

Square Root 3-Based Origami and Mathematics

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Abstract

In nature world, there are diverse and abundant objects, some of them are abstracted into three very important graphs for their close relation with people's study and life, and people dedicate themselves to solve those related problems in mathematics and in practice. They are circles, squares and triangles. And three binding parameters are Pi, square root 2 (i.e. $\sqrt{2}$) and square root 3 (i.e. $\sqrt{3}$).

As we all know, modern origami requires a whole uncut square to fold various vivid or profound models. The square is always segmented into parts of natural integers or the magnifications and the minification of $\sqrt{3}$, but $\sqrt{3}$ is less involved, not mentioned in polygons, such as hexagons, octagons and dodecagons, etc.

Being an origami lover, I felt obliged to widen the range of origami applications, so I managed to make dozens of math origami models to help others study mathematics. In the duration, I found that sometimes it's easier to solve some math problems by origami instead of original pure mathematical calculation or derivation. Some models need segmenting squares or polygons into the magnifications of $\sqrt{3}$, which will be introduced in this paper.

The segmenting method of $\sqrt{3}$ is based on similar triangles or utilizes some well-known trigonometric function values related to $\sqrt{3}$, just like the segmenting method of $\sqrt{2}$. I have summed up a table for squares segmented in $a + b\sqrt{3}$, and it can be generalized to hexagons, octagons, dodecagons or other polygons.

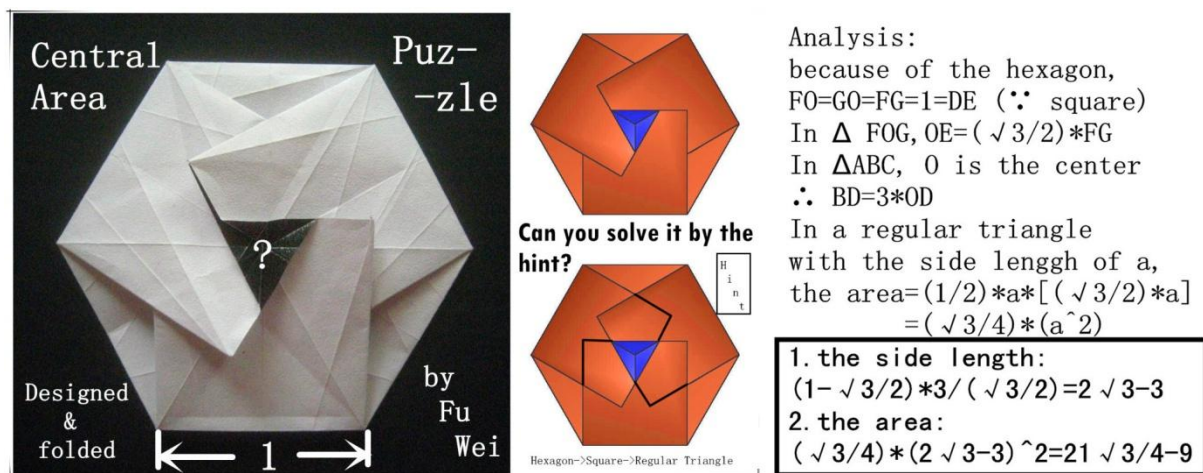


Figure 1: $\sqrt{3}$ -based origami math puzzle

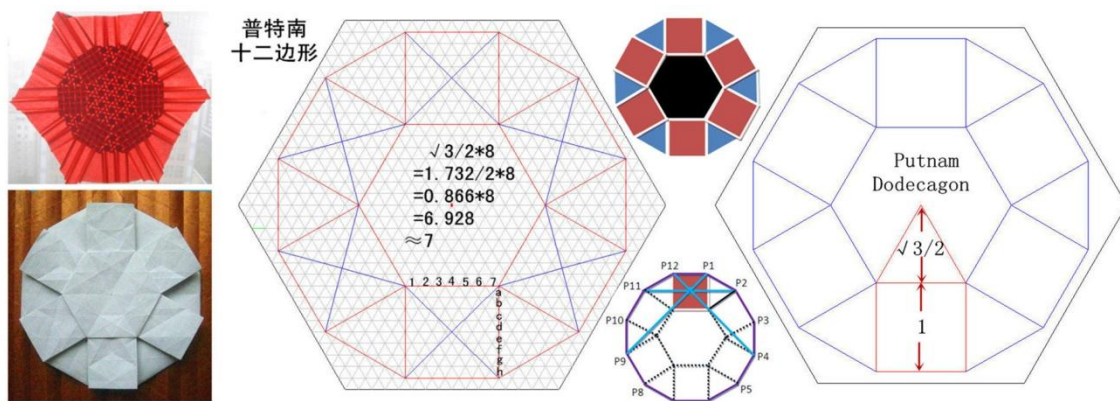


Figure 2: Putnam dodecagon segmenting method

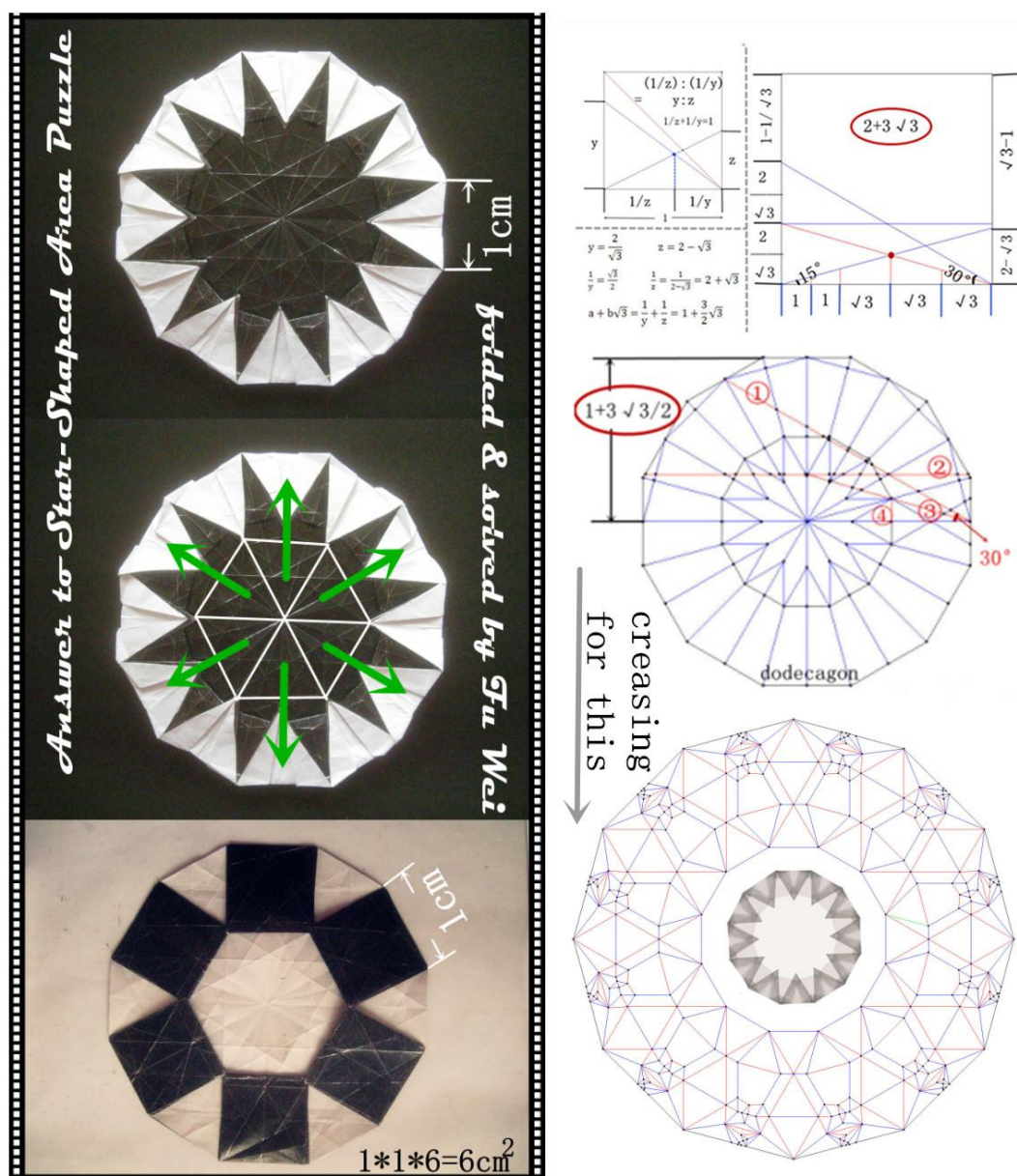


Figure 3: $\sqrt{3}$ segmenting method for squares and dodecagons

We will acquire double happiness by math origami. If you don't think so, then try it. Why not?