200 (Groups, rings and fields), MAT3500 (Topology).

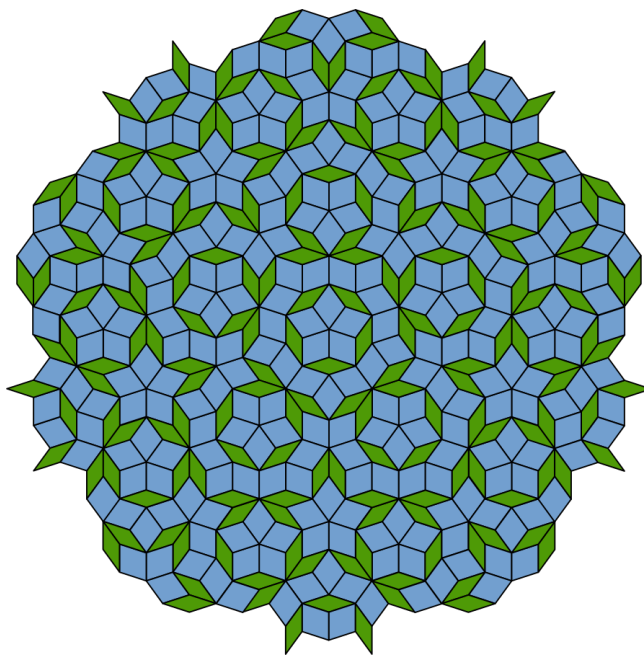


Figure 1: The Penrose tiling (P3).