How to make a snapology origami model of the Campanus Sphere for the case $n = 3$

Introduction

At the end of the previous section, we saw that the dimensions of the edges in our model will be as follows. Led *S* be the side length that you choose for the equatorial dodecagon. Then S will also be the side length of all the 12 longitudinal dodecagons. In the figure below, all the sides with length *S* have been drawn in red.

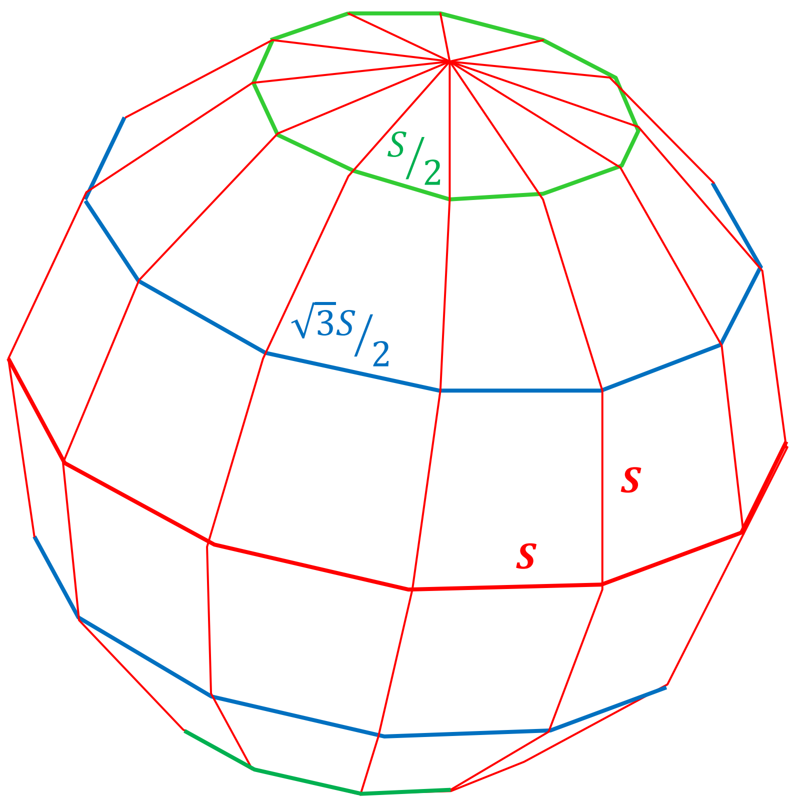


Figure 1: Side lengths in a Campanus' Sphere with $n = 3$.

The remaining two latitudinal dodecagons north of the equator have side lengths $\sqrt{3}S/_2$ and $S/_2$, and are drawn in blue and green, respectively. By symmetry, the two dodecagons south of the equator have the same dimensions.

What follows will outline how to make this model in snapology origami, a modern medium invented by Heinz Strobl. This is quite an advanced and labor intensive snapology origami project, and if you are new to snapology origami, you are strongly encouraged to "warm up" with the following presentations by snapology origami expert by David Honda.

1. Icosahedron model (One Drive or Google slides version)
2. Basic Cutting and Folding

Once you are familiar with Dave Honda's presentations, you will get an idea of how this object holds together. In particular, you will be familiar with the terminology "face pieces" and "connector pieces".

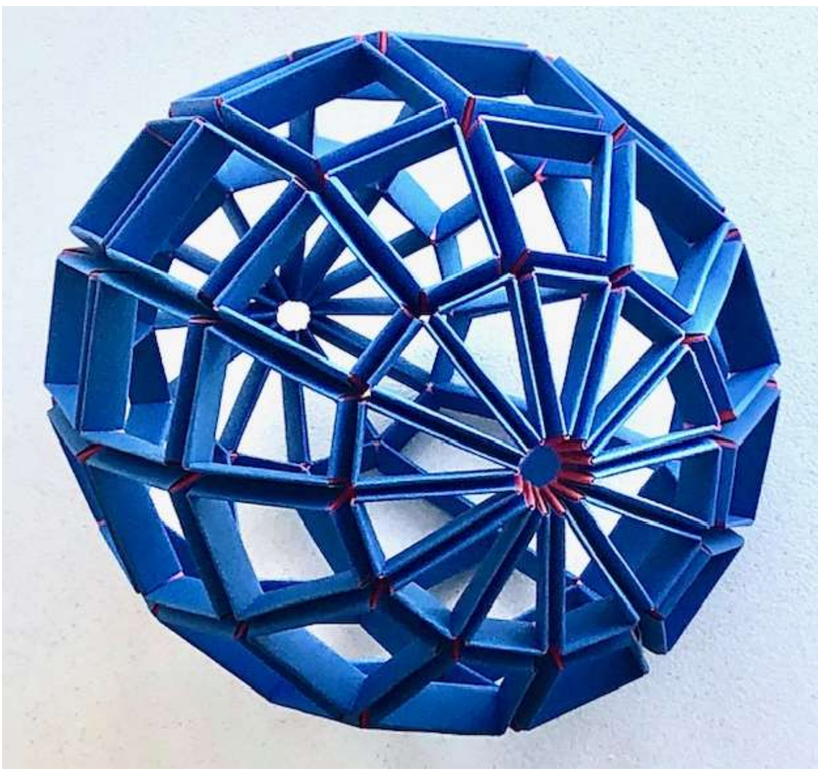


Figure 2: Campanus' Sphere for the case $n = 3$.

This piece is made from 70lb cardstock. I suggest to use this or heavier cardstock for your piece.

Decontruction

Here is a summary of the faces you will be constructing. We will discuss how they will hold together a little later in this section.

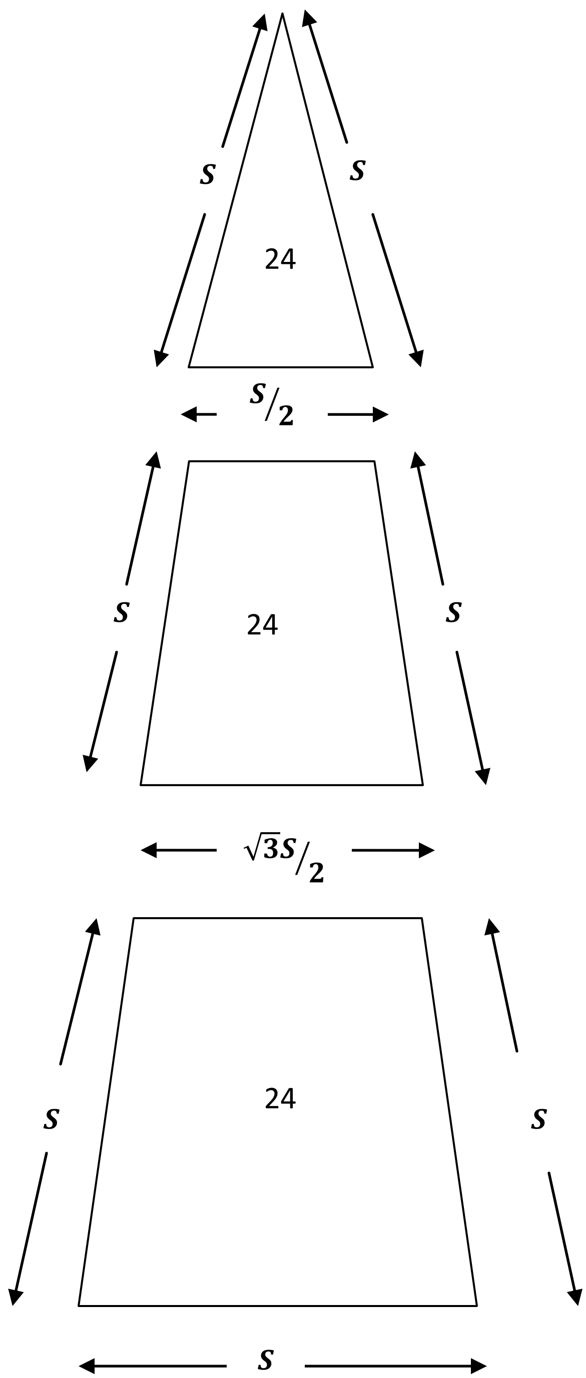


Figure 3: schematic drawing of the three types of polygons needed to build this Campanus' Sphere model.

Before we get into the connectors you will need to hold these faces together, here is a picture of the connector removed, so that the “face” is exposed:

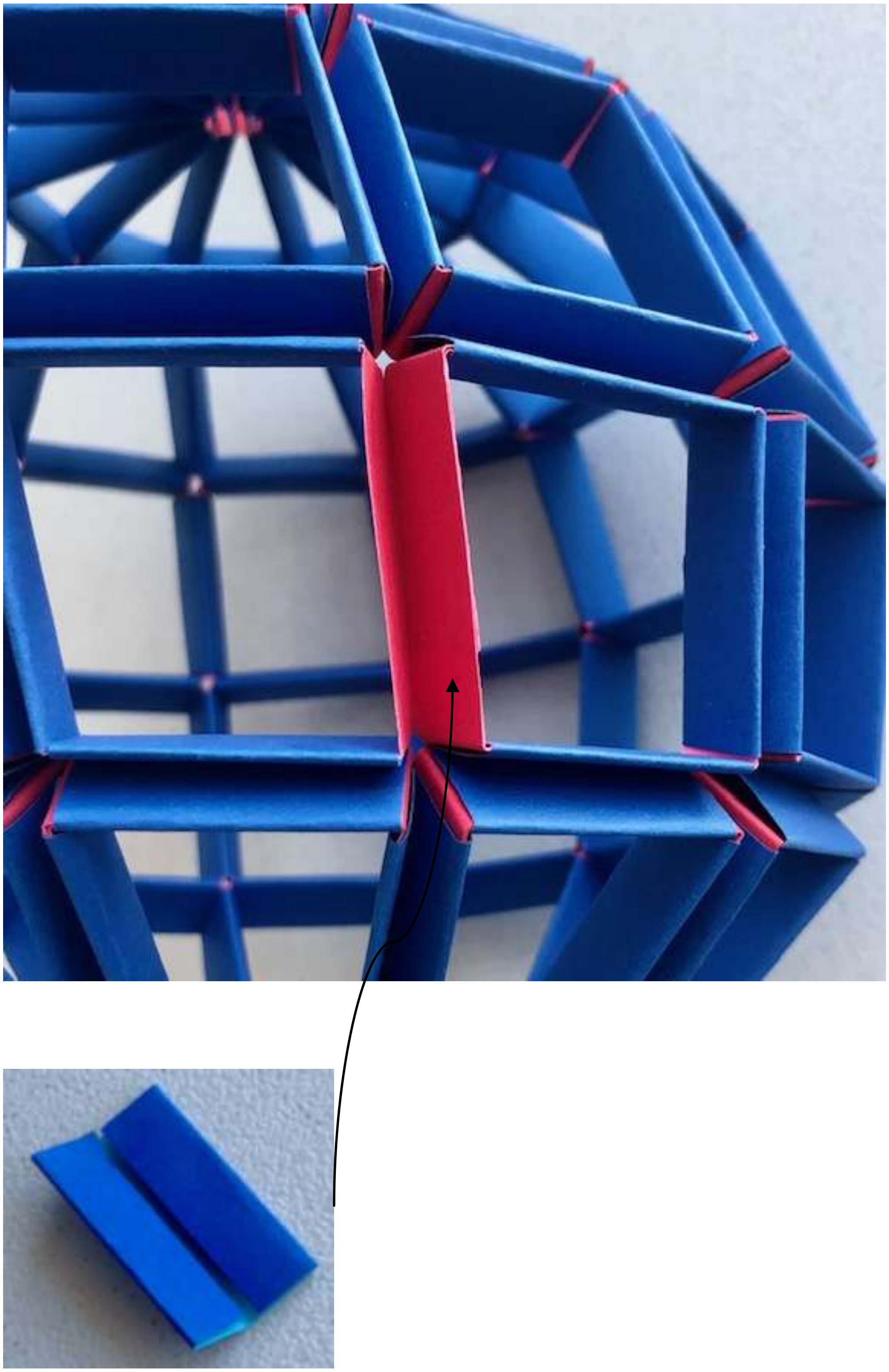


Figure 4: Detail of Campanus’ Sphere in Snapology origami with one of the edge connectors removed.

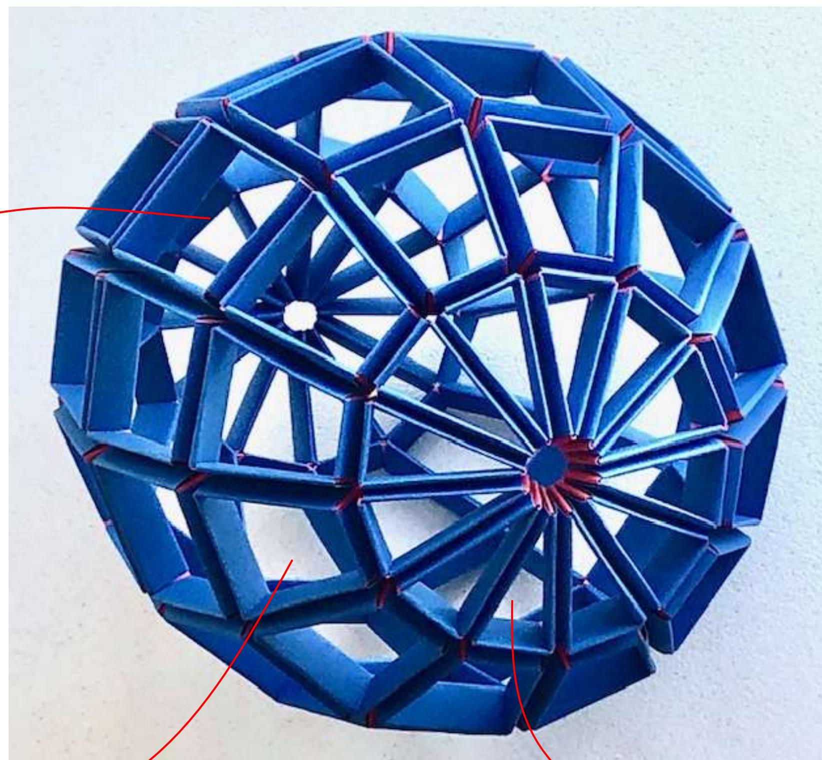
You can see that the faces are red, and mostly hidden by the blue connectors in the finished piece.

The number of connectors is simply the number of edges. In summary, you will need

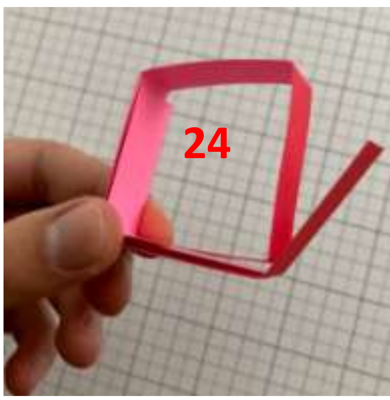
72 face pieces

132 connector pieces

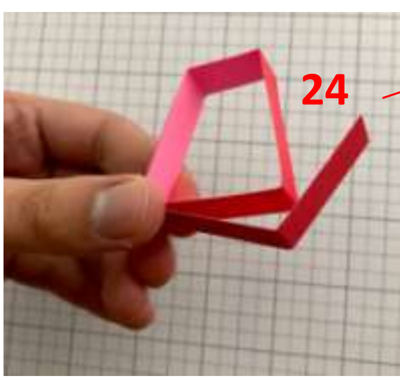
Here are pictures of all the pieces that you will need, along with required quantities:



trapezoidal faces (squarish)



trapezoidal faces (elongated)



isosceles triangle faces

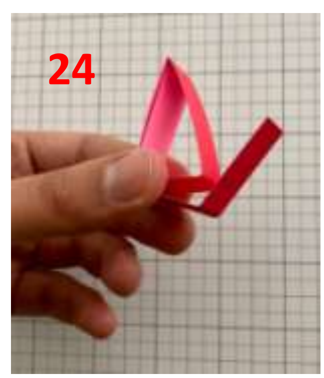


Figure 5: The face connectors

You will need connector pieces in 3 sizes: S , $S/_2$, and $\sqrt{3}S/_2$. In the example here, I chose $S = 1.5$ inches. I chose the edges to be 0.5 inches thick (see Figure 4 below) .

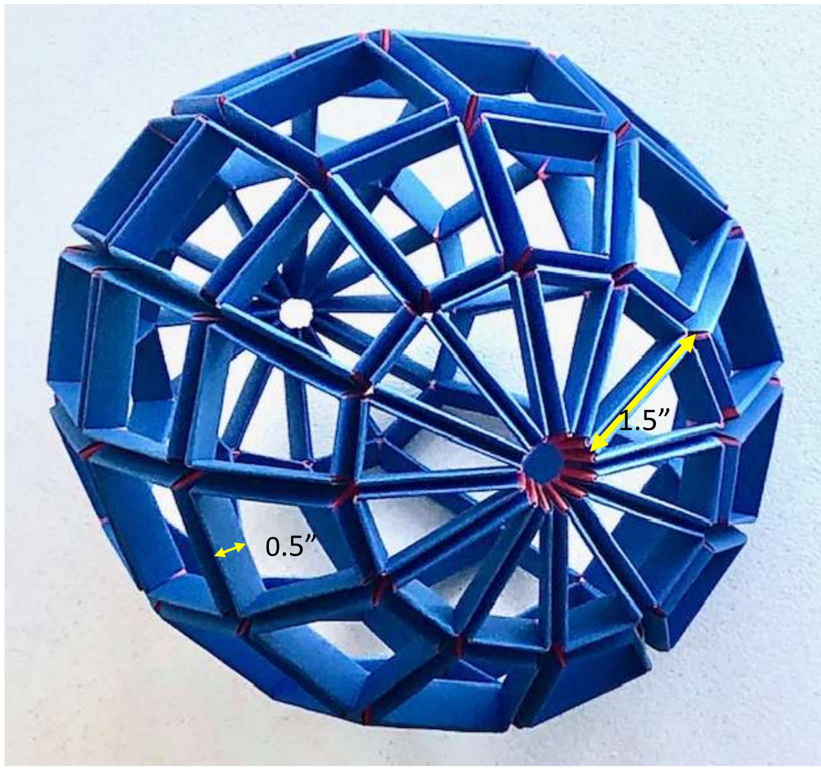


Figure 6: Lengths and widths of connectors that are chosen by the crafter.

Here is a picture showing all three connector pieces on graph paper with each small square measuring .25 inches, along with the number of each connector you will need.

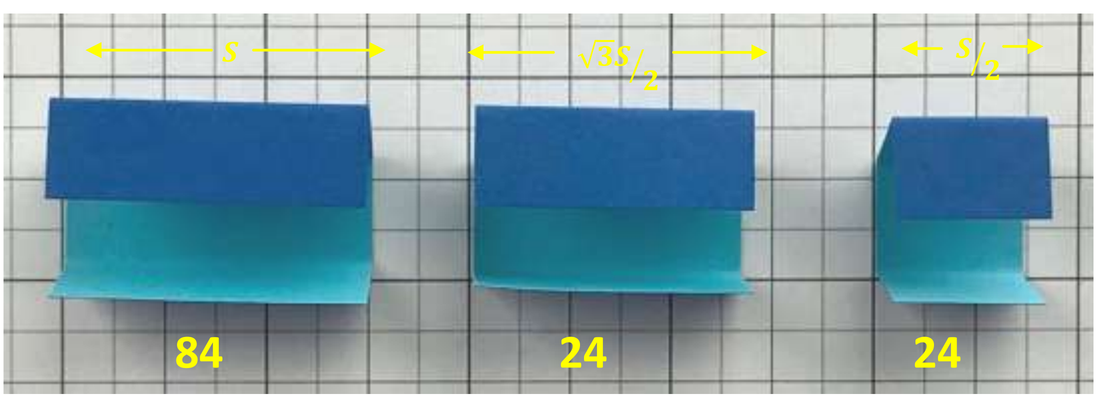


Figure 7: The three types of connector pieces you will need to make this model of the Campanus’ Sphere.

How to make the edge pieces and the connector pieces

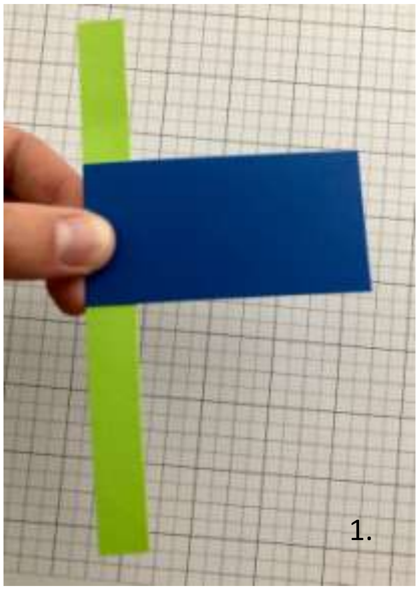
You will be using the "wrap" technique from Basic Cutting and Folding to make both the connectors and the face pieces. For this, you will need cardstock pieces that will act as your measure guides. You will need them in the following widths:

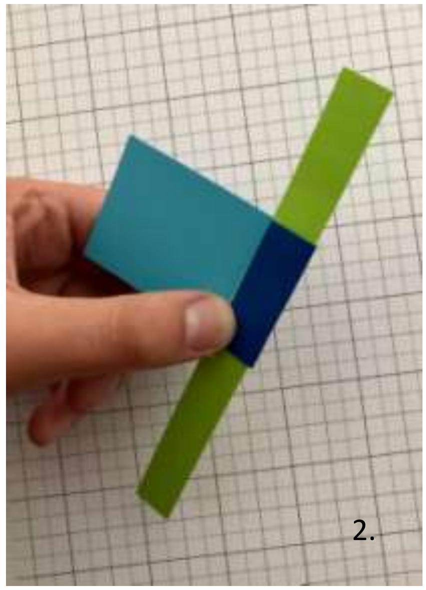
- .5" or whatever you decide the width of your final connectors to be (See Figure 4)
- S, with the edge lengths of your choosing.
- ${}^{S}/_{2}$
- ${}^{\sqrt{3}S}/_{2}$

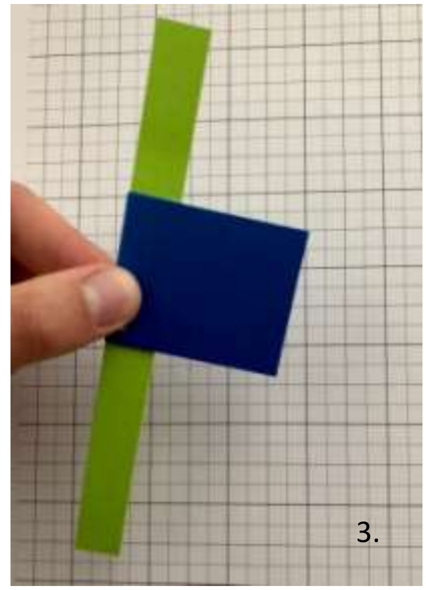
I suggest that you choose these cardstock pieces to have different colors from the ones you are using in the final piece, and also different colors from each other. This is to minimize confusion. Here are my cardstock pieces.

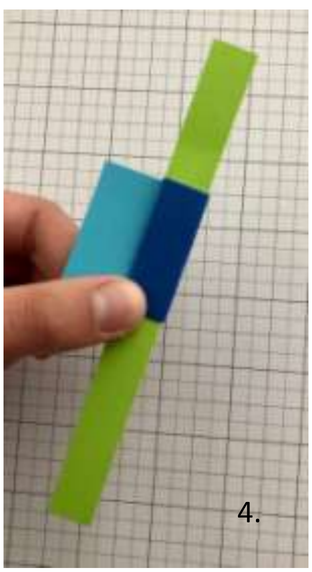
Figure 8: Cardstock pieces for measuring faces and connector pieces

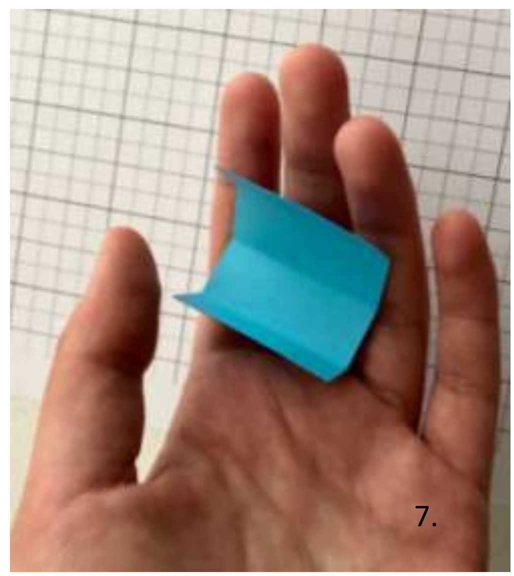
Let’s start with the simpler connector pieces. Simply wrap them around your cardstock strip until you have 4 sections. This technique is demonstrated in Dave Honda’s videos with different widths. The paper used in this example is dark blue on one side and light blue on the other. We are using the dark blue side in the final project.





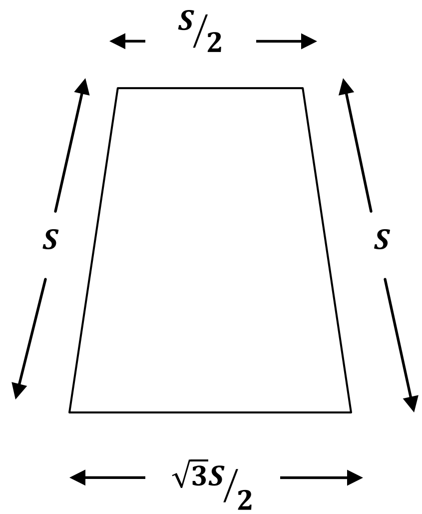






The face pieces are much trickier in the case of the Campanus' Sphere, since none of them are equilateral. I suggest to have pieces with 5 sections for the triangles (so two sides will be overlapping) and 7 pieces for the trapezoids (so 3 sides will be overlapping). I will now describe how I made these face pieces—I certainly cannot claim this is the only or best way to do this. It is admittedly awkward and time consuming.

In this example, we show how to make the elongated trapezoid. This trapezoid has dimensions as follows:



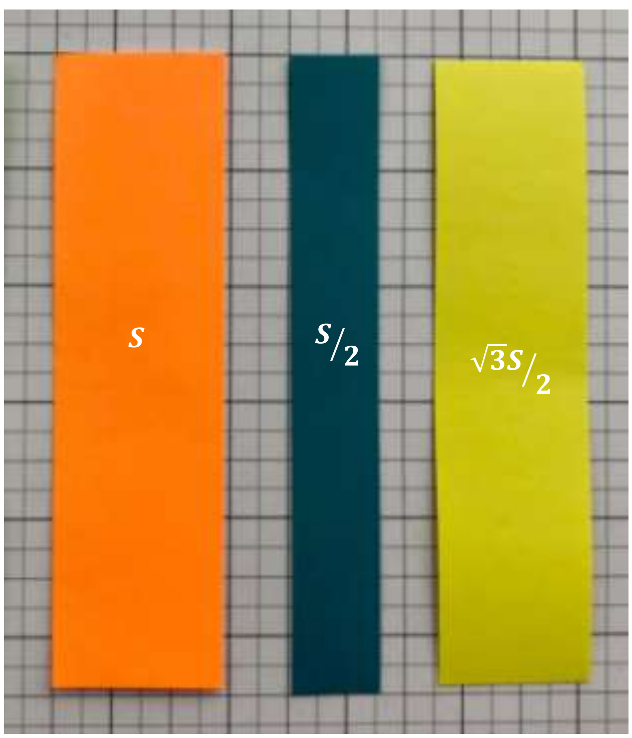
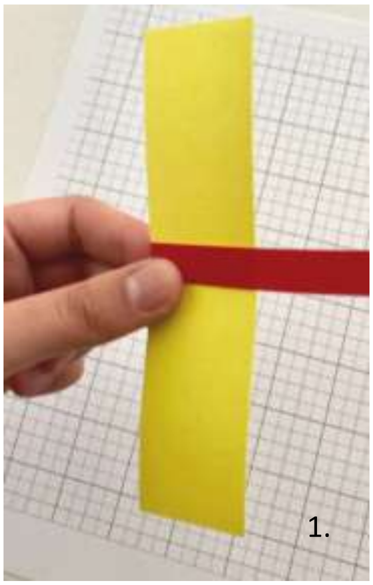


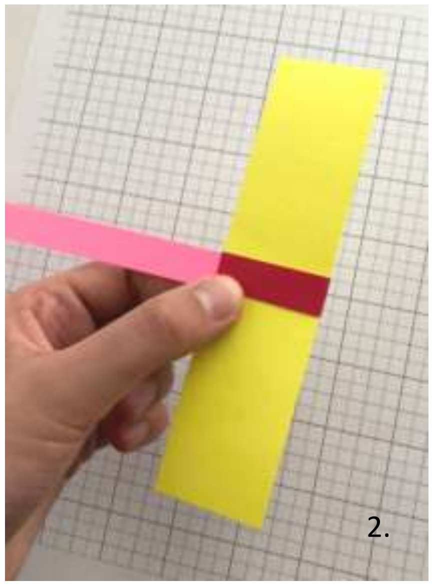
Figure 9: Cardstock measuring strips you will need for folding the face pieces.

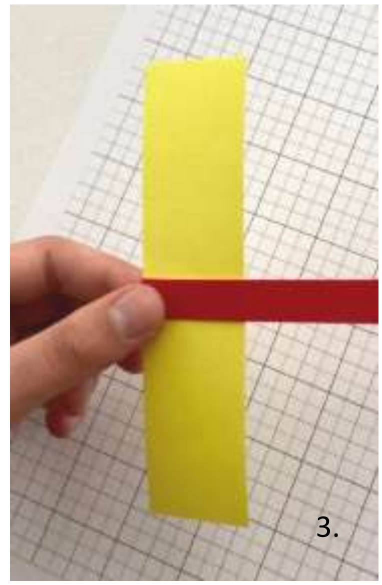
For our example, chose $S = 1.5$ inches, so that $\boldsymbol{S/2 = 0.75}$ inches**, and** $\boldsymbol{\sqrt{3}S/2 \approx 1.3}$ inches $\approx 1\,{}^{5}/_{16}$inch**.**

The strip of paper that we are forming into a face piece is red on one side and pink on the other.

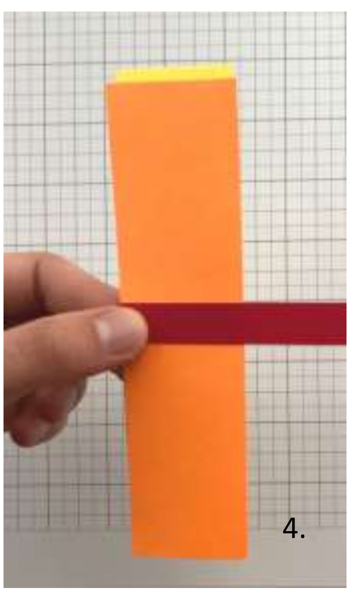
We start with aligning the edge of your face strip (red) with the edge of the yellow strip (1). Fold (2) and fold again (3).

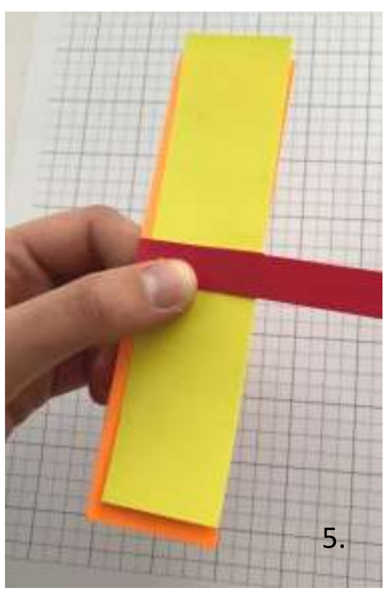


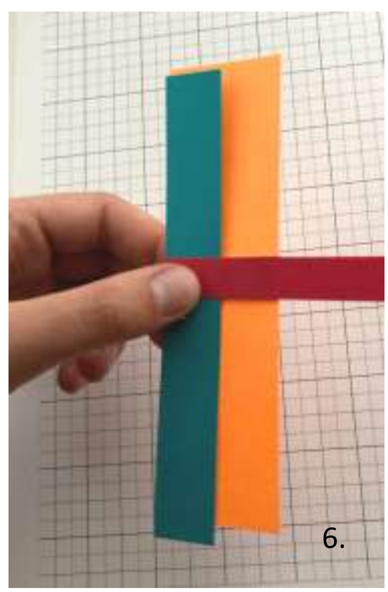




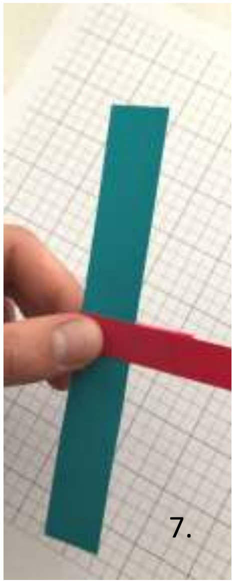
We have just created the "bottom " side of length $\boldsymbol{\sqrt{3}S/2}$ of our trapezoid. Now we need to create one of the sides with length S. In order to do this, we switch to the orange measuring strip with width S. We do this by slipping in the orange strip (4) so we can fold around it (5). Next, remove the yellow strip with a teal strip (6).



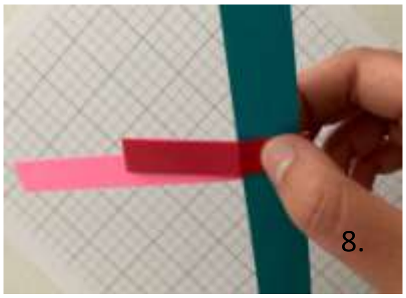




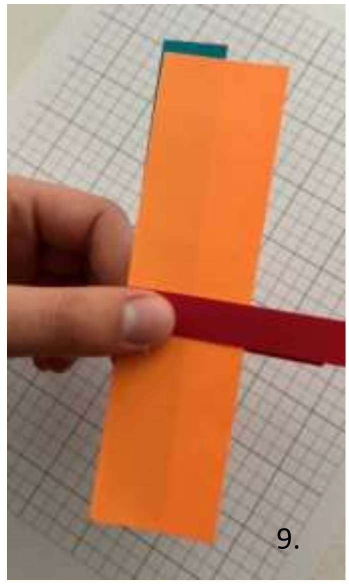
We can also remove the orange strip (7). Fold around the teal strip (8), and reinsert the orange strip (9)



7.

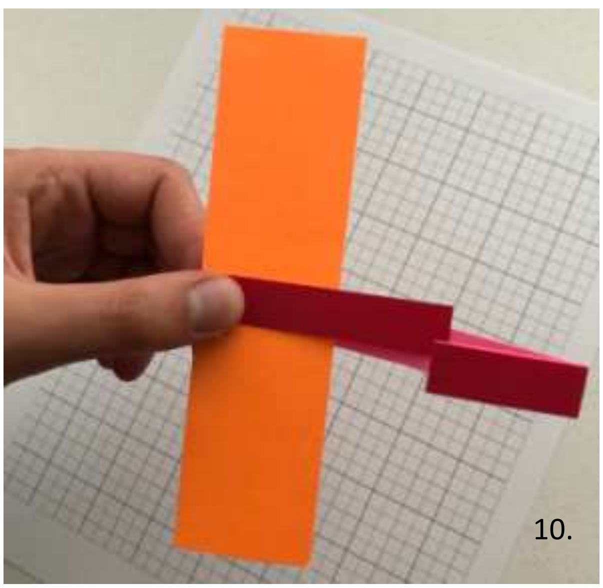


8.

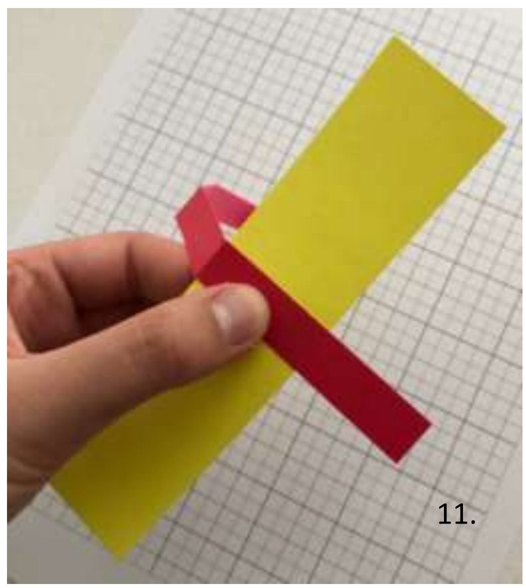


9.

Fold around the orange strip (10). Back to the yellow strip for the last fold (11).

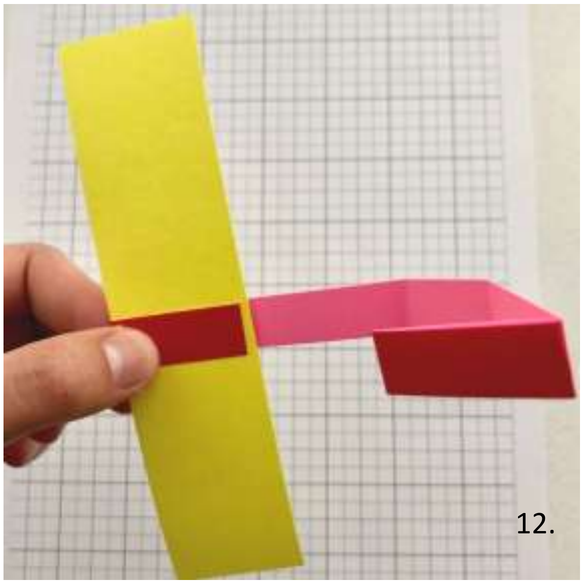


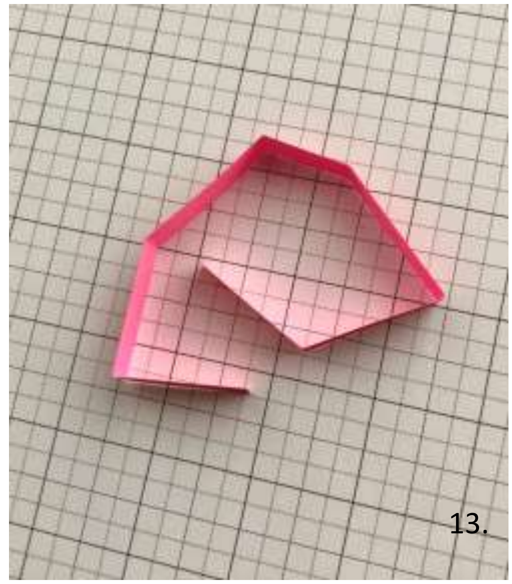
10.

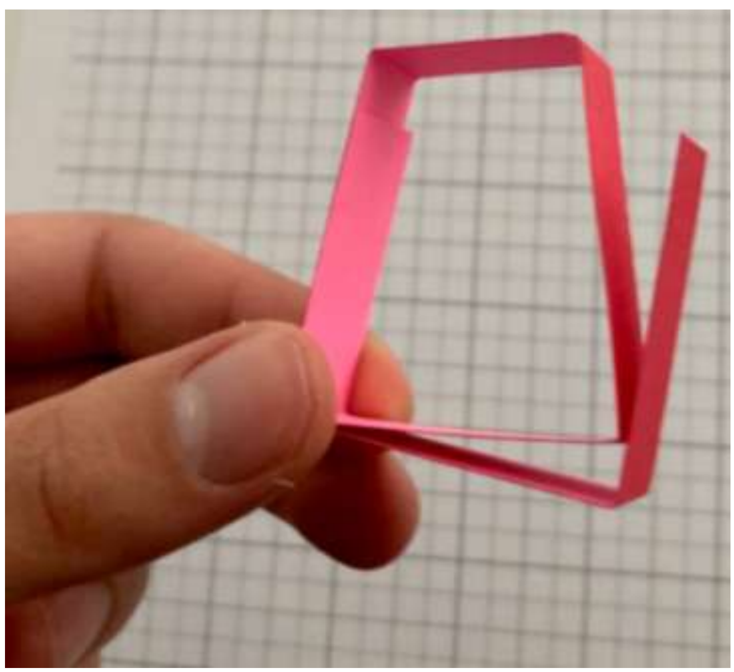


11.

Fold over and cut (12). Precise location of cut is not important because this part will be covered by a connector. The final product is shown in 13.







Conclusion

Now that you have seen how to fold an elongated trapezoid face, you can use the same technique to fold an isosceles triangle and a squarish trapezoid face. You can now start to assemble your face pieces and connector pieces in the traditional snapology origami manner. As always the case in snapology origami, it will seem at first as if your piece is not holding together without glue. It will hold together eventually. You may want to hold it with paper clips while you are working on it. Enjoy!