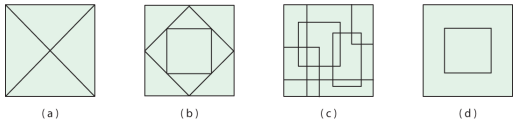
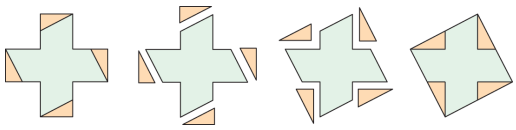
Computational Geometry

Dissection

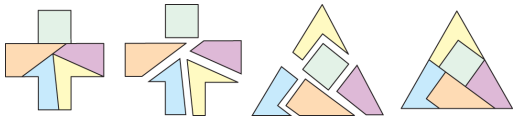
Dissections of a Square



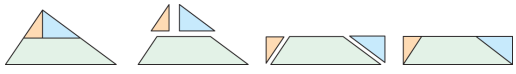
Greek Cross to Square



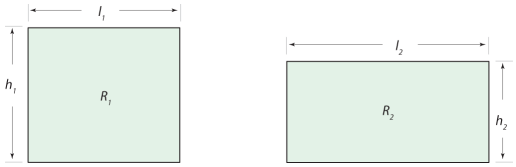
Greek Cross to Triangle



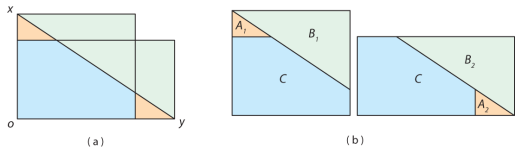
Triangle ⇔ Rectangle



Two Rectangles of the Same Area

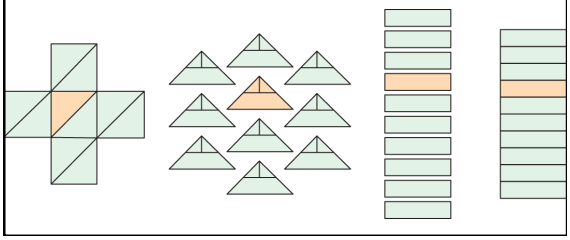


Rectangle ⟺ Rectangle

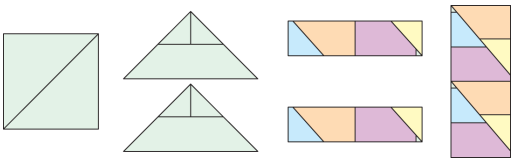


Greek Cross ⟺ Rectangle

- Any two polygons of the same area are scissors congruent



Square ⟺ Rectangle



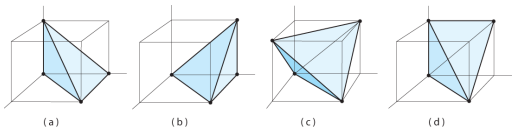
Open Problem

- For each positive integer *n*, is it always possible to partition a given convex polygon into *n* convex pieces such that each piece has the same area and the same perimeter?
- Solved for $n = 2$, $n = 3$, $n = 2^k$ and $n = p^k$

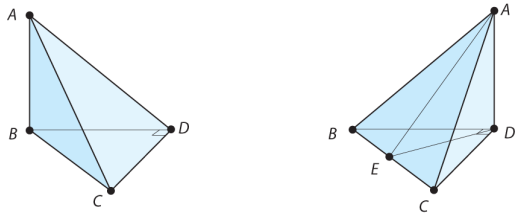
3D Dissections

- One of Hilbert's original 23 problems in 1900.
- #3: Given any two polyhedra of equal volume, is it always possible to cut the first into finitely many pieces which can be reassembled into the second?
- Proved by Max Dehn, by counter example.

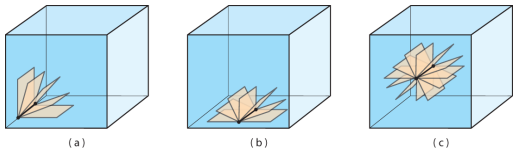
Dihedral Angle



Irrational Dihedral Angle



Dehn Invariant



Tetrahedron ⟺ Prism