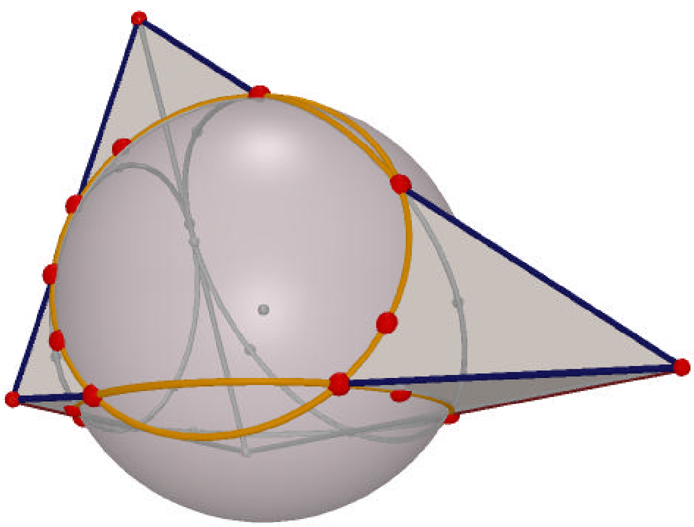
A Beginner's Look at Cabri 3-D



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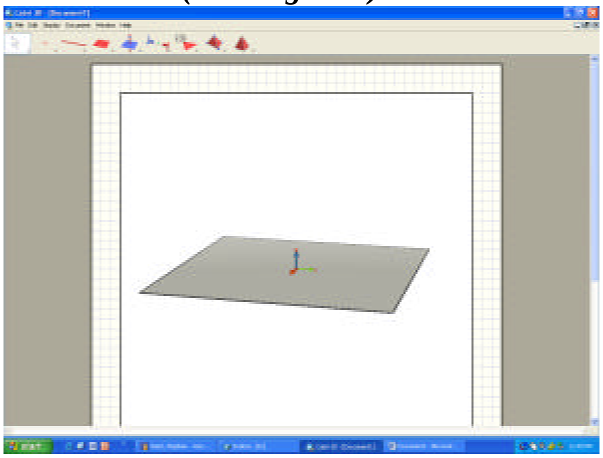
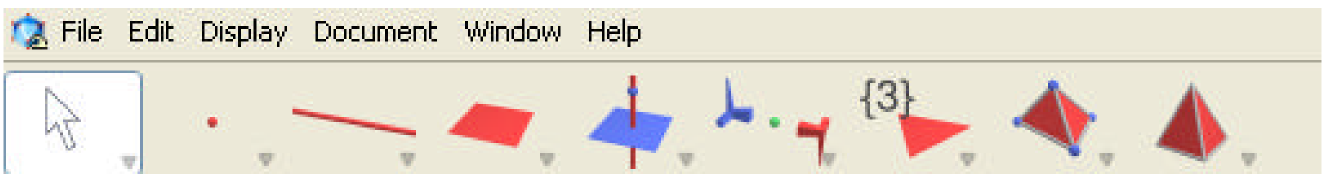
A "Quick and Dirty" Introduction to Cabri 3-D

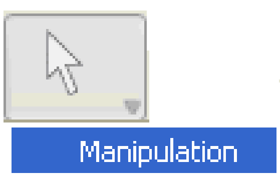
Visual Plane (drawing area)



Pull Down Drawing Tool Menus

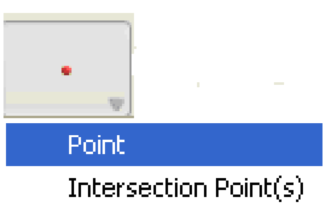


Manipulation Tool



This tool is used to select and drag tools in a manner very similar to other Cabri software. By holding the right mouse button down and moving the cursor  you can change the viewing angle of any figure that you have constructed.

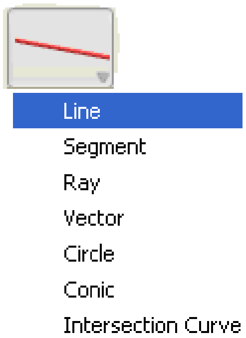
Point Tools



Points in the Plane: Select the point tool and drag the cursor over the Visual Plane and the words "a new point (on the plane) will appear. A left mouse click will create points in the plane. Once created in the plane the point may be dragged using the manipulation tool, but it will always remain in the plane. *Don't be misled by the perspective.*

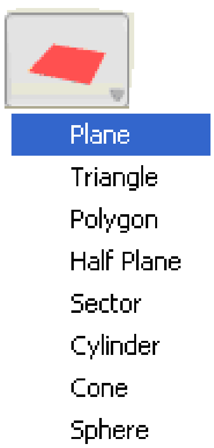
Points in Space: Select the point tool and drag the cursor until the words "a new point (on the space) appears. A left mouse click will create points in space. Once created in space, a point may be dragged horizontally using the manipulation tool or vertically if the *shift key* is held. Once the shift key is held you can only create points in space. Pressing the *Esc key* will return the selection tool to its original state. *Don't be misled by the perspective as you drag a point in space.*

Pull Down Curve Tools



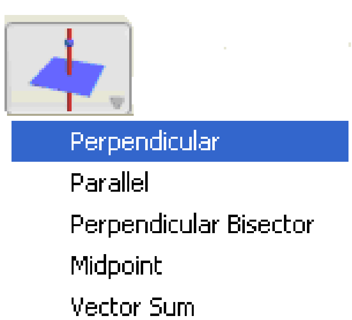
These tools work as you would expect them to – by selecting or creating the points that define them. In particular a *circle* can be constructed by its center and a point on the circle, three non-collinear points, or by its center and its radius (line segment). Other methods exist, but this will suffice for now. A *conic* by five points that determine it (other methods also exist).

Surface Tools



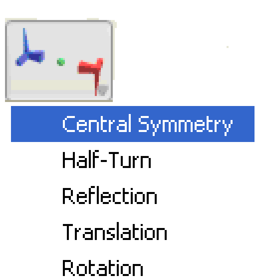
These tools also work as you would expect them to – by selecting or creating the points and/or lines and curves that define them.

Relative Constructions



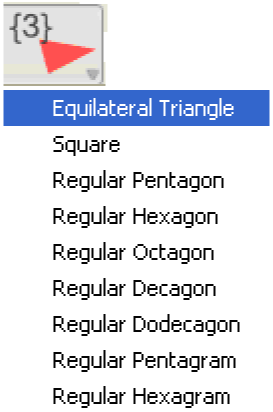
Perpendicular will construct a line perpendicular to a plane or a plane perpendicular to a segment, line, ray or vector. *Parallel* will construct a line parallel to a segment, line, ray or vector or a plane parallel to a plane.

Transformations



3-D Transformations are the analogs to those in 2-space. To perform a *Central Symmetry*, select the object and then the point of symmetry; To perform a *Translation*, select the object and then the vector of translation; To perform a *Reflection in a plane*, select the object and then the plane of reflection; To perform a *Rotation about a line/segment/ray, vector*, select the object and then the axis of rotation and then two points that define the angle about the axis;

Regular Figures



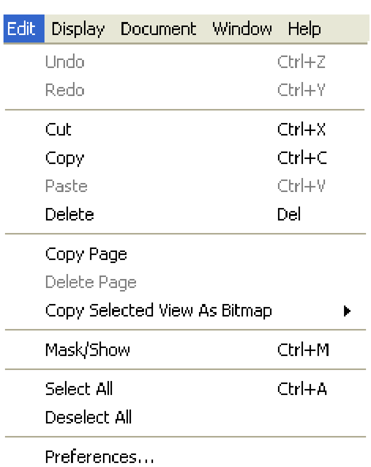
Regular polygons in a plane are constructed by selecting the plane in which the polygon lies, a point or axis which serves as its center and a point that defines the radius of the circumcircle.

Polyhedra

A *Tetrahedron* is determined by any four non-coplanar points. A *Prism* is determined by any convex polygon and a vector indicating the translation between the two parallel bases. A *Pyramid* is determined by any convex polygon and a point indicating the vertex of the pyramid.

Regular Polyhedra

A *Regular polyhedron (Platonic solid)* is determined by constructing then points defining its circumcircle in a plane. (Select the plane, the center of the circumcircle and a point that determines its radius.)



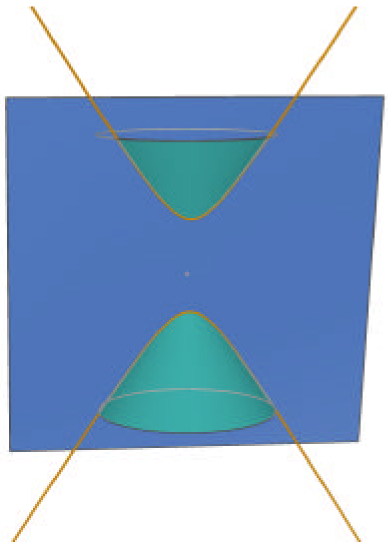
The editing commands are those common to most software. Two important features are *Copy Selected view as Bitmap* which will allow you to save and insert Cabri 3-D figures into documents, and *Mask/Show* which is Cabri 3-D's analog to Cabri 2-D's "Hide and show".

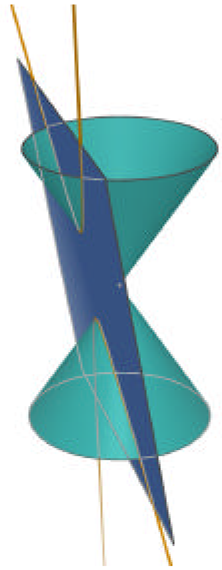
Investigations

Conic Sections

Illustrations of the geometric definition of conic sections.

hyperbola

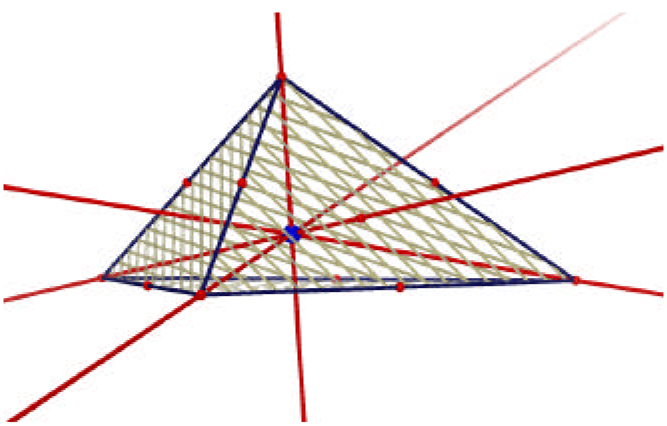




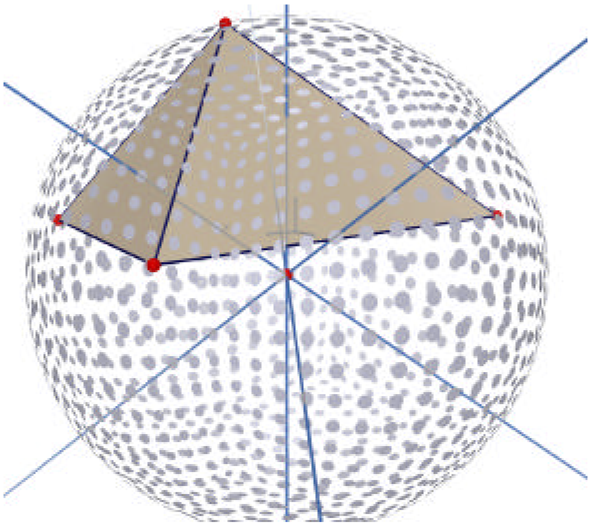
2-D Analogies

The simplest investigations are those which are extensions of theorems in 2-space to analogies in 3-space. For example, the 3 dimensional analog to a triangle is a tetrahedron, and the following represent "theorems" in 3-space.

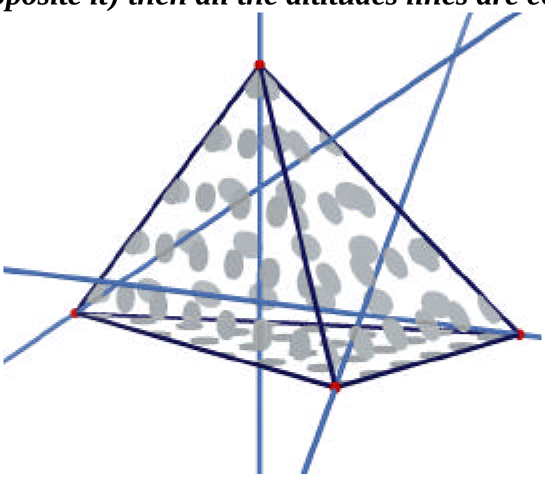
Centroid of a tetrahedron: ***In a general tetrahedron, the four lines connecting each vertex with the centroid of the face opposite are concurrent.***



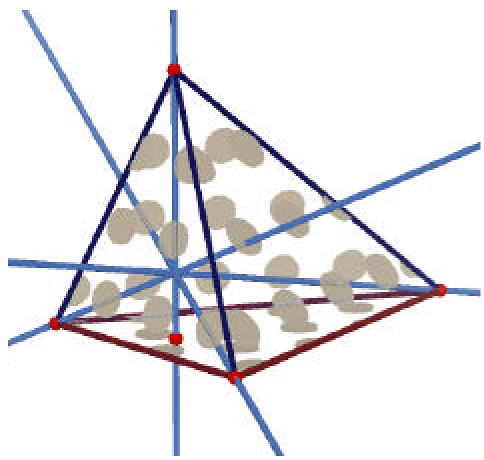
Circumcenter of a tetrahedron: ***The planes which are perpendicular bisectors of the edges of any face intersect in a line. The four lines of intersection are concurrent at the circumcenter.***



Orthocenter of a tetrahedron: ***In general the altitudes lines of a general tetrahedron are*** **not** ***concurrent. However in an (a tetrahedron in which an altitude passes through the orthocenter of base opposite it) then all the altitudes lines are concurrent and the tetrahedron is called orthocentric.***

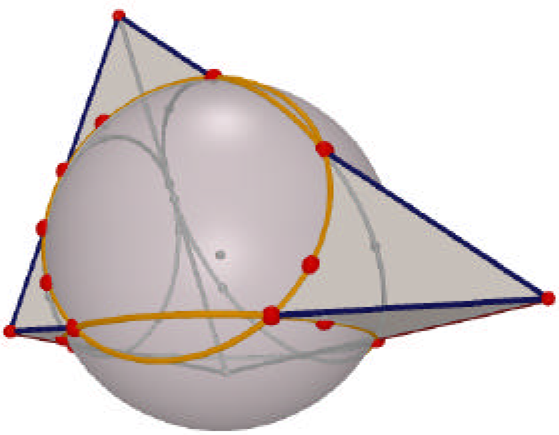


non-orthocentric tetrahedron



orthocentric tetrahedron

24 point sphere*: Each face of a tetrahedron is a triangle and hence has a nine-point circle. For each orthocentric tetrahedron there exists a sphere that intersects each face in its nine-point circle.*



Spherical Geometry

Investigations of non-Euclidean geometry on the surface of the sphere (a geometry with no parallel lines).

Summit Angles of a Saccheri Quadrilateral*: In a Saccheri quadrilateral (a quadrilateral with right angles at points A and B and with* $\overline{BC} \cong \overline{AD}$*.) the angles at points D and C are congruent and obtuse.*