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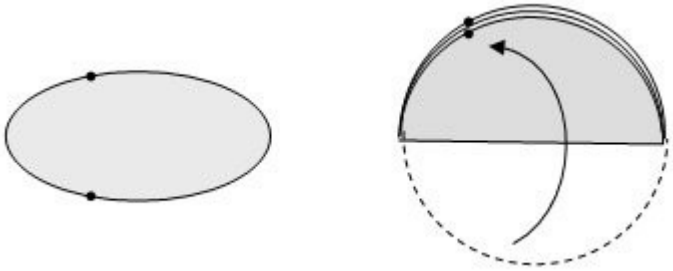
How to Fold Circles

Here are four fundamental folding activities

Anyone that can fold a paper plate in half can do this; four and five years old on up. Paper plates, masking tape and bobby pins are all that is necessary. There is no cutting or measuring, only proportional folding of the circle. This is a process about touching points. If the points are accurately placed together the creases will be exactly where they need to be. Use a hard straight edge to get a good folded crease, a ruler or folding stick will do. This will flatten the paper plate at the same time creasing the folds. Any kind of paper circle will do.

00.Fold in Half

Two points anywhere on the circumference of a circle when touched exactly together will fold the circle in half. This forms a diameter and two more points on the circumference. The diameter is creased perpendicular to and half way between the movement between the two points. This forms a tetrahedron pattern (4 points in space define a tetrahedron pattern of 6 lines of relationship defining 4 triangles.) This right angle movement is a 1:2 ratio; one Whole to two parts.



Fold circle in half by touching any two points on the circumference together and crease. Make sure points are touching before creasing.

There is too much information generated in this one fold to go into it here. Everything that happens in this first fold is principle to all subsequent folding of the circle and is basic to the functions and relationships fundamental to mathematics. This movement reflects spherical origin and the tetrahedron as pattern.

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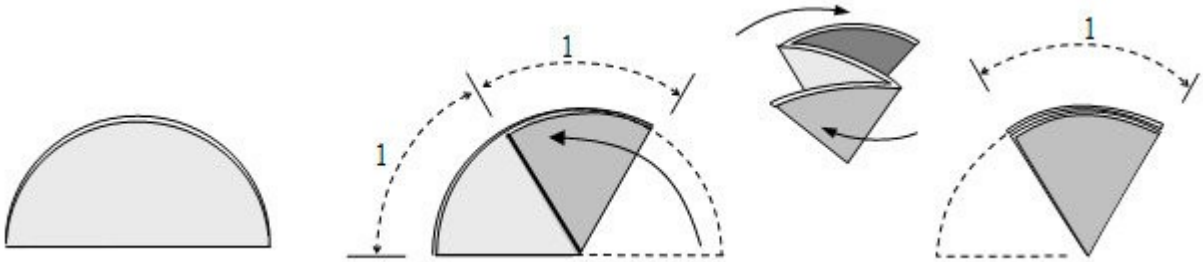
0.Three Diameters

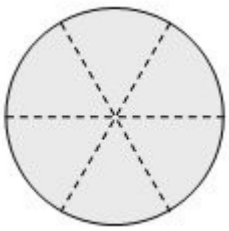
Fold the circle in half.Fold unfolded part behind. One fold is on top, one in the middle, and one on the bottom, like a "Z". This allows you to look at both sides to make adjustments in order to get both end points even, making the third point even. When the points are even then the edges and circumference will also be even. When all is even, give it a good strong crease.

Fold one corner point half way over on curved edge making 2 equal parts, in the ratio of 1:2. Don't measure! Use your eyes; they are made to see proportionally. Don't crease the folds yet.



One folded forward, one folded to the back.

This folds the folded circle into thirds. Open it to find 3 diameters in a hexagon pattern of 7 points (6 end points on the circumference and one center point of intersection). There are 6 equally divided intervals. Folding circles is about spatial patterns and the intervals formed by the self-referencing movement of the circle.The three diameters are proportional directive for further folding, they are the root.



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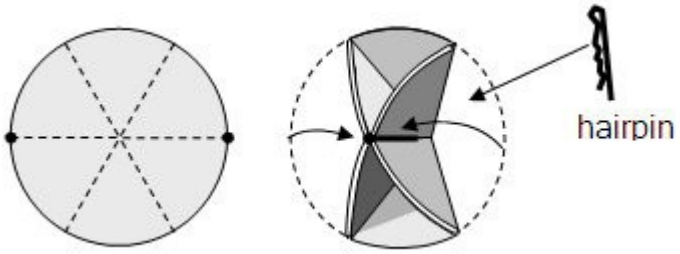
1. Make a Sphere

Open to flat circle. Bring 2 end points of one diameter together, hold them closed with a bobby pin. This forms a pattern of 4 tetrahedra; 2 open formed tetrahedra and 2 tetrahedral intervals. Six points in space.

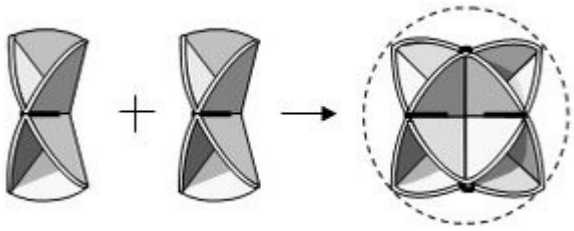
Bring the ends of one diameter together holding edges with a hairpin.



Make another circle in the same way. Join the two circles together joining only on the straight edges (as with the single circle). This forms a square or quadrilateral interval that moves on perpendicular axis, reflecting first fold.

Two circles folded the same way are joined together. There are now four open tetrahedra in a circle pattern showing a square.

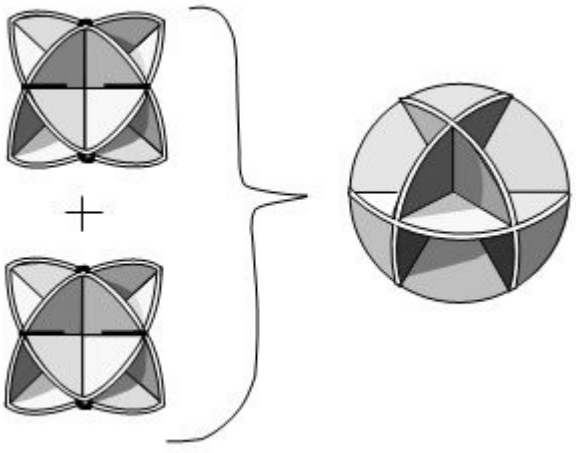
2 sets of 2 joined together on the radii using two more hairpins to hold them together, one on each side



Make another set of 2 circles in the same way and join them together, straight-edge-to-straight-edge holding together with bobby pins. This creates a tight and strong sphere of 8 open triangles and 6 open squares, (four circles.) This is called the vector equilibrium, or traditionally the cuboctahedron. There are 13 points of intersection (12 around 1) reflecting 6 points around 1 in the hexagon.

Make another set of 2 folded circles.

Use hairpins to join the two sets of two circles each together on their straight edges.



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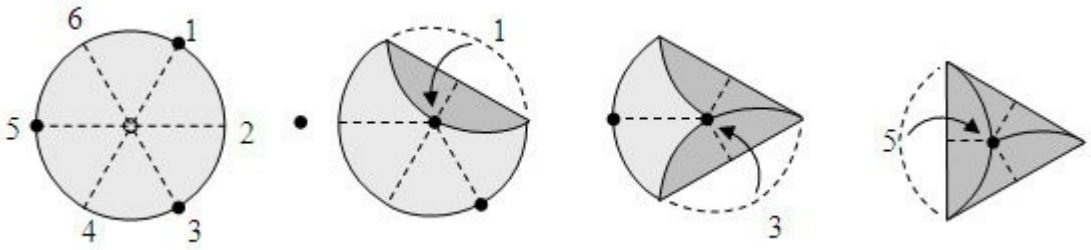
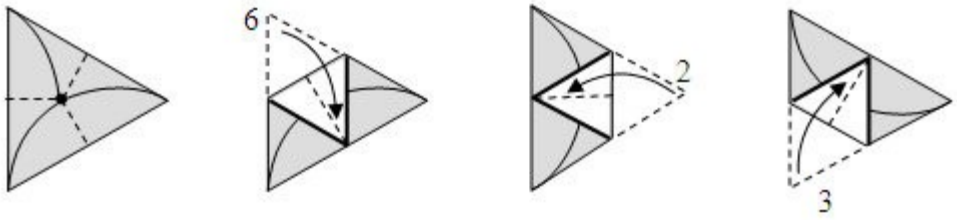
2. Make a Tetrahedron

Start with open circle and 3 diameters. Fold 3 alternate points on circumference (1, 3, 5) to the center point. (Be accurate in putting the points to the center point otherwise subsequent folds will not be accurate.) Crease well. This forms a 2-frequency equilateral triangle. Each edge length is divided in two equal parts.



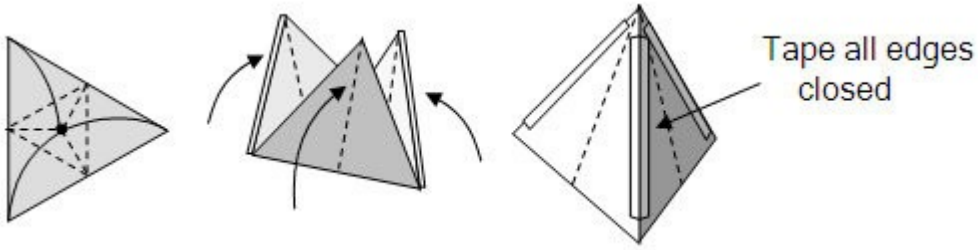
Fold three alternate points to the center point and crease well.

Fold each end point of the triangle to the mid point on the opposite side. Do all 3 folds individually. Do not overlap these folds. Crease well each fold using a hard straight edge.



Fold each end point to the point on the opposite side and crease well. Do one at a time.

Bring end point together forming a tetrahedron. Tape full length along the edges to hold it together. This gives form to the tetrahedron pattern in the first fold.



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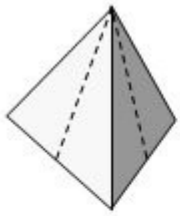
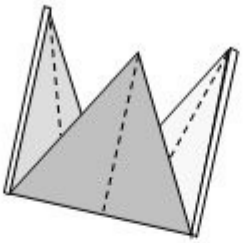
3. Make an Octahedron

Fold a tetrahedron. Open it half way so the triangular spaces are the same size as the triangles that form them. There are now 6 points and 8 triangular planes, (4 open triangle planes and 4 surface or closed planes.) The open tetrahedron forms an octahedron pattern.

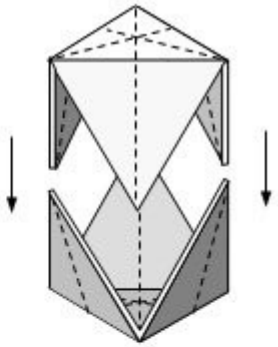
Make another tetrahedron and open it the same way. Join the 2 opened tetrahedra together, joining edge-to-edge. Tape the edges together the full length.



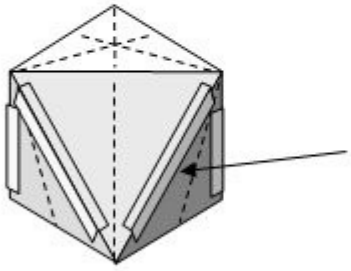
Fold a tetrahedron.



Open half way.

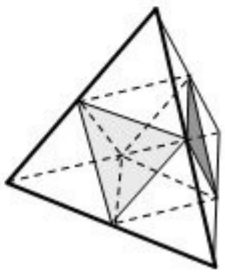


Put 2 open tetrahedra together. The triangles of one will fit into the triangle spaces formed by the other.



Join the six edges with masking tape.

Four tetrahedra will fit around the octahedron forming a "solid" 2-frequency tetrahedron. Make the larger tetrahedron without the octahedron, leaving the center open, using only four tetrahedra.



The vector equilibrium sphere with triangles and square intervals, and the tetrahedron (triangles) and octahedron (triangles and squares) are three components interrelated to a single system where all edge, surface, and interval relationships are congruent. There is much to explore using multiples of these three units. The tetrahedron is formed by 9 creased lines in the circle. There are countless ways of reconfiguring and joining multiple circles using only these 9 folded lines.

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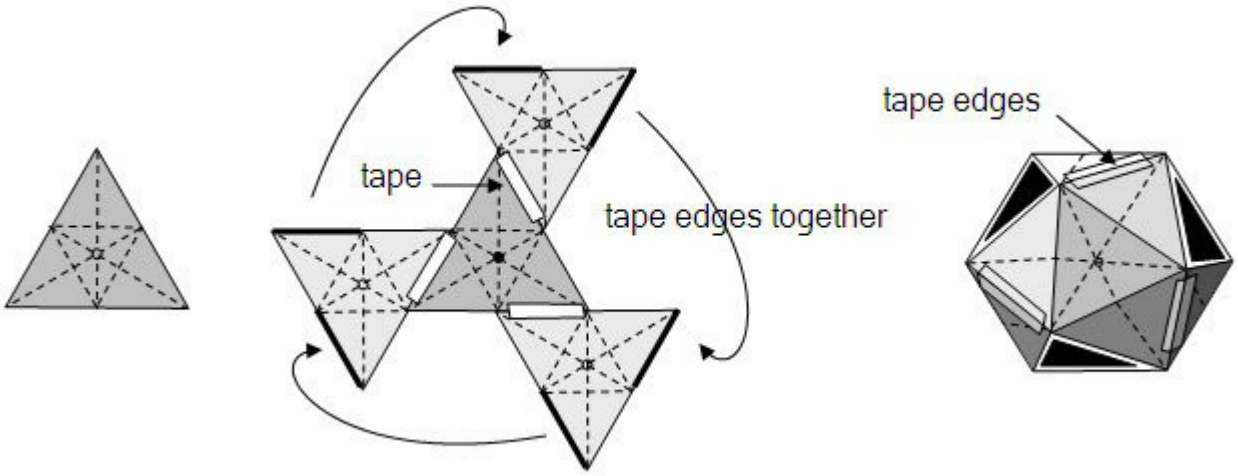
4. Make an Icosahedron

Fold four tetrahedra, open them to flat triangles and arrange them showing three triangles around the center triangle. Four triangles is the pattern of the tetrahedron net. Off-set the three to 1/2 edge length of the center triangle and tape edge-to-edge. This can be a left hand or right hand direction depending on which side of the center triangle you place the three triangles.

Fold the edges together showing the same alternate taping pattern to the center triangle. This forms four open triangle intervals in a tetrahedron pattern. By using sixteen triangles we have formed the twenty-sided icosahedron.

Around each of the twelve vertexes are four triangle closed planes and one open triangle interval forming a pentagon.



By completing the icosahedron, you will then have made the third primary polyhedra of the five Platonic Solids by simply folding tetrahedra. The other two, the cube and the dodecahedron, can also be modeled by folding and joining tetrahedra, a stellation process of the first three regular polyhedra.

This is only the beginning to an endless process of reforming and joining multiples circles.