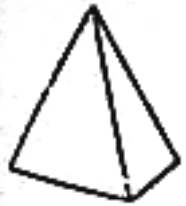


# Polyhedra and Their Nets

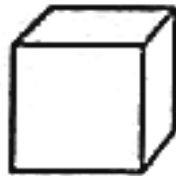
Alexandra Lamtyugina

# Problem

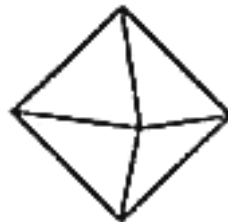
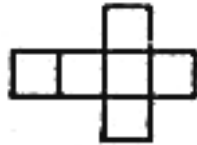
- Polyhedron nets



TETRAHEDRON



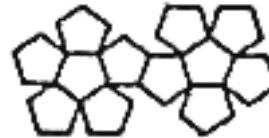
HEXAHEDRON



OCTAHEDRON



DODECAHEDRON



ICOSAHEDRON



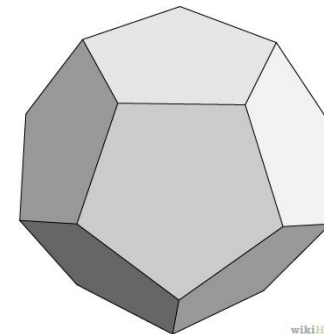
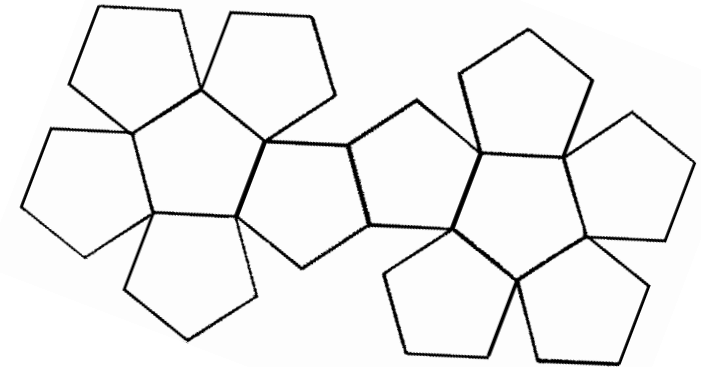
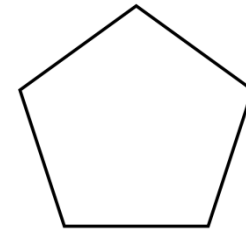
- Open problem: Durer's Conjecture

# Motivation

- Modular polyhedron origami



MQYKLILNGKTLKGETTTEAVDAATAEKVFKQYA  
NDNGVDGEWYDDATKTFTVTE



wikiHow

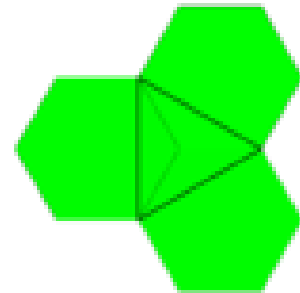
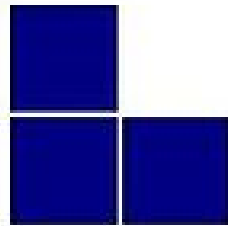
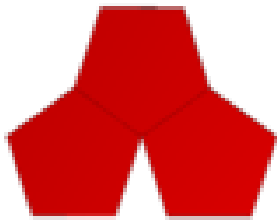
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<http://www.mathstuff.com/math/spoken/here/2class/160/gif/hedr12.gif>  
<http://www.rcsb.org/pdb/explore/jmol.do?structureId=2QMT>

# Methodology

- Defined dihedral angle
- Define vertices in an array
- Translate vertices of each face along common edge to another face
- Repeat for all faces

# Analysis of Net

- Angular defect



- Euler characteristic

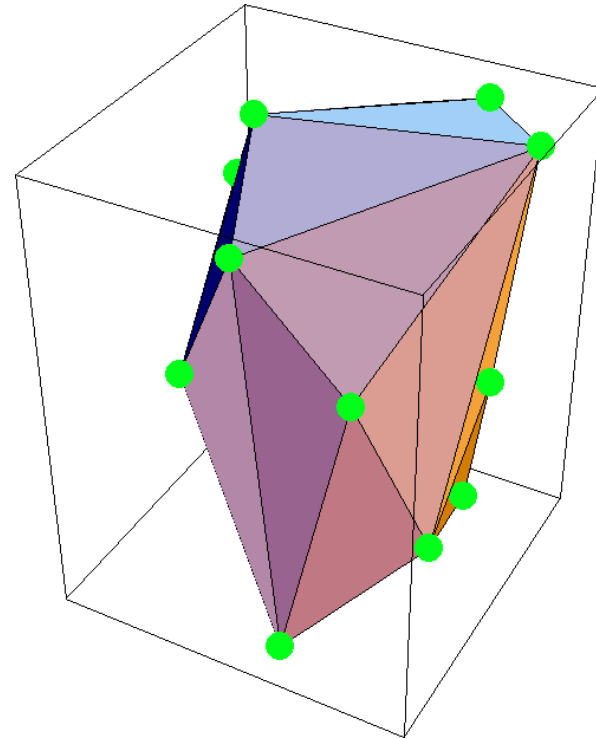
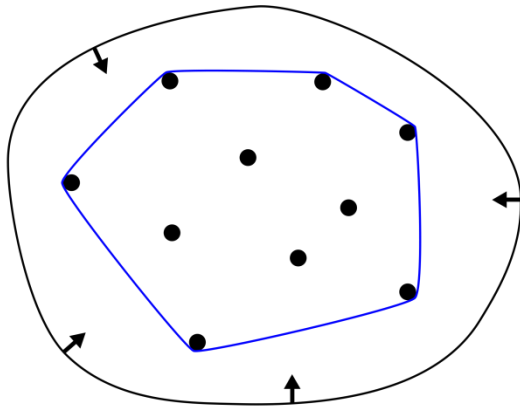
$$V - E + F = 2$$

- Descartes' theorem

$$V = 720^\circ / (\text{angular defect})$$

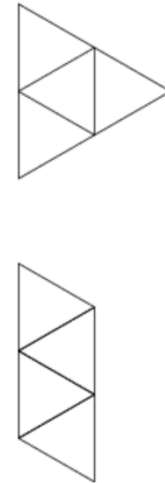
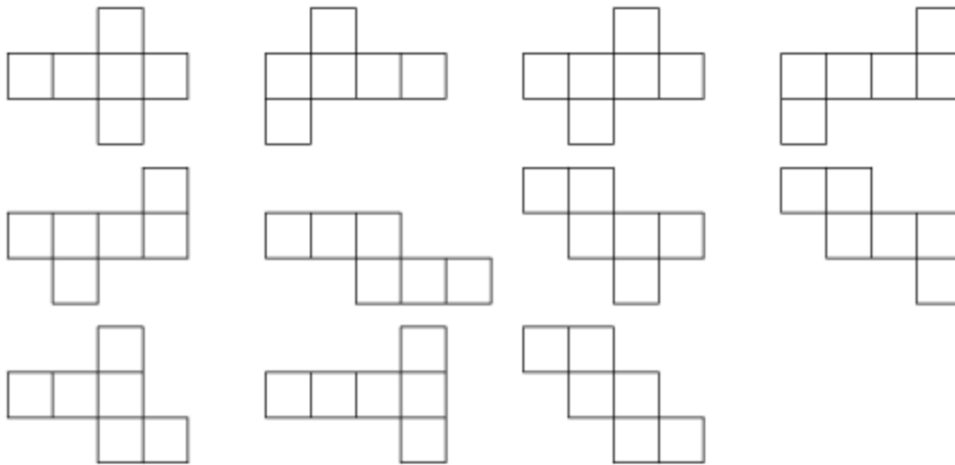
# Restrictions

- Convex – convex hull



# Restrictions

- Faces: regular polygons



- Deltahedra