

Puzzle ID : **INPC2005-12**

Polygon 12

Suppose there is a circular string of which length is 12. Ignoring its thickness, make a convex polygon that satisfies

- a) its area is exactly an integer n ($n = 1, 2, \dots, 11$), and
- b) all the vertices are on grid points.

Let "scale" of a polygon be defined as the ratio of unit length (one 12th of the string) to the unit interval of the grid mesh on which it can be drawn. The idea is to find a polygon with a scale as small as possible for each n , because that would have the simplest shape. Multiply the scales for $n=1$ through 11 to obtain the final product, which is the summary measure of your performance.

If there are different answers of the same scale, the following criteria will be applied in a lexicographic order.

- (1) The fewer the number of the vertices, the better.
- (2) The more symmetric the shape is, the better.
- (3) The more diversified the shapes are across different n , the better.

Answer Key: Each polygon can be shown by standard x-y coordinates of vertices, as A(0, 0), B(1, 3) and so on.
 The scales of polygons and the total product can be shown in numbers.

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Quad-Block

Fold up shapes, then assemble them into a compact block.

Quad-Block

Figure is next 2 pages

Answer Key: To assemble the block, place identical pieces together to form a square. Repeat with other pair.
 Invert one pair and place on top of other pair.
 (note that the pieces will also match in a way that does not allow them to make the final block)