

Woolly Thoughts

IN PURSUIT OF CRAFTY MATHEMATICS



Dodecagon Thing (cushion/afghan/whatever)

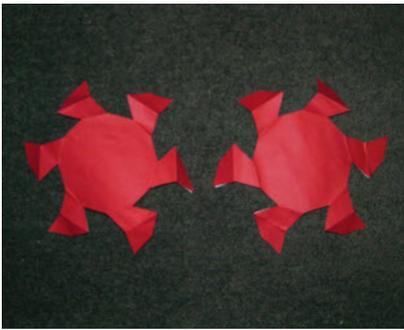
designed by

Pat Ashforth & Steve Plummer

Dodecagon Thing

We were introduced to this construction of a dodecagon at a Maths convention called MathsJam, in November 2011. Each speaker was allowed five minutes to present something they found interesting or challenging. Joel Haddley had been looking at shapes where you can double the area and get a new shape the same as the original but bigger. He used a paper model for a nice visual proof of a dodecagon to fit the rule.

The photos below (not all at the same scale) are of the paper models which Joel gave us.



Two small dodecagons with six extra 'wings' on each, pointing in opposite directions. They are white on the back.

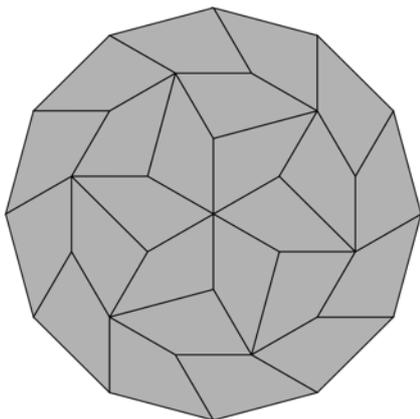
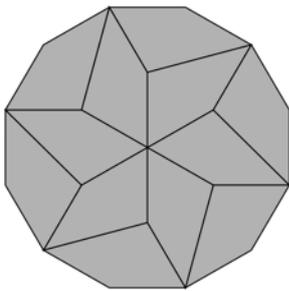


One of the shapes with its wings folded to the back completely covering the centre dodecagon. This shows that the area of one set of wings is the same as the area of the dodecagon.

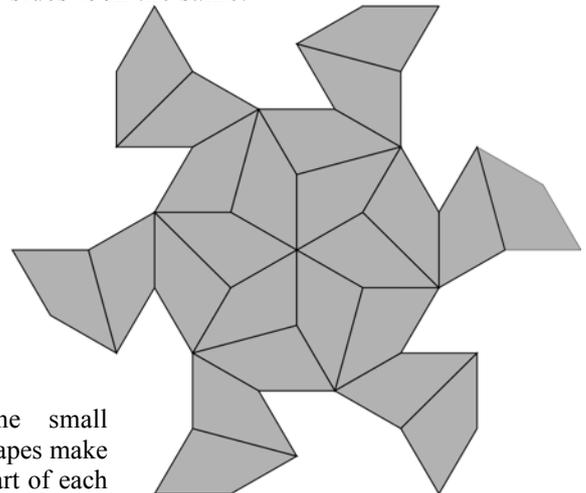


The two original shapes have been placed face-to-face and the wings folded to cover all the white backing. The larger shape is now a dodecagon twice the area of the centre.

This seemed to be a nice shape for knitting as the small dodecagon can be split into 12 identical shapes and one set of wings consist of 12 more identical shapes. The shapes do not all point in the same direction but this does not matter when they are knitted in garter stitch as both sides look the same.

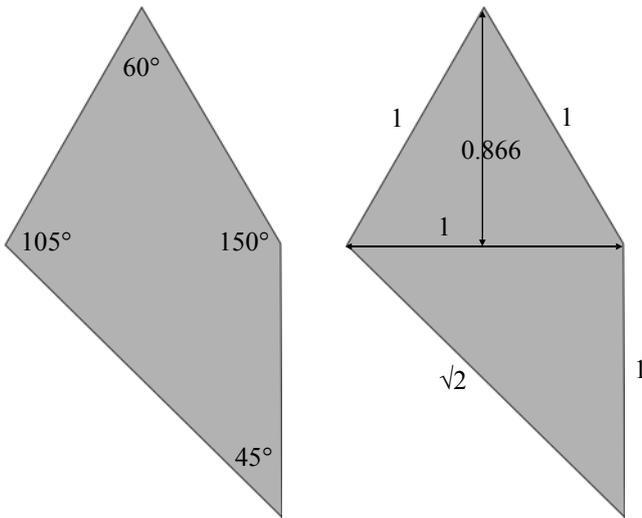


12 shapes make the small dodecagon. 12 more shapes make the wings. The outer part of each wing can be removed, turned over and fitted into the spaces around the dodecagon to make the new larger dodecagon.



Basic shape

The shape needed to create the dodecagon is a quadrilateral with special proportions.



It is basically a right-angled isosceles triangle joined to an equilateral triangle.

The sides of the smaller decagon are 1 unit. The sides of the larger decagon are $\sqrt{2}$ units. $\sqrt{2}$ is approximately equal to 1.4.

The vertical height of the equilateral triangle can be calculated by using Pythagoras' Theorem. It is approximately 0.87 units.

This shape is very easy to knit and can be made to any size.

Knitting the shape

Any yarn and needles can be used.

Triangle A

Make a slip knot and knit into the front and back of it (2 stitches).

Next row: Knit.

Next row: Knit to the last stitch, knit into front and back of the last stitch.

Repeat these two rows until the shape is the width and height you want. You are making triangle **A**. Your complete quadrilateral will be almost twice this height. The complete small dodecagon will be approximately three and three-quarter times the height of the triangle.

Triangle B

Continue on the same stitches.

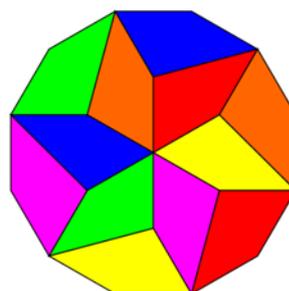
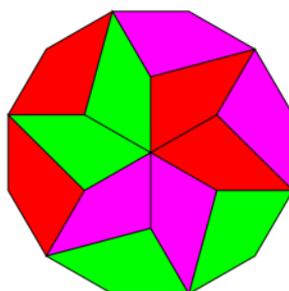
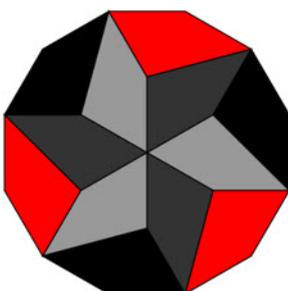
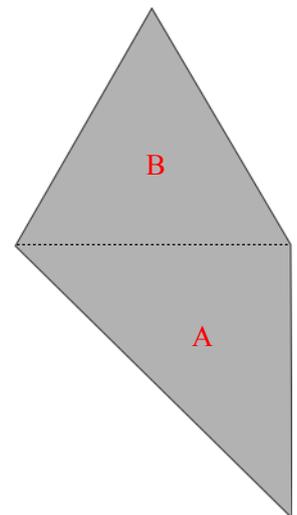
Row 1: Knit to last two stitches, knit two together.

Rows 2 & 3: As Row 1.

Rows 4 & 5: Knit.

Repeat until all stitches are worked off. Fasten off.

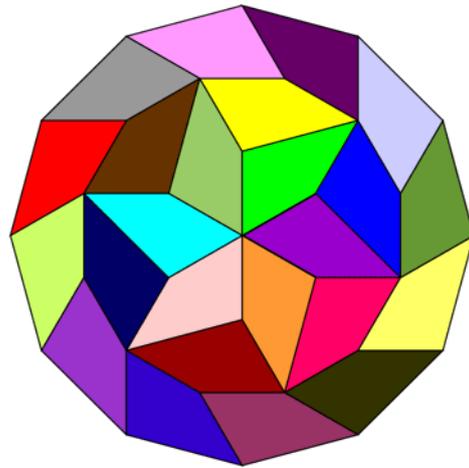
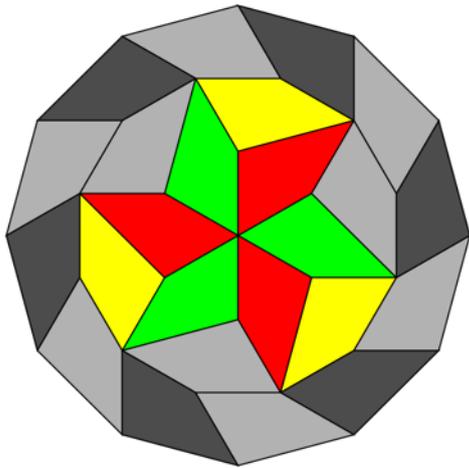
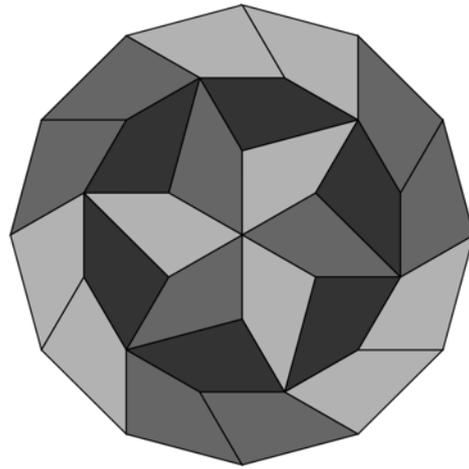
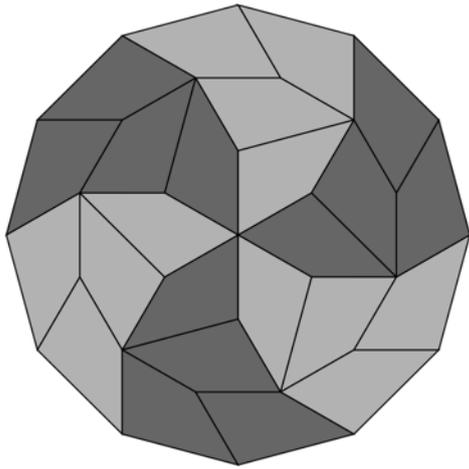
12 shapes can be stitched together to make the small dodecagon.



After much experimentation, the shape only proved useful for making either the small or large decagons. Any further tessellation leads to shapes with very uneven edges.

The small decagon can be used as a cushion though, over time, this would probably look circular rather than 12-sided. The shapes would work well for an afghan as the 12-sidedness would be preserved.

24 shapes can be used to make the larger decagon. The decagon will be approximately five and a half times the height of triangle A.





I made 24 shapes and arranged them in different ways. They were then rearranged to make a cushion with the illusion of a distorted cube on one side and the effect created by folding in one set of wings on the other.



©Pat Ashforth and Steve Plummer

First published in 2012

166 Keighley Road, Colne, Lancashire, BB8 0PJ, England

www.woollythoughts.com

All rights reserved