

Penta-Dodecaflexagons

Penta-dodeca flexagons have some new twists. After having created the tri and tetra dodecagon flexagon templates, I was so impressed with this family of flexagons, that I had to create a 5 basic sided version, the penta-dodecagon flexagon. This turns out to be even more interesting than the tri and tetra versions! The Penta-dodecaflexagon has 5 basic faces and 5×12 or 60 triangles. The number of face variations that you can flex is numerous and much bigger than 5. Flexing will take you into hexagonal, kite, and many other shapes both two and three dimensional. If you want an easy way to make one for yourself, my net for the penta-dodecaflexagon can be downloaded from the dodecaflexagon tab.

Several people have written about the existence of flexagons built from 30-60-90 triangles, most notably Harold McIntosh in his paper, "Trigonal Flexagons", Anthony Conrad in his paper, "The Theory of Flexagons" RIAS Technical Report 60-24, and Les Pook in his book, "Flexagons Inside Out". Harold McIntosh actually had the net for the dodecaflexagon diagrammed in his paper, but stated that the best that could be done with it was a flexacup. Anthony Conrad also had the tri-dodecagon template and stated that it could be made into a flexagon but did not elaborate further. But then it was Ann Schwartz who independently found a net that produced her "Shape Shifting 12-gon" based on the 30-60-90 triangles. This discovery has brought much new interest and discussion about this type of flexagon due to the fascinating dynamic properties of this flexagon. Ann's 12-gon is actually equillivant to my tetra flexagon template. The nice aspect to Ann's design is that you can make it from a straight strip, it just has some triangles that do not show up in flexing. Les Pook has released a draft paper on these new dodecaflexagons, titled, "Dodecaflexagons" to the Yahoo "Flexagon Lovers" newsgroup. He describes them as being a stellated degenerate ring dodecagon flexagon. He has an excellent discussion of Tuckerman diagrams (state diagrams) as they relate to these type of flexagons. As Les states in his paper, there is a lot more to learn about this family of flexagons.

There is a lot to explore with this dodecaflexagon. The toggle triangles appear on front and back faces for more options when flexing and they also open to new faces by shifting one set or both of them clockwise and/or counterclockwise. If you fold up my template as I describe, you will find all five sets of colors/letters will each appear on one or more faces in various configurations when flexing. A first challenge is to find the face with all Ds where all 12 Ds circle the center with the 30 degree angles in the center. It is not easy at first to find this face, but I assure you it is there to be found via standard 3-corner pinch flexes and shifting of rogue triangles.

Numerous interesting faces can be obtained by three corner pinch flexes and shifting of the rogue triangles on front back or both. I suggest that faces created in this way are the proper or standard faces of this flexagon. If you make good creases with the three corner pinch folds after it is first assembled, the penta-dodeca will flex quite well and not get tangled up. Many additional faces can be obtained by nonstandard flexing. This will take you into uncharted but quite facinating waters for sure. The shifting of triangle numbers (eg A1-A12) on the faces is not as orderly as with the three and four faced 12-gons. Be sure to watch how the numbers lay out on each of the faces. There is much more to come on this topic….