

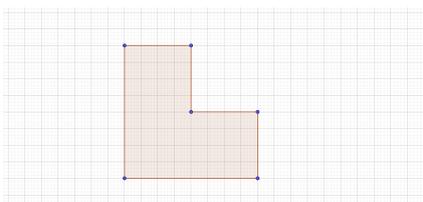
Applications of Computers in Education 1

Def. 1 Two polygons W and P are called *equidecomposable* if they can be divided into a finite number of polygons, respectively W_1, W_2, \dots, W_n and P_1, P_2, \dots, P_n , in such a way that W_i is congruent to P_i for all $i = 1, 2, \dots, n$.

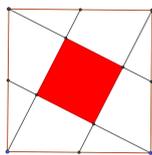
Theorem 1 (Bolyai–Gerwien) Two polygons are equidecomposable if and only if they have equal areas.

Problems to be solved using GeoGebra

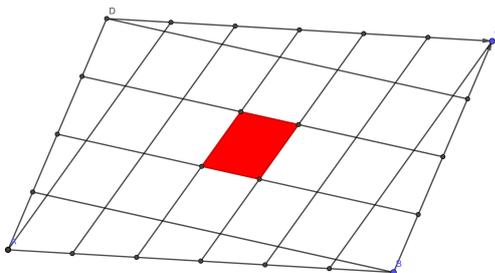
1. Derive formulas for the areas of an arbitrary triangle, a parallelogram, and a trapezoid using equidecompositions into appropriate rectangles.
2. Using equidecomposition with a suitable rectangle, prove that the area of a regular octagon is equal to the product of the lengths of its longest and shortest diagonals.
3. Divide the polygon shown in the figure into four congruent polygons.



4. Cut a rectangle with side lengths 4 cm and 25 cm into three parts from which a square can be assembled.
5. Cut a square with side length 12 cm into two parts so that a rectangle of dimensions 9 cm \times 16 cm can be assembled from them.
6. From a rectangular tabletop of dimensions 12 dm \times 6 dm, a carpenter made a square tabletop with side length 8 dm, performing only one gluing along a straight line. How did he do it?
7. The midpoints of the sides of a square with area P are connected with the vertices as shown in the attached GeoGebra figure *square*. Determine the area of the shaded square obtained in this way.



8. The sides AB and CD of a parallelogram $ABCD$ with area P are divided into n equal parts, and the sides AD and BC into m equal parts. The division points are connected as shown in the figure (for $n = 6$ and $m = 4$). What is the area of the shaded parallelogram formed in this way?



9. Present a proof of the Pythagorean Theorem based on equidecomposition.