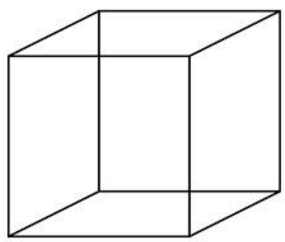
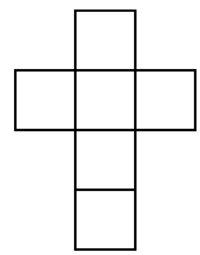
# PLATONIC SOLIDS

A net of a polyhedron is a connected 2-D configuration of the faces that can be folded into the polyhedron.

(1) Write out all possible nets of the cube with no repetitions. We consider two nets to be the same if we can turn one into the other by spinning them or flipping them over.



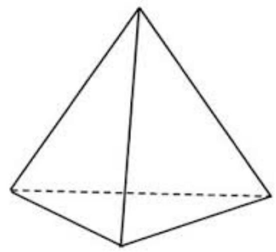
One Example of a Net:



Note that any net of the cube should have 6 squares.

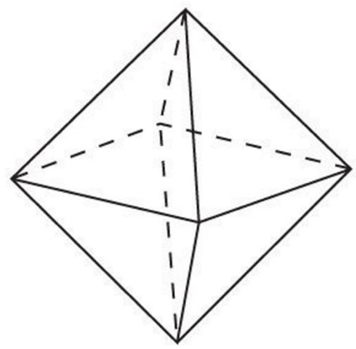
If it helps, use the paper and scissors provided to test your guesses and make sure they fold into cubes.

(2) Find all nets of the Tetrahedron (i.e., the pyramid with 4 faces that are equilateral triangles).



Again, feel free to use the paper and scissors provided to test your guesses and make sure they fold into tetrahedra.

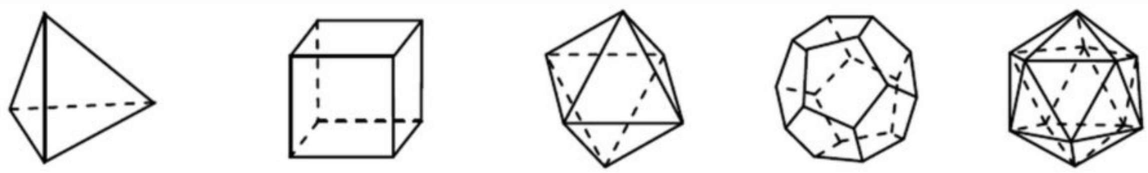
(3) Find all nets of the Octahedron (i.e., the shape below with 8 faces that are equilateral triangles).



Again, feel free to use the paper and scissors provided to test your guesses and make sure they fold into octahedra.

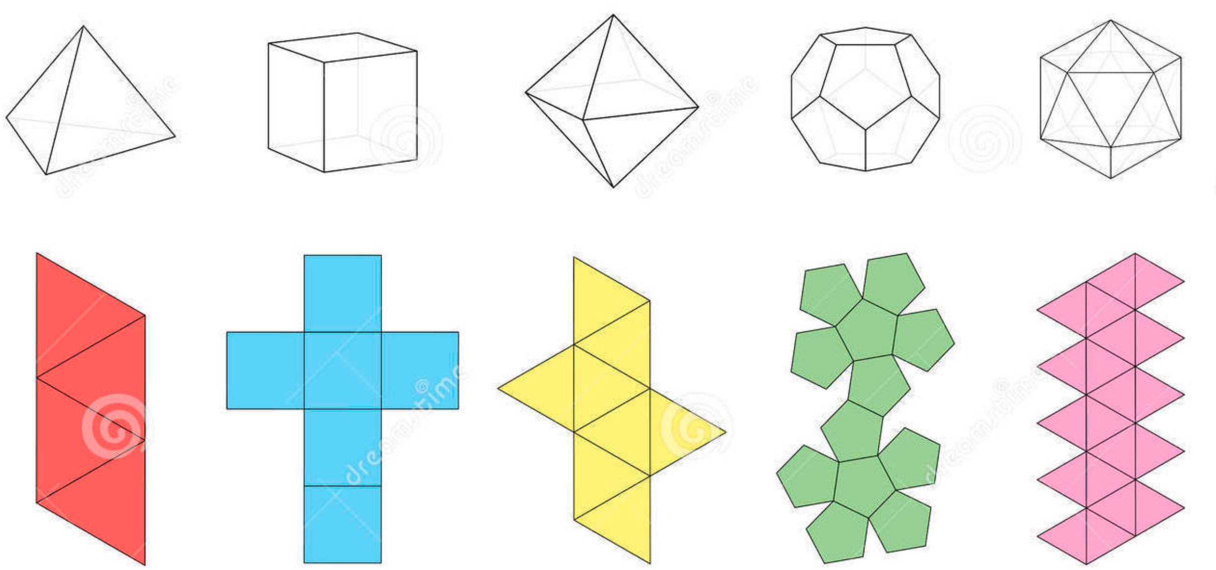
There are five Platonic Solids (i.e., solids with all faces equal to the same regular polygon, and having the same number of polygons meeting at each corner vertex).

| Tetrahedron | Hexahedron / Cube | Octahedron | Dodecahedron | Icosahedron |
|---|---|---|---|---|

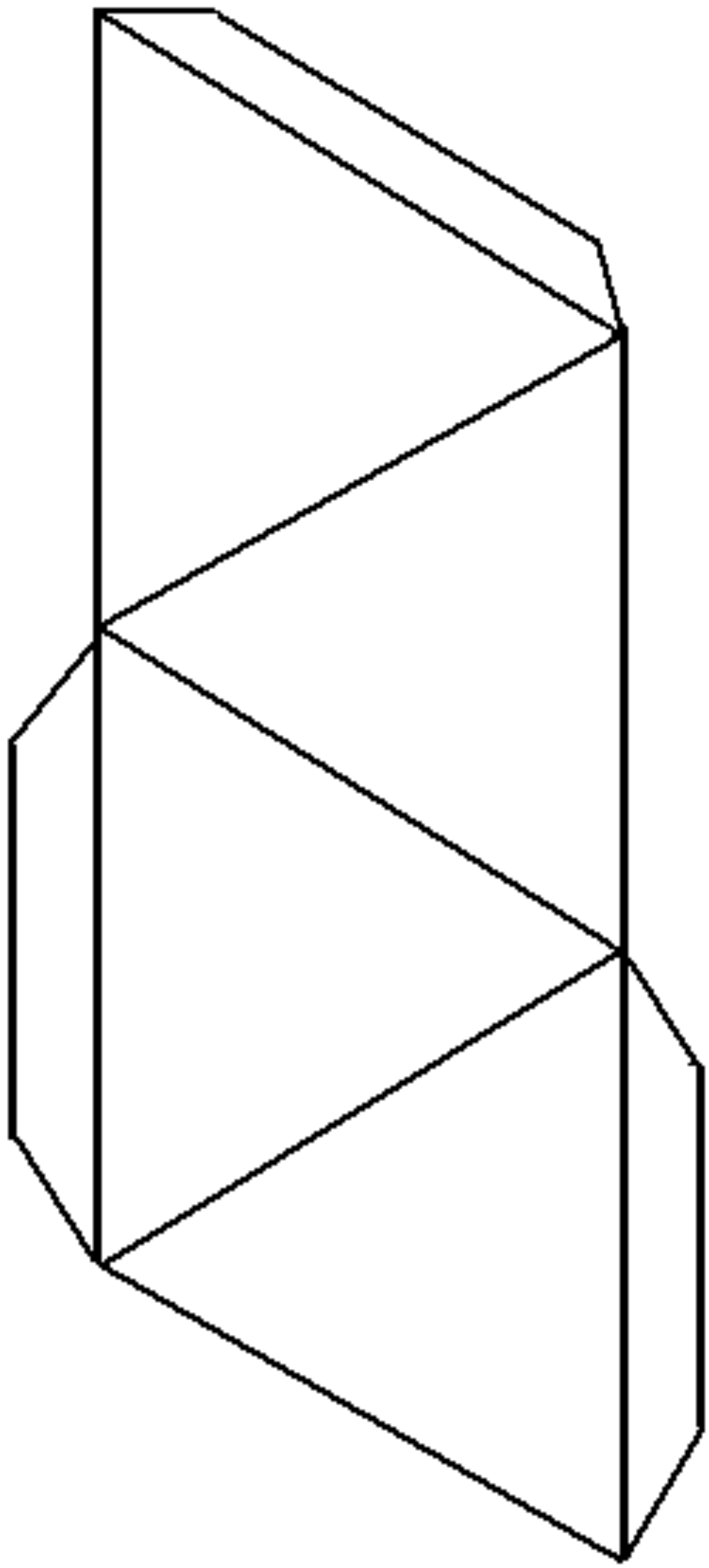


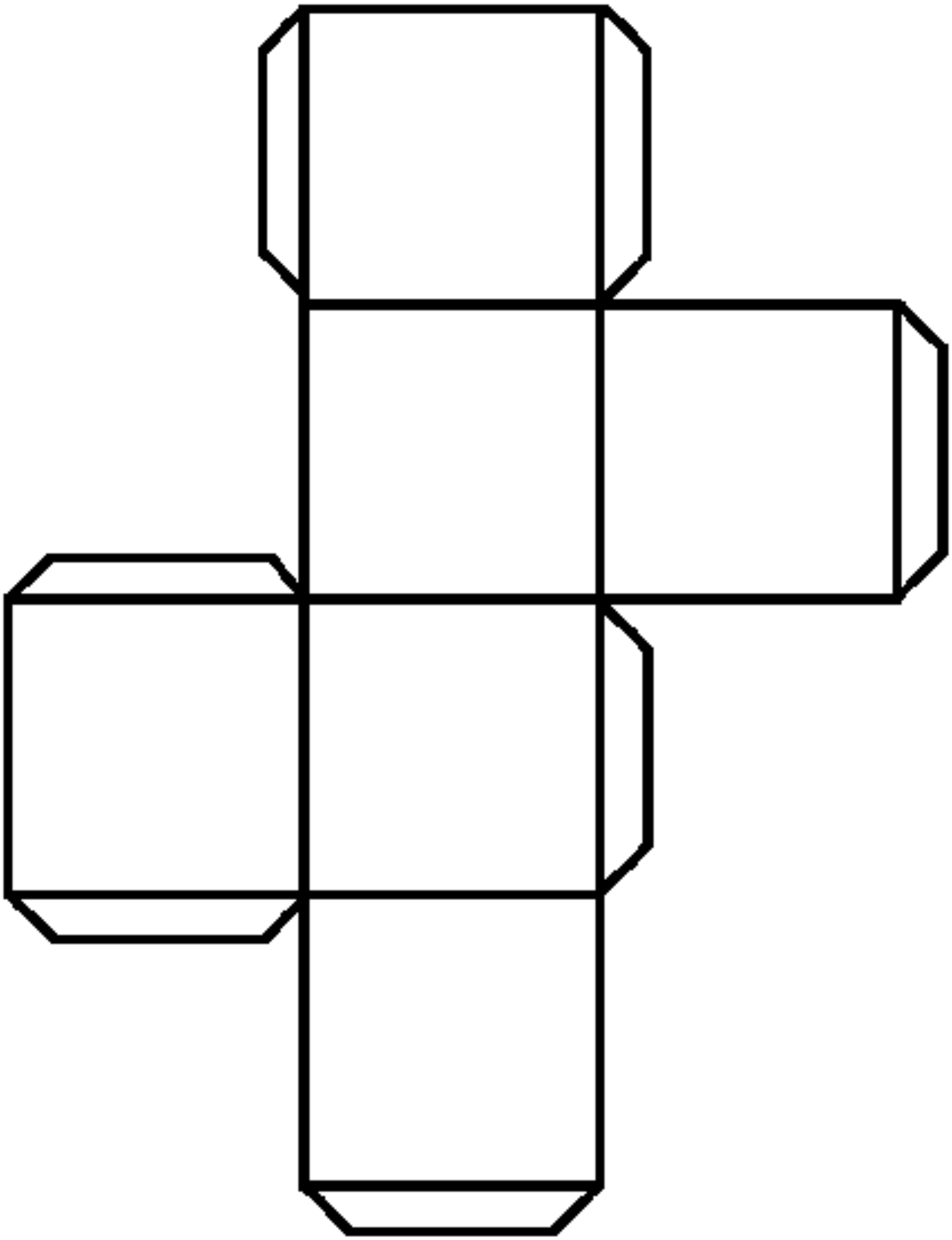
| | | | | |
|---|---|---|---|---|
| 4 faces<br>Triangles | 6 faces<br>Squares | 8 faces<br>Triangles | 12 faces<br>Pentagons | 20 faces<br>Triangles |

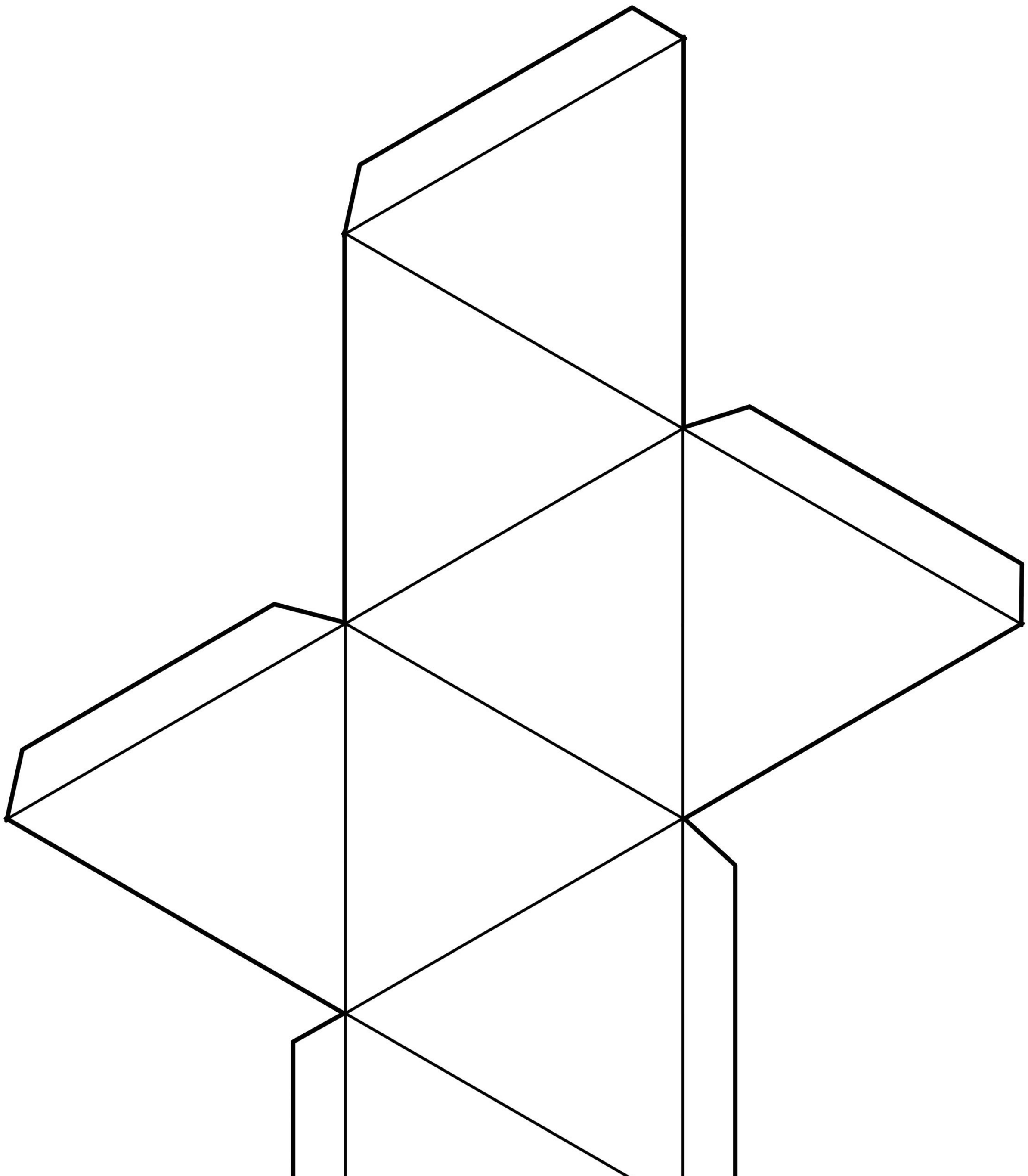
Here are nets for each of the Platonic Solids.

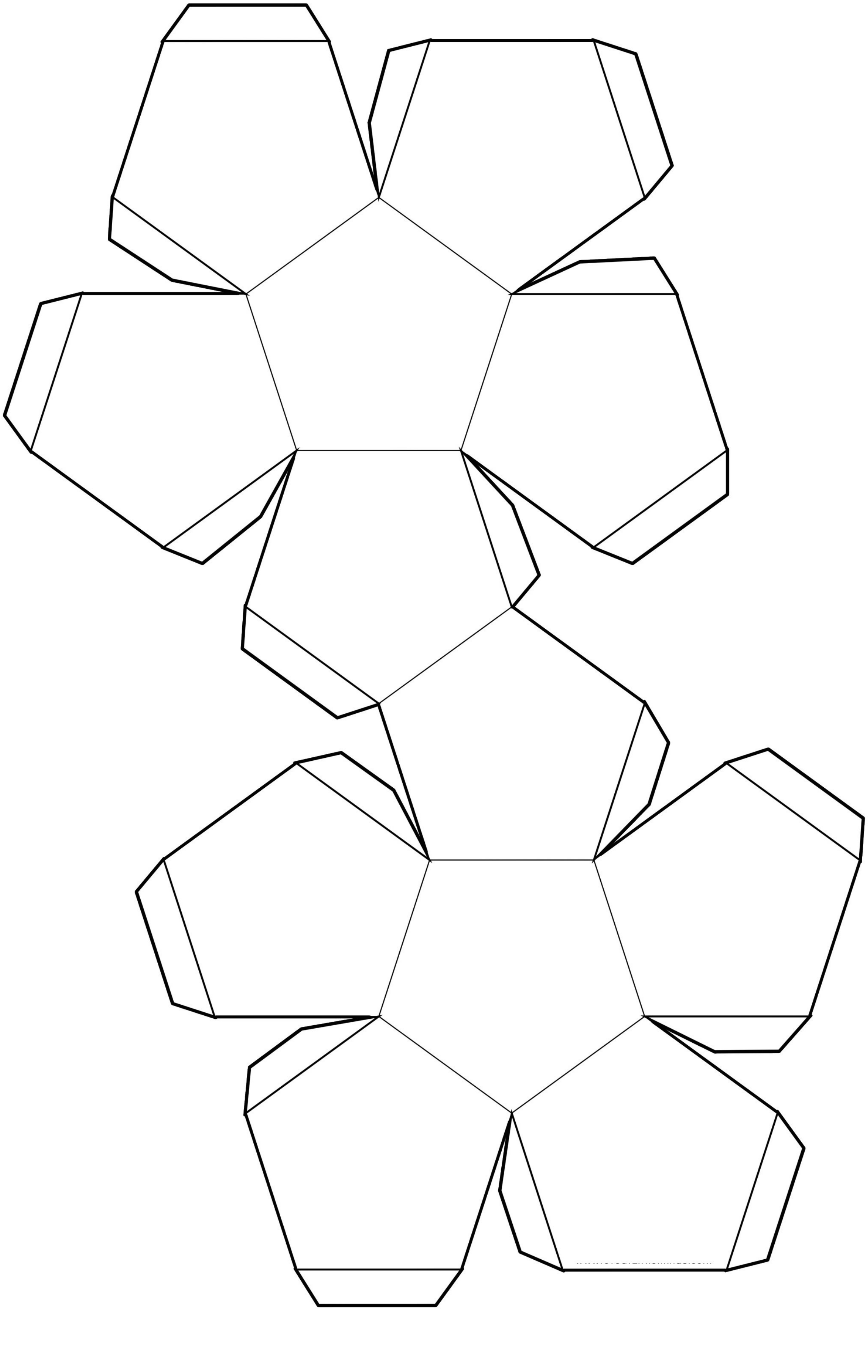


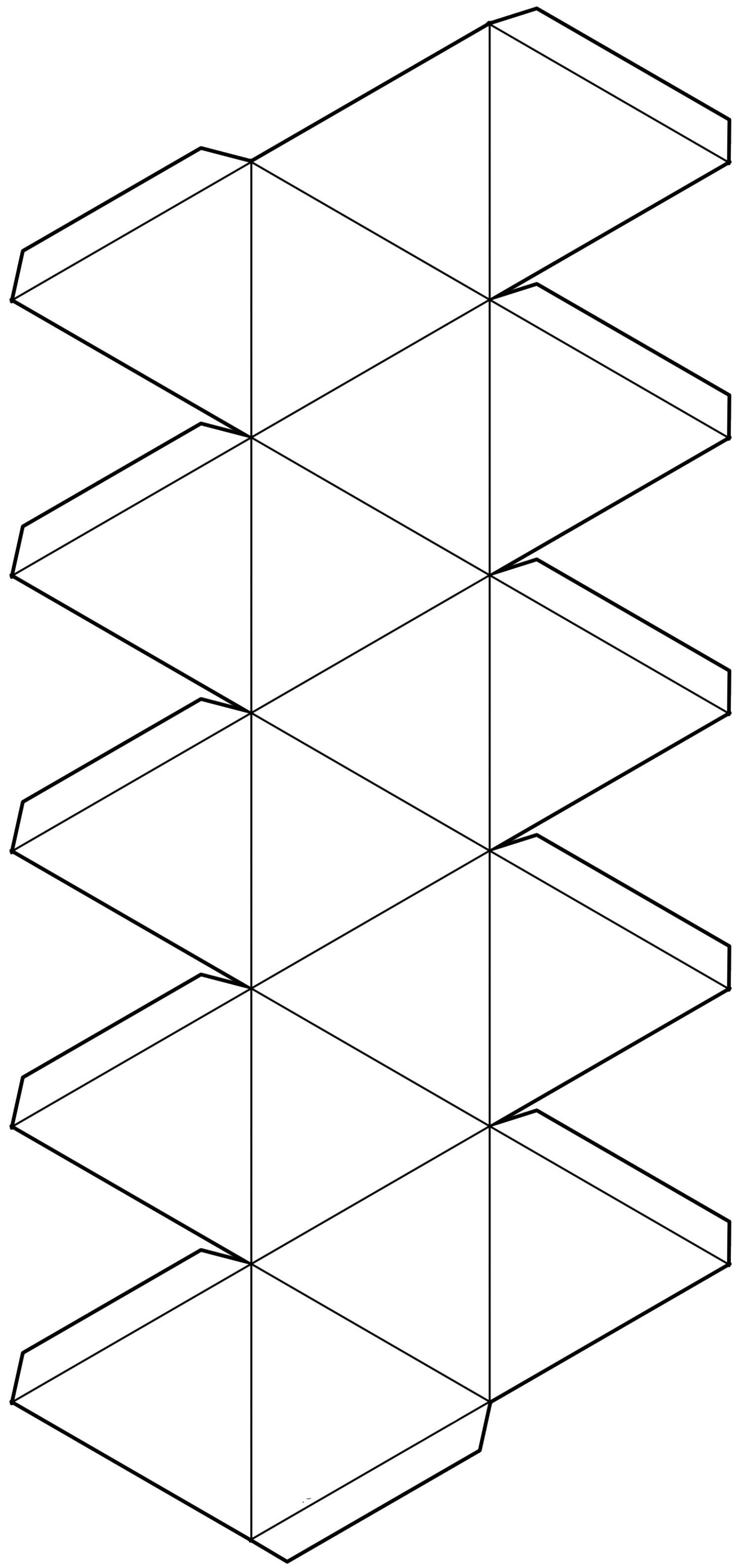
Cut out the nets on these pages and take them together to make the Platonic Solids.
(There are flaps included on the nets to help you tape the sides together.)





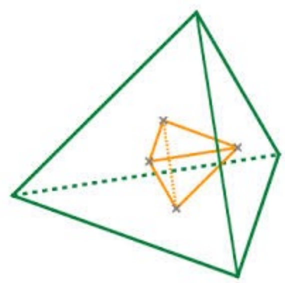




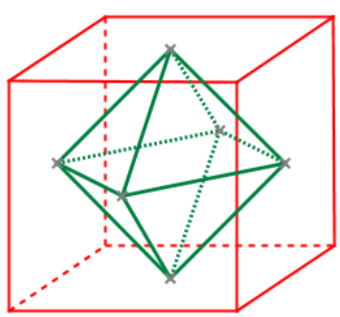


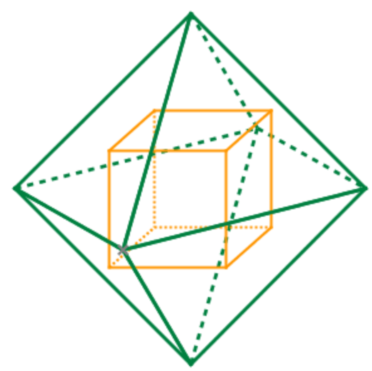
If you take the center point on each face of a platonic solid, and then connect the points with line segments, you get another platonic solid.  We call this process “dualizing”.

If you take the tetrahedron and dualize, you get another tetrahedron.  So we say the tetrahedron is its own dual or that it is “self dual”.

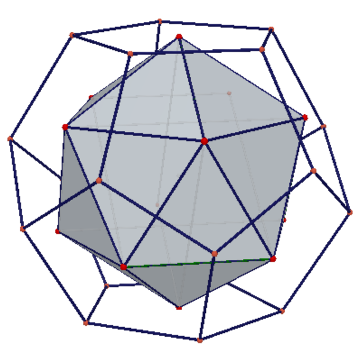


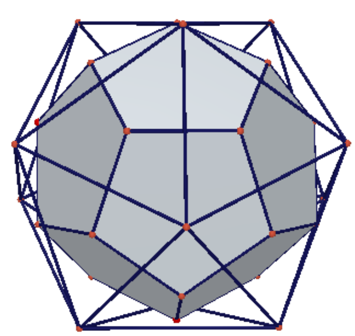
If you dualize the cube, you get the octahedron.  Likewise if you dualize the octahedron, you get the cube.  So we say the cube and octahedron are duals of each other.

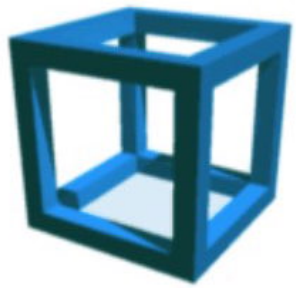
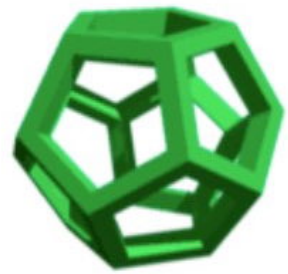
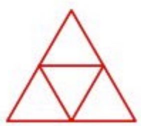
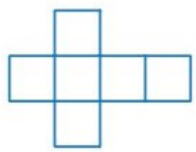
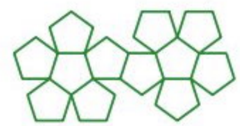
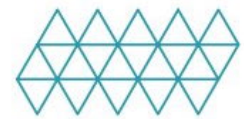




It’s a bit harder to see, but if you dualize the dodecahedron, you get the icosahedron.  Likewise if you dualize the icosahedron, you get the dodecahedron.  So we say the dodecahedron and icosahedron are duals of each other.





| | Tetrahedron | Hexahedron / Cube | Octahedron | Dodecahedron | Icosahedron |
|---|---|---|---|---|---|
| |  |  |  |  |  |
| Animation control | Play > | Play > | Play > | Play > | Play > |
| Pattern, or planar net |  |  |  |  |  |
| | Self-dual | Dual | | Dual | |
| Faces | 4 | 6 | 8 | 12 | 20 |
| Vertices | 4 | 8 | 6 | 20 | 12 |
| Edges | 6 | 12 | 12 | 30 | 30 |
| {p,q} * | {3,3} | {4,3} | {3,4} | {5,3} | {3,5} |
| Element | Fire | Earth | Air | Universe | Water |

* p: edges per face, q: faces at each vertex