

Readme for 4D work from students at The Paideia School

Four dimensional work at Paideia is done by students investigating three and four dimensional objects as best they can. The goal is not mathematical understanding, although that always happens to some degree, but direct perception, the ability to intuit four dimensional objects. To this end the students draw; construct with Zome-tools, string, and balsa wood; compute with Mathematica, but mostly (to my surprise) with Sketchpad. We use only one book (Banchoff's) and try to discover everything ourselves. After they discover something new (to us), they often write it up, these write-ups becoming the text for the following students.

Included in these material are two folders. One is of tutorials written by Paideia students (sometimes when they were in college) for other students. The ones by Michael Matthews were written at Brown University in Thomas Banchoff's 4D course and immediately incorporated into our tutorials. These are among the best introductions to four dimensions that I have ever seen.

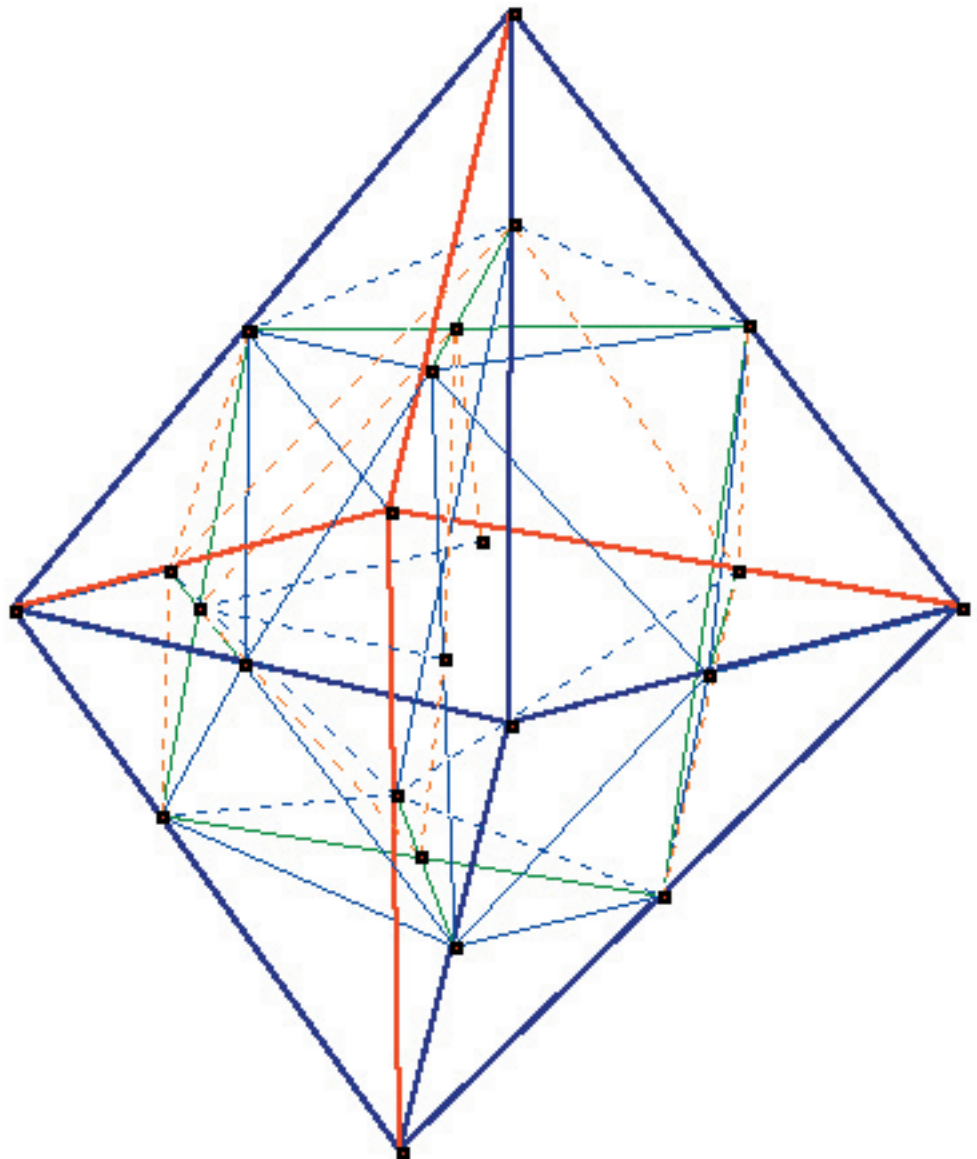
The tutorial should be considered the intellectual property of the authors, who have given permission for its individual or classroom use.

The other folder contains student work in Sketchpad. Open them up and enjoy. The objects are usually hypercubes, so grabbing an edge of the hypercube and manipulating the figures. There are several interesting objects, including the 24 cell, an object of particular interest to our students because it has no 3D analog. The sketches are the culmination of a long process of discovery for this object.

The term "face-dual" is a (technical) term we invented and is used in some of the sketches. It refers to the figure constructed by connecting the centers of adjacent faces in a 4D object. For example the face-dual of the hypercube is the 24 cell. It is incorrect usage because it is not a dual. The face-dual of the face-dual is not a copy of the original object. I suspect we will continue using the term anyway.

The supplied sketchpad file is Jolie Dahl's introduction to the hypercube.

Steve Sigur
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picture by Chad