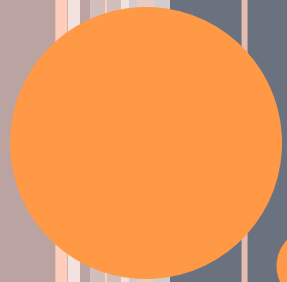


GEOMETRY

Jonathan L. Brendefur, Ph.D.
Sam Strother, MA.E.

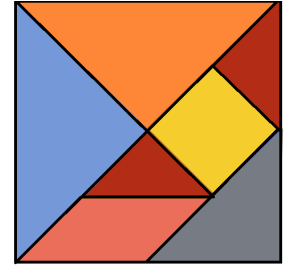
Boise State University





TANGRAMS

TANGRAMS



- A Tangram is an ancient, unique, Chinese puzzle that consists of seven (geometric) pieces.
 - 1 square, 5 triangles, 1 parallelogram
- Focusing on area, what are the relationships among the geometric pieces?
- Focusing on angle measurement, what are the relationships among the geometric pieces?



TANGRAMS

○ Area relationships

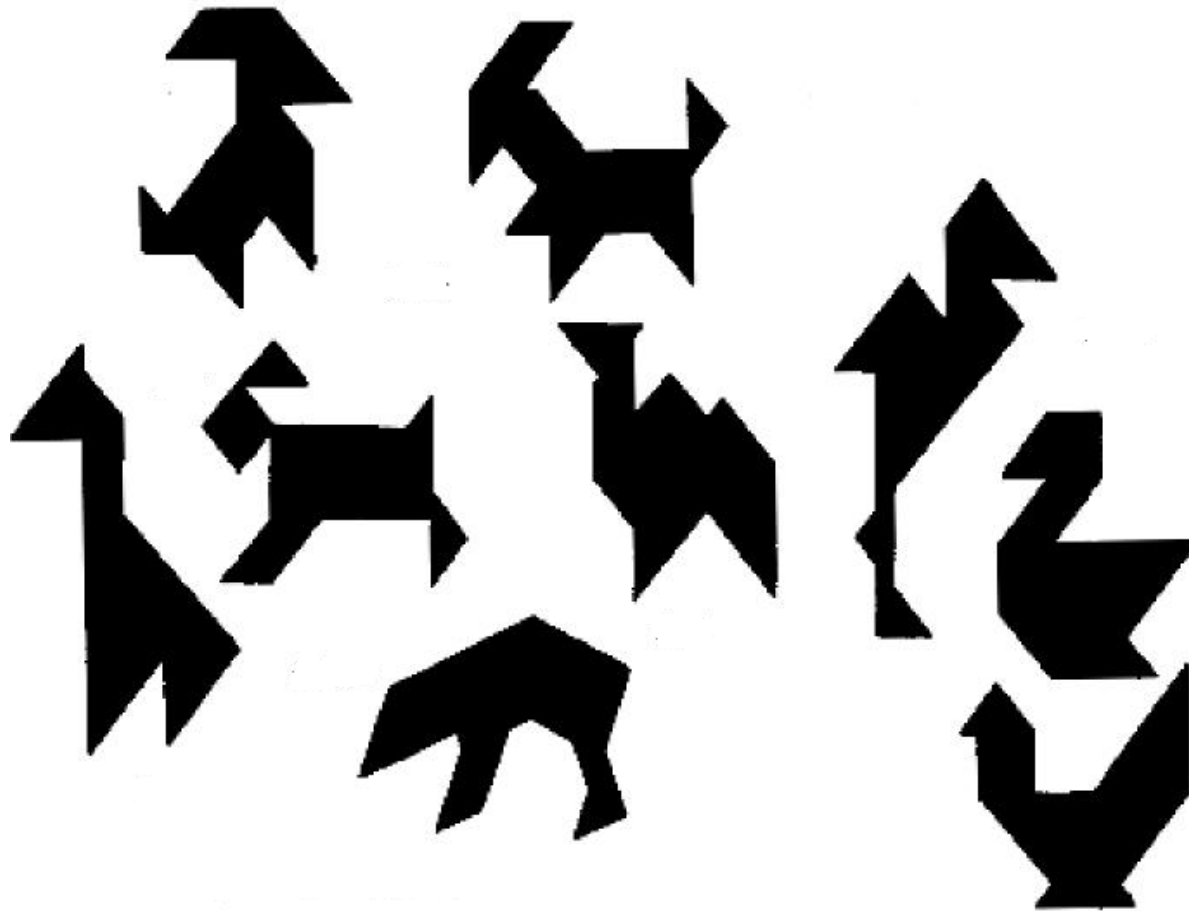
- The large triangle is twice the area of the medium triangle
- The medium triangle, the square, and the parallelogram are each twice the area of a small triangle

○ Measurements

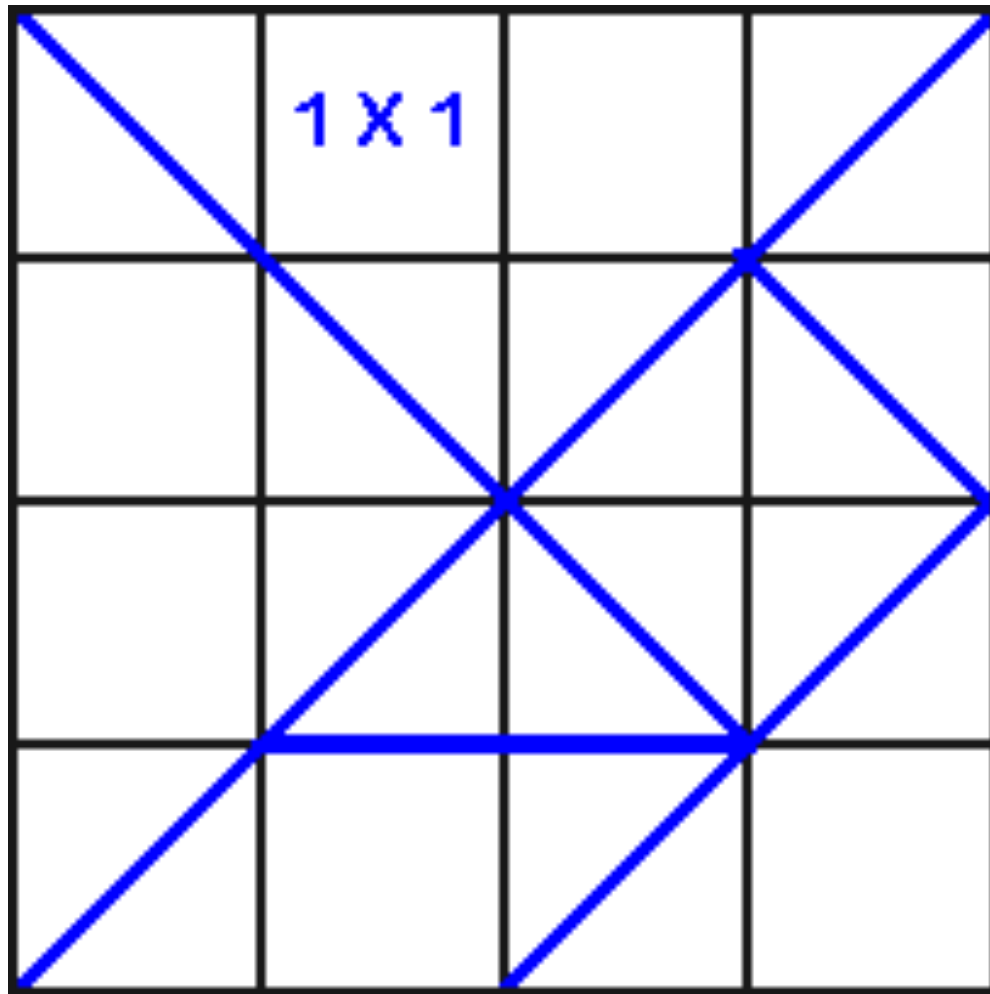
- Each measure of the square measures 90°
- Since each triangle contains a 90° and two 45° angles, they are isosceles right triangles, and the two sides opposite the 45° angles are congruent.
- The parallelogram contains 45° and 135° angles.

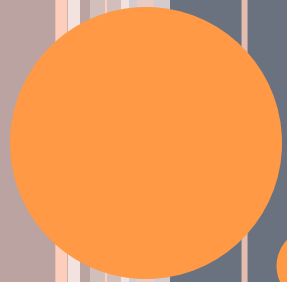


TANGRAM ANIMALS



TANGRAM CUTOUT





STRUCTURAL IDEAS

PROGRESSION OF THINKING ABOUT RELATIONSHIPS

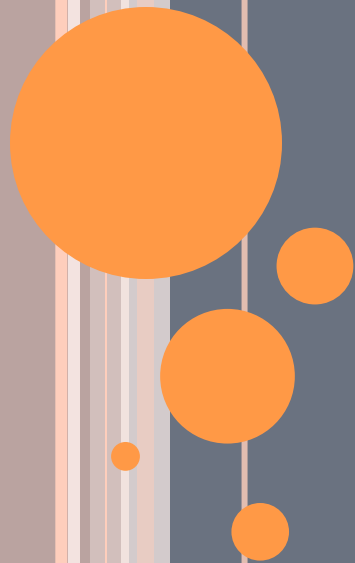
- Students' shape concept consists of the appearance of a single prototype
- Students' shape concept consists of a single prototype and its properties
- Students' shape concept consists of many exemplars and a set of critical properties



THE STRUCTURE OF GEOMETRY

- Space (Describing the world around us)
 - Measuring
 - Maneuvering
 - Transformations
 - Locations
 - Boundaries
 - Defining or Describing Space (including visualization)
 - Dimensions
 - 2-d, 3-d
- Shapes
 - Attributes and properties
 - Composing/Decomposing
 - Congruency and similarity
 - Growing and Shrinking
 - Transformation

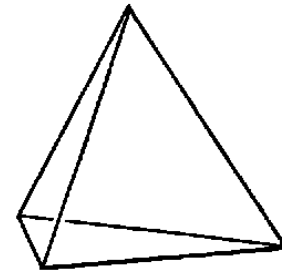




BUILDING NETS

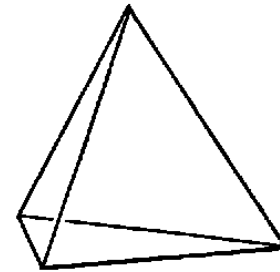
NETS

- A “Net” is a two-dimensional layout of a three-dimensional polyhedron.
- Use a circle compass, a ruler, (compass), and paper to create a net for the following polyhedron:

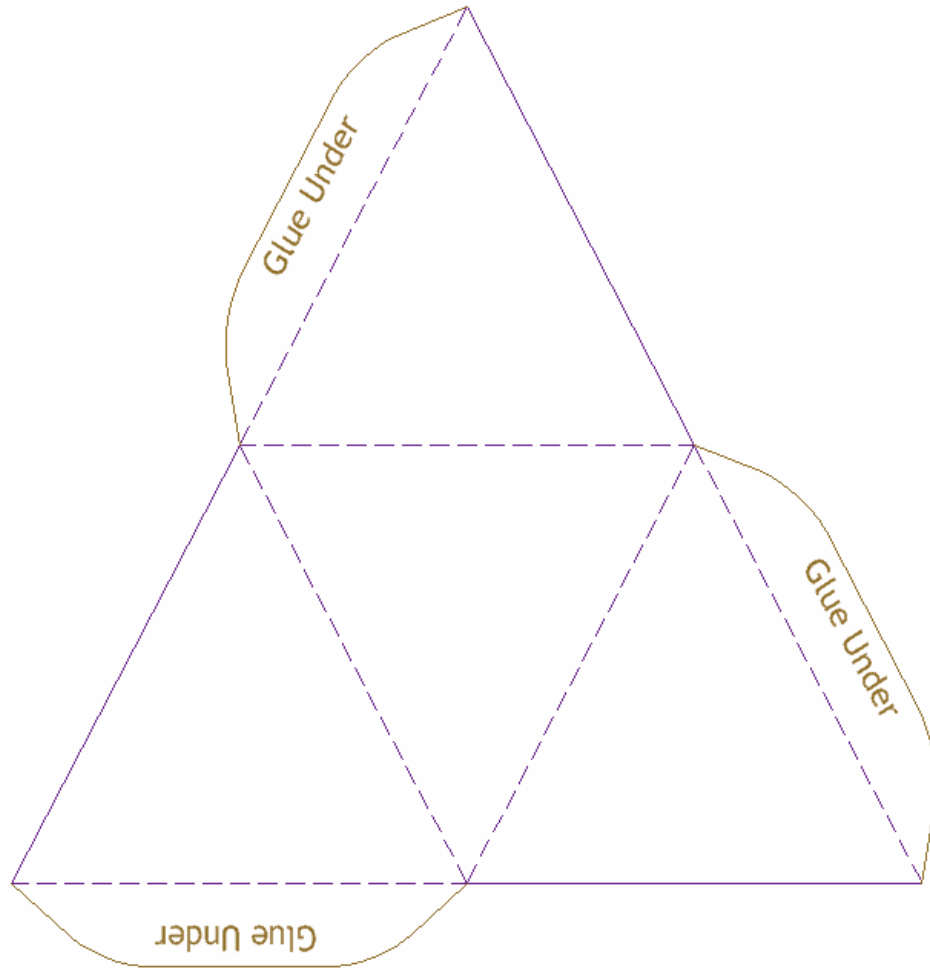


NETS

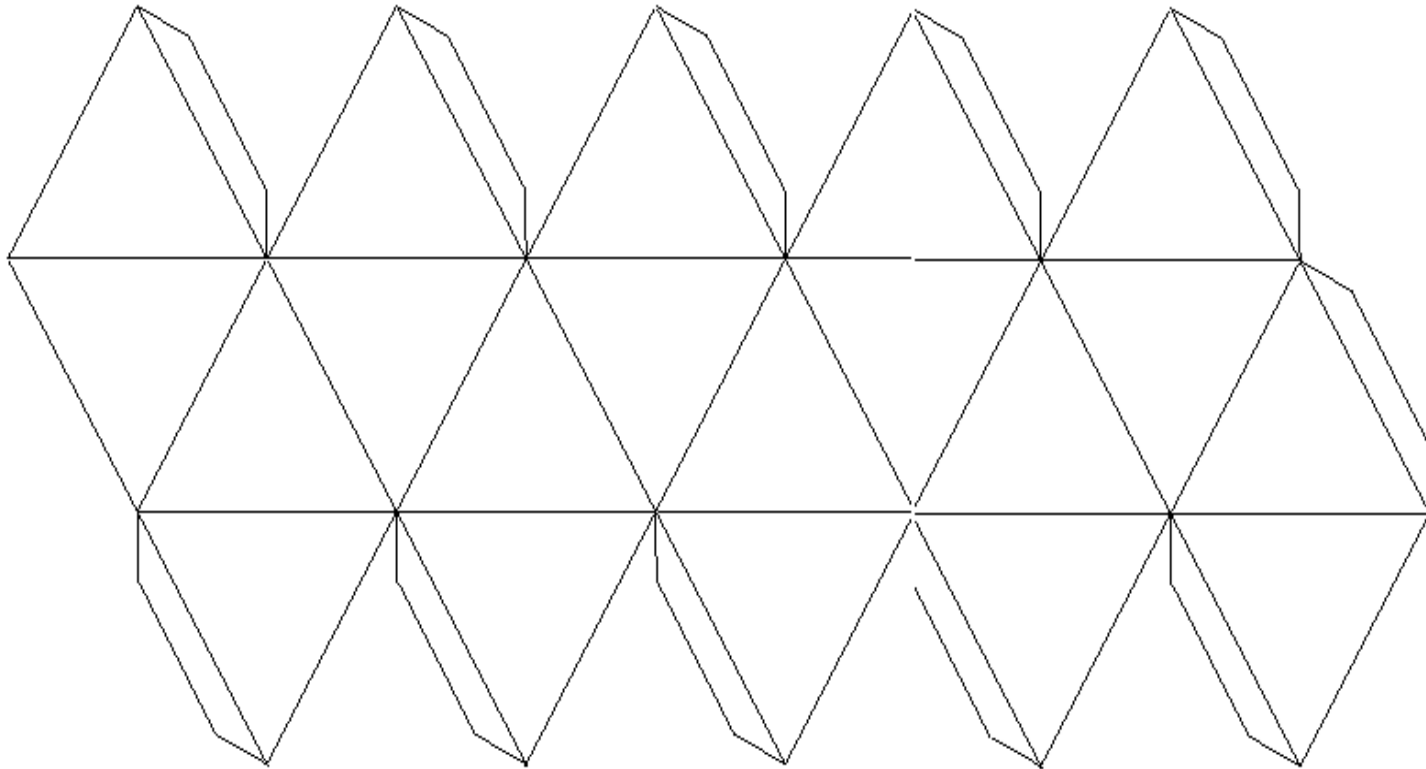
- A “Net” is a two-dimensional layout of a three-dimensional polyhedron
- Use a circle compass, a ruler, (compass), and paper to create a net for the following polyhedron.
 - Tetrahedron
 - Pyramid
 - Square base
 - Pentagonal base
 - Hexagonal base
 - Prism
 - Square base
 - Pentagonal base
 - Hexagonal base



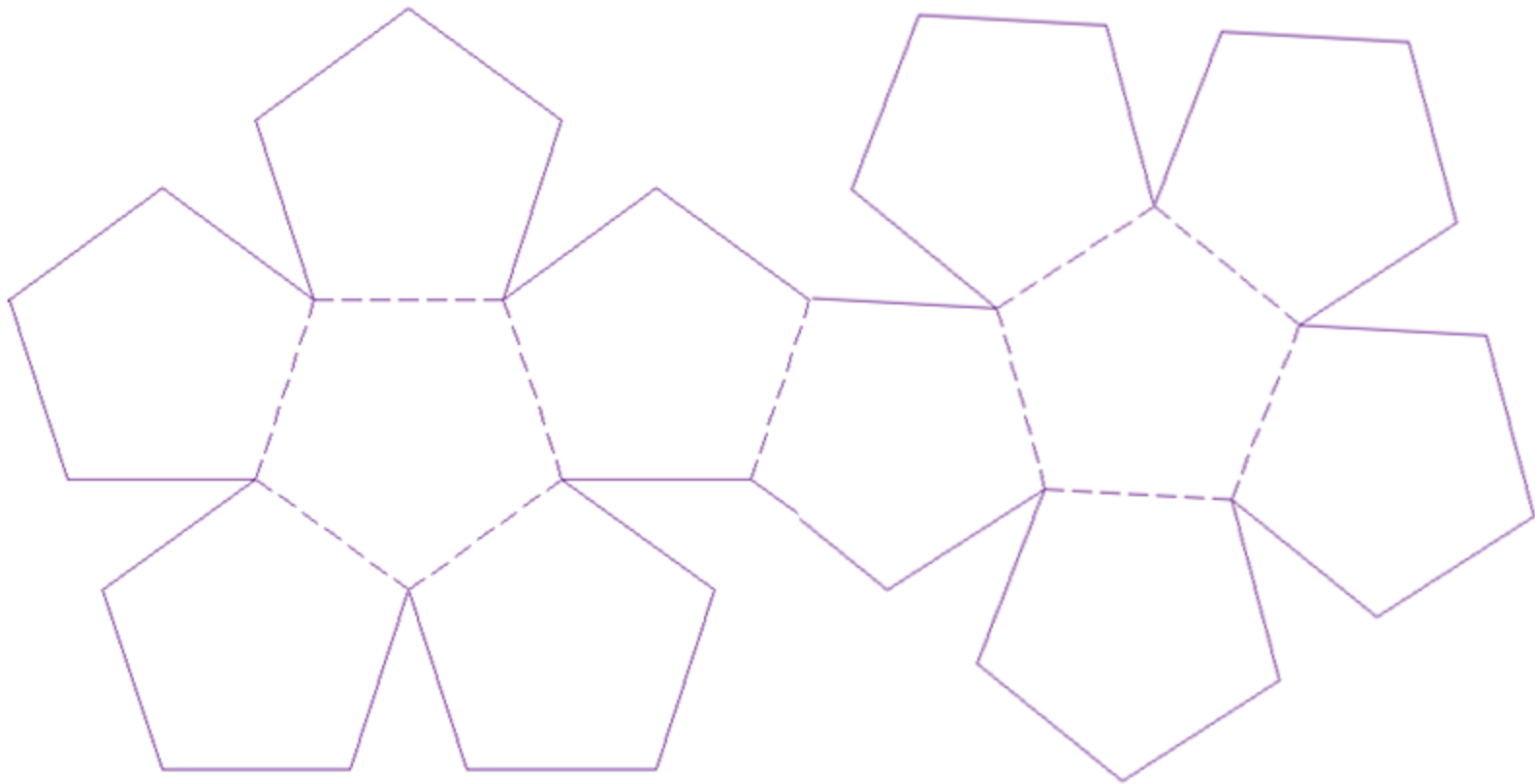
TETRAHEDRON NET



NET OF AN ICOSAHEDRON



DODECAHEDRON





විවිධ උපරිමයක් වස්තූන්ගේ



විවිධ උපරිමයක් ඛණ්ඩාංකයක්
ප්‍රකාශනයක්



විවිධ උපරිමයක් ඛණ්ඩාංකයක්
වැඩි කිරීමේදී



ප්‍රකාශනයක් වැඩි කිරීමේදී



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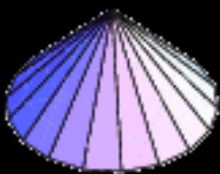
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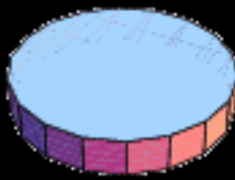
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වැඩි කිරීමේදී
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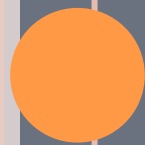
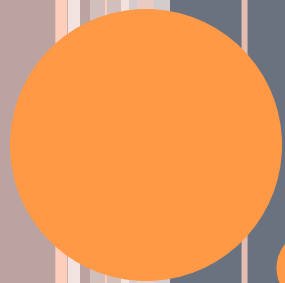


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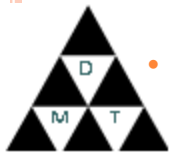
EULER'S FORMULA

BUILDING POLYHEDRON NETS

- In your group, build the different polyhedrons and record the number of faces, cubes, and edges of the following:

Polyhedron	Type of Face	Faces	Vertices	Edges
Tetrahedron				
Cube				
Octahedron				
Dodecahedron				
Icosahedron				

- Make a conjecture based on the data in the table and then build a formula.
- Can you make any predictions for other polyhedron?

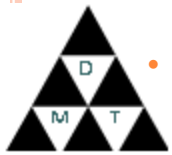


BUILDING POLYHEDRON NETS

- In your group, build the different polyhedra and record the number of faces, cubes, and edges of the following:

Polyhedron	Type of Face	Faces	Vertices	Edges
Cube				
Triangular pyramid				
Triangular prism				
Pentagonal prism				
Square Pyramid				

- Make a conjecture based on the data in the table and then build a formula.
- Can you make any predictions for other polyhedron?



EULER'S FORMULA FOR POLYHEDRONS

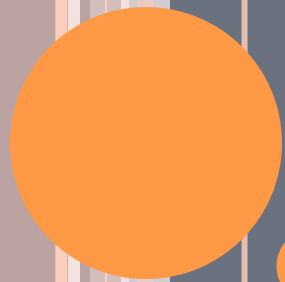
- $X = V - E + F$
 - Where, X is the surface, V is vertices, E is edges, and F is faces.
 - Any convex polyhedron's surface has these characteristics
- $X = V - E + F = 2$
- So, $V - E + F = 2$



EULER'S FORMULA FOR POLYHEDRON

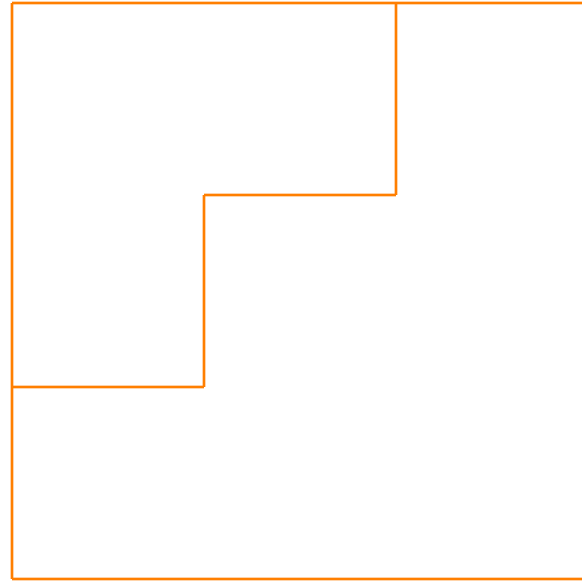
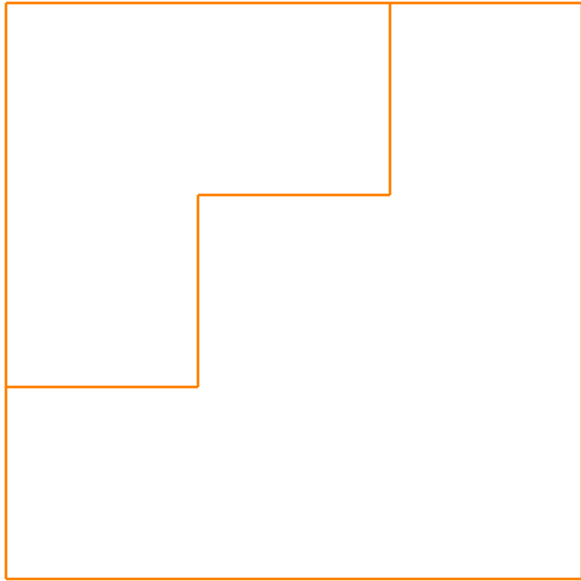
Name	Vertices V	Edges E	Faces F	Euler characteristic: $V - E + F$
Tetrahedron	4	6	4	2
Hexahedron	8	12	6	2
Octahedron	6	12	8	2
Dodecahedron	20	30	12	2
Icosahedron	12	30	20	2



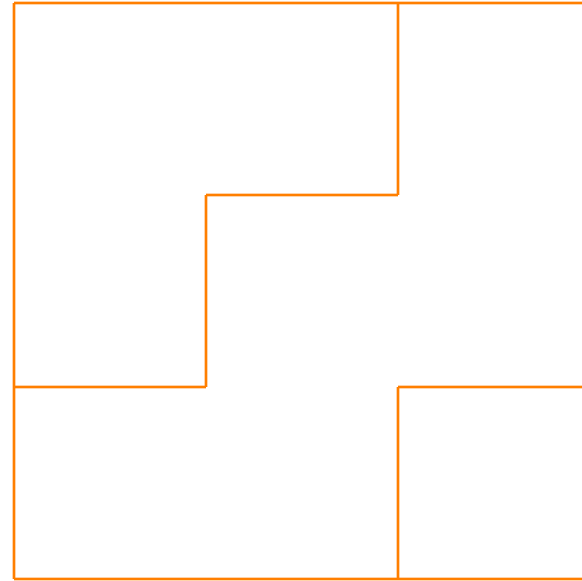
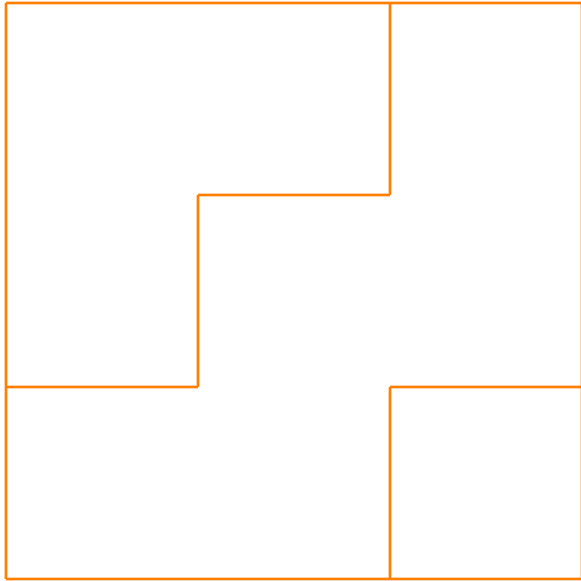


DECOMPOSING SHAPE

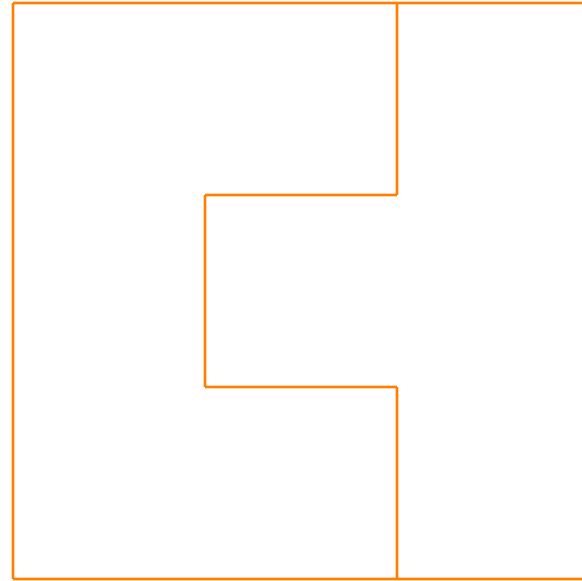
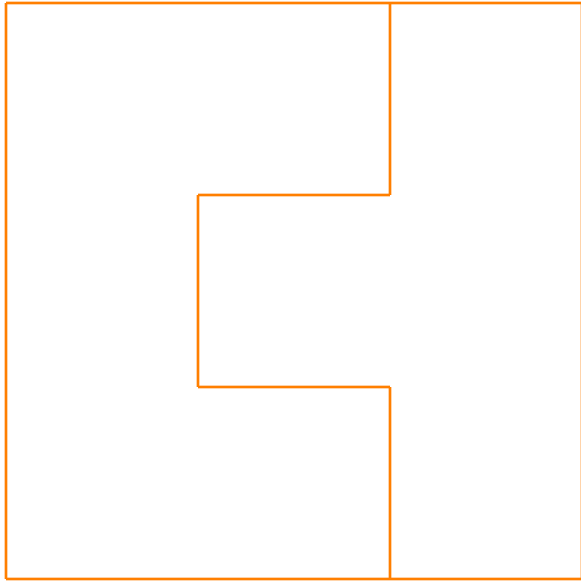
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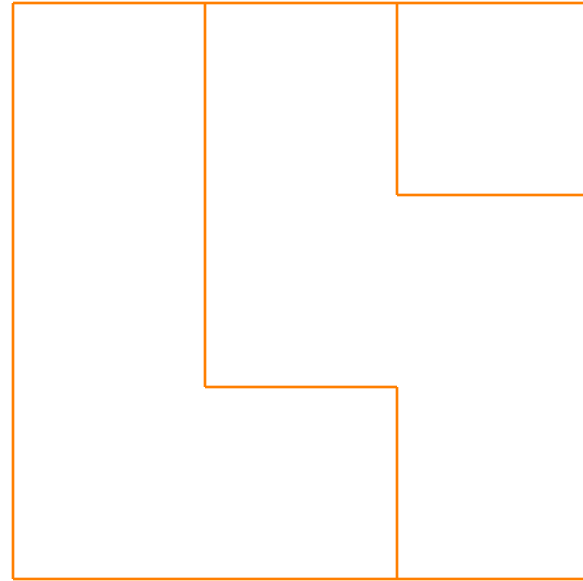
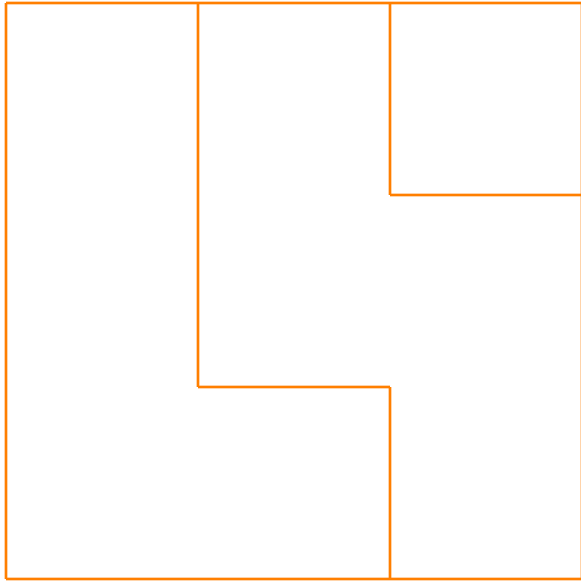
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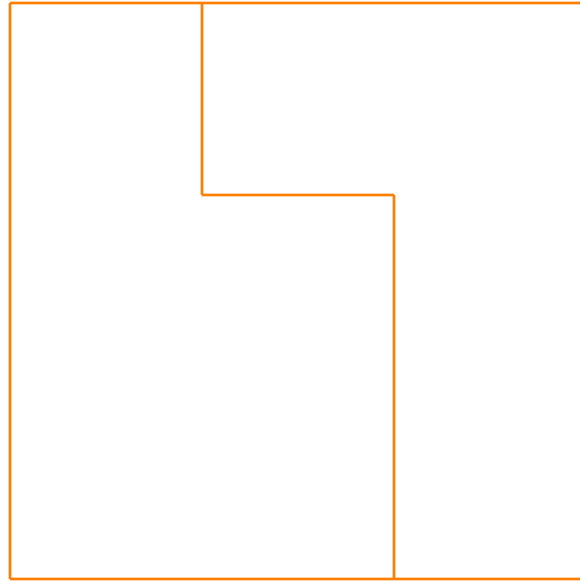
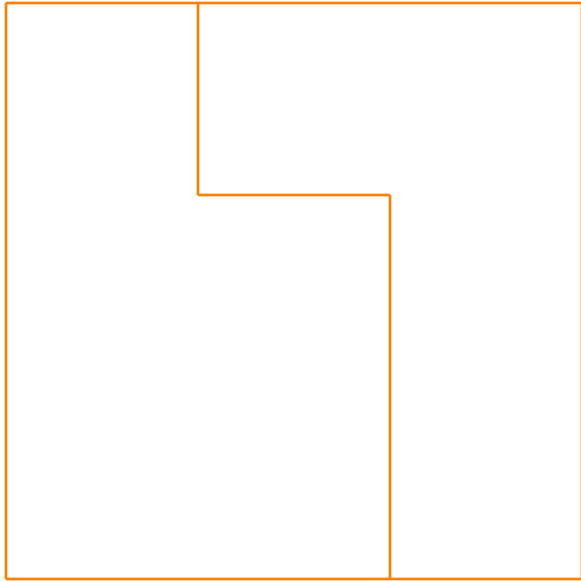
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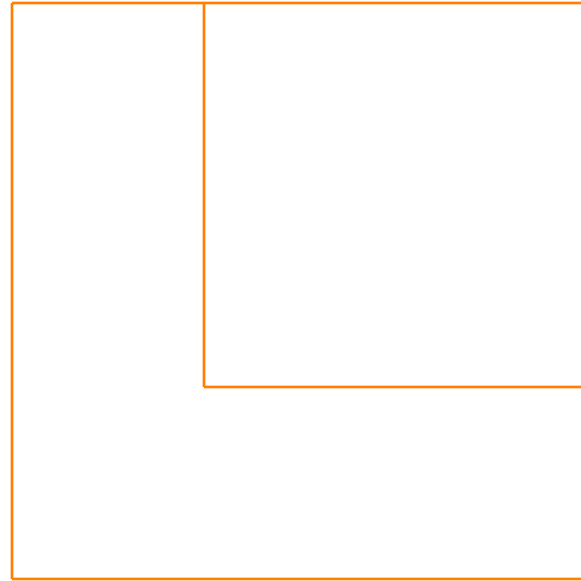
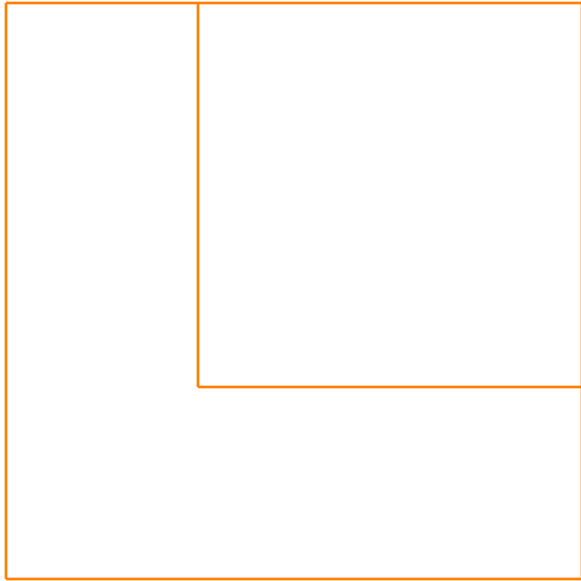
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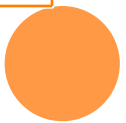
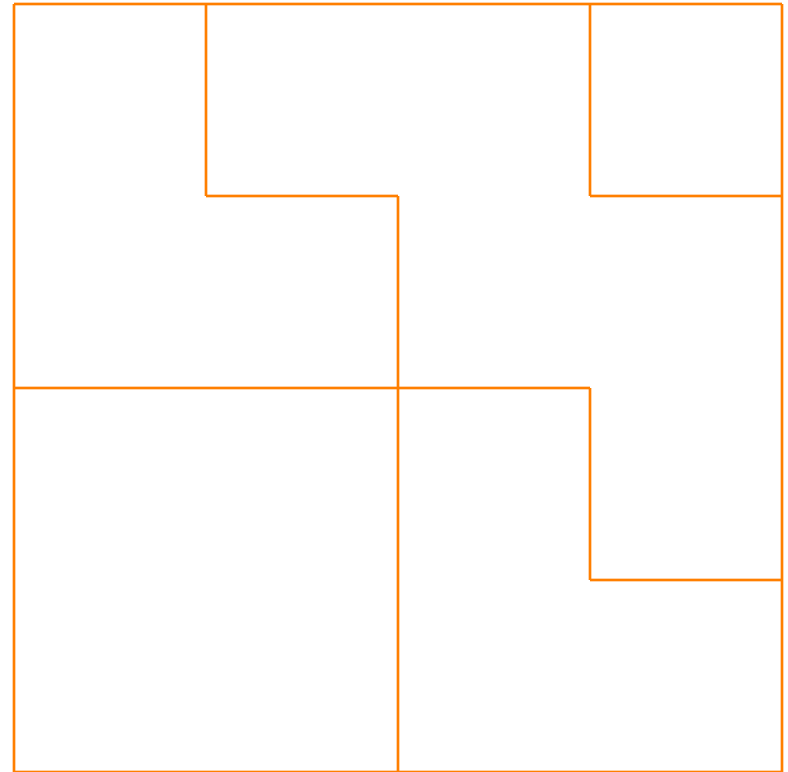
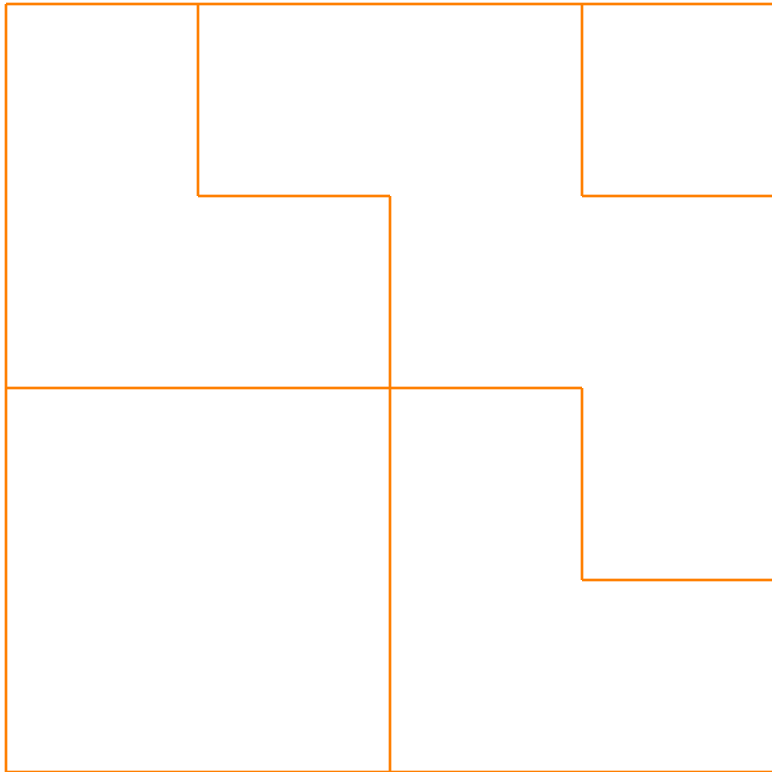
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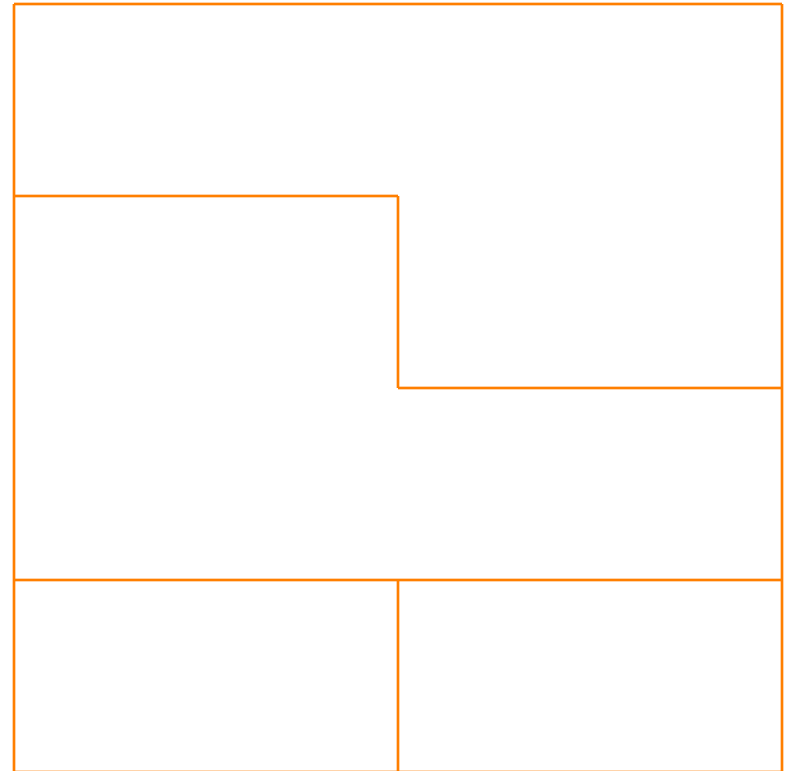
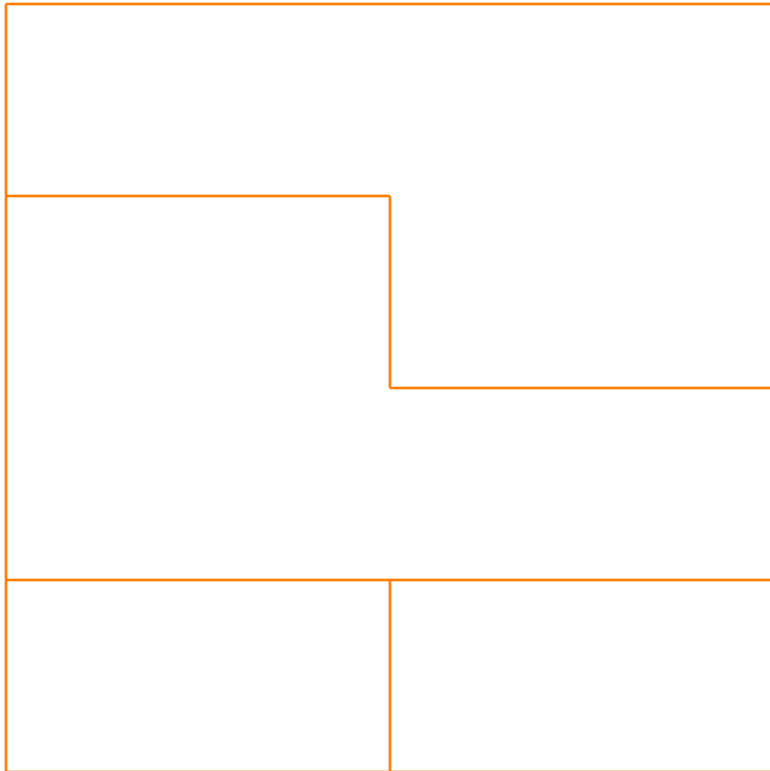
4 X 4



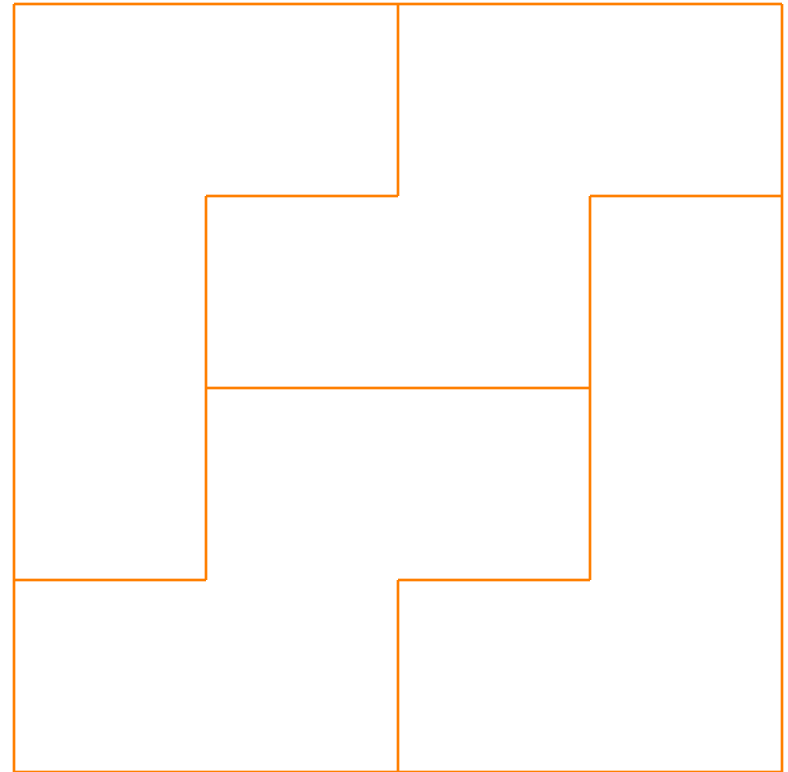
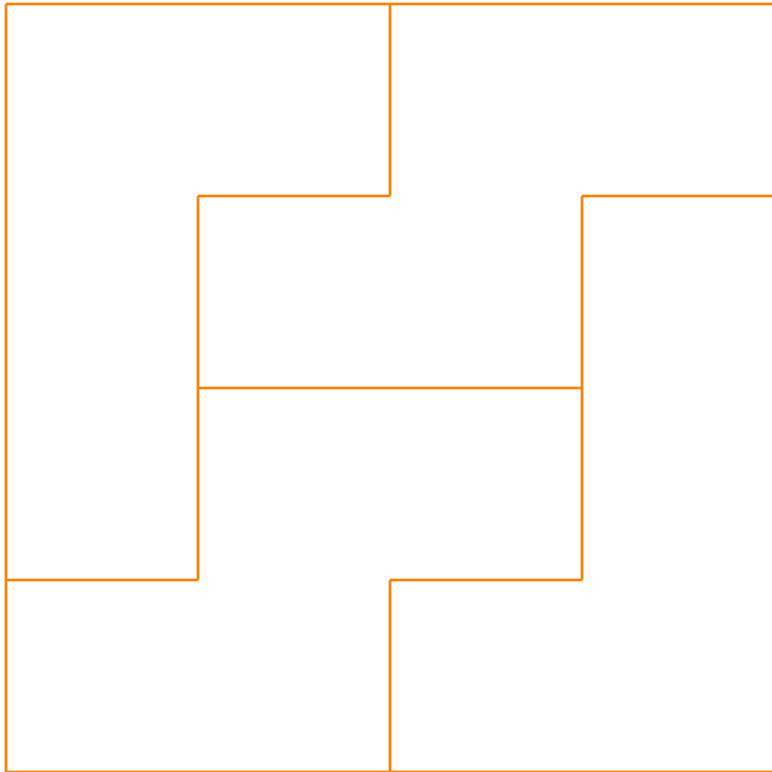
4 X 4



4 X 4



4 X 4



4 X 4

