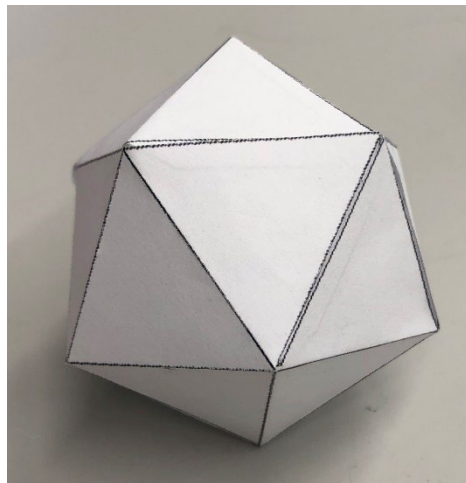


Making a “Virus”

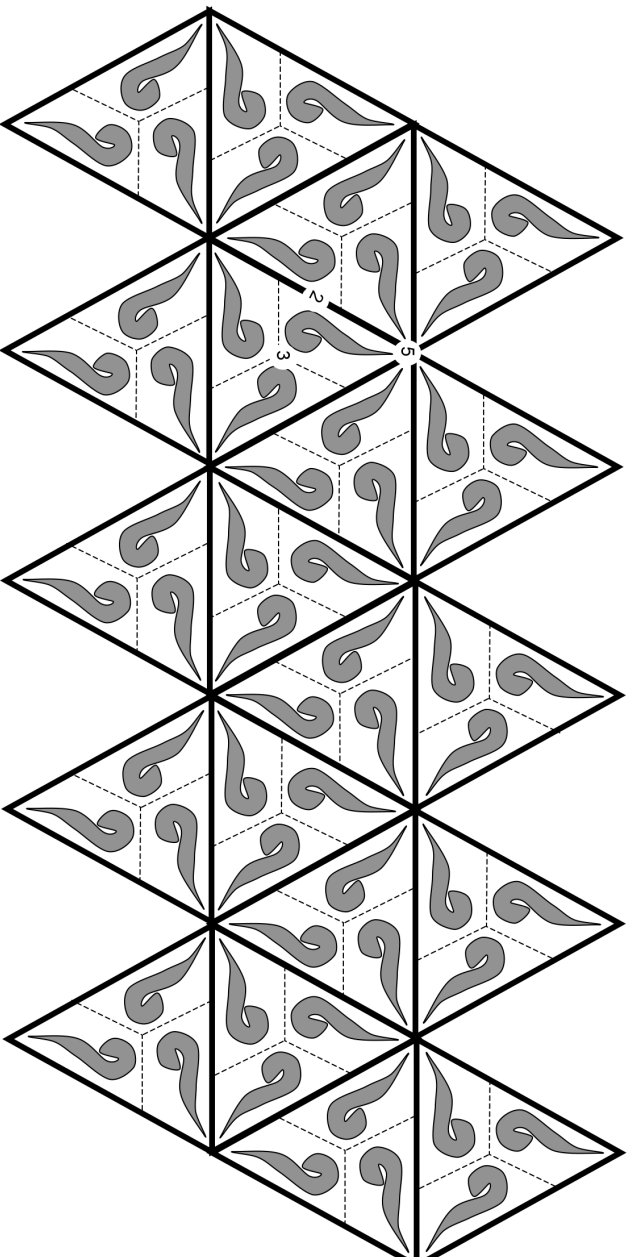
In this exercise, you will construct a model of a virus using paper, scissors, and tape. The structure you are making is called a virus capsid. It is the outside shell of a virus and is shaped like an icosahedron (it has 20 sides). Many viruses like HPV have capsids that are shaped like icosahedrons. HPV vaccines are made by using a single virus protein that comes together to form a capsid, much like the real virus but without any nucleic acid on the inside, thus ensuring that the vaccines are safe and effective.

Making the virus capsid

- 1) Print and carefully cut out a template of your choice. Note: A white template is on the last page so you can color the triangle before cutting if you want.
- 2) Identify all 20 of the big triangles with black borders. Starting at one end, fold along each dotted border, always folding “inward”. It is much easier to do this “pre-folding” before taping.
- 3) Starting at one end, tape each folded triangle using a small piece of tape. Hint: It is easier to put the piece of tape on one triangle first and then attach the other triangle.
- 4) Tape the last flap. The virus should now look similar to the picture shown below.



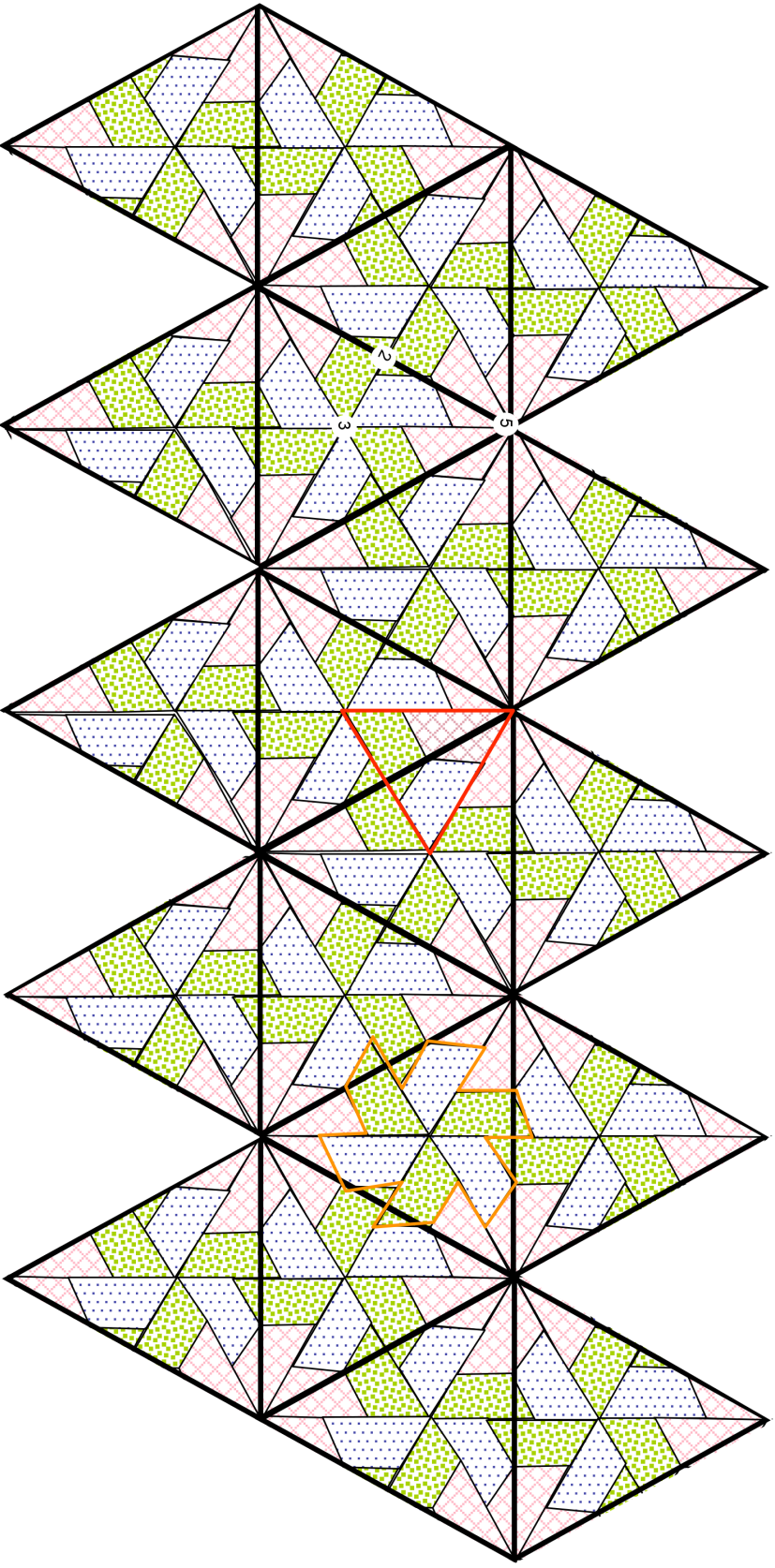
Cut out the figure below and fold along the heavy lines to make a 3-D shape with 20 triangular faces



$$T=1$$

Each of the 20 faces contains 3 identical subunits for
a total of 60 subunits
12 pentamers and [10(T-1) = 0 hexamers]

Cut out the figure below and fold along the heavy lines to make a 3-D shape with 20 triangular faces



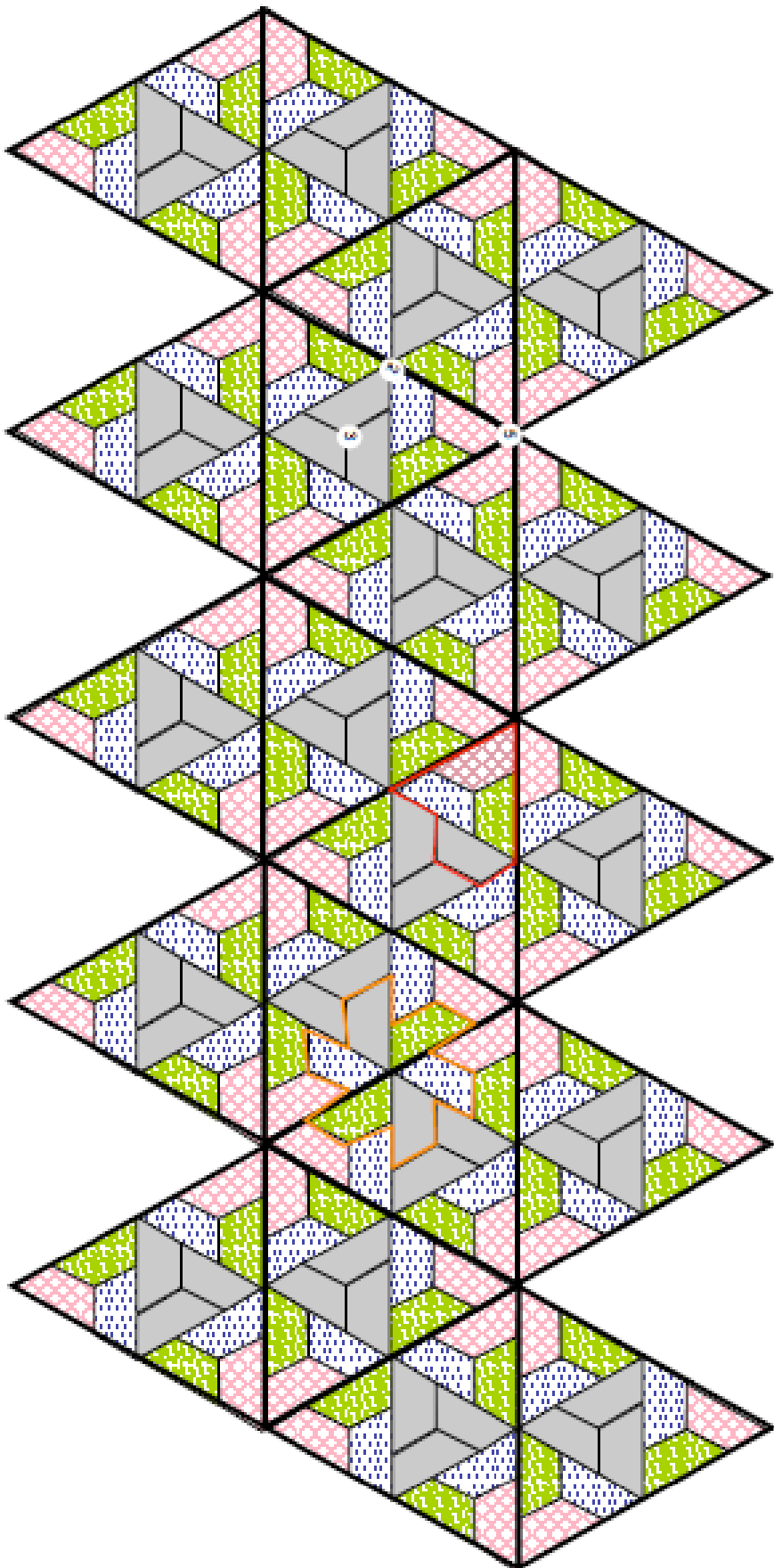
T = 3

pseudo-six fold symmetry around 3-fold axis of symmetry

Each asymmetric unit (outlined in red) contains 3 subunits; there are 60 of these asymmetric units for a total 180 subunits

12 pentamers and [10(T-1) = 20 hexamers]

One of the 20 hexamers is outlined in orange



T=4

A template for coloring

