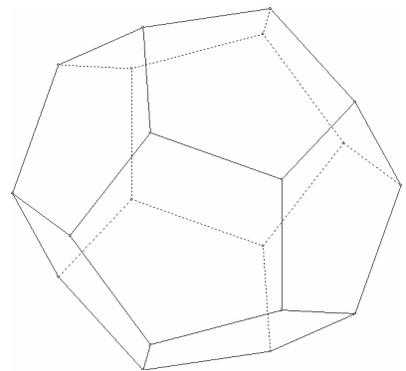


The Volume of a Dodecahedron

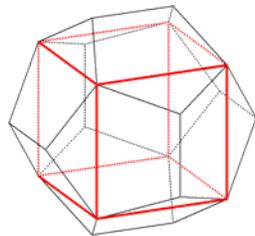
The dodecahedron is a very special object. It is one of the five regular platonic solids.

If you know the length of the edges, can you calculate the volume of the dodecahedron? Assume the length of an edge is 12 cm.

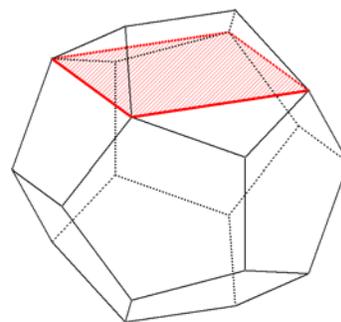
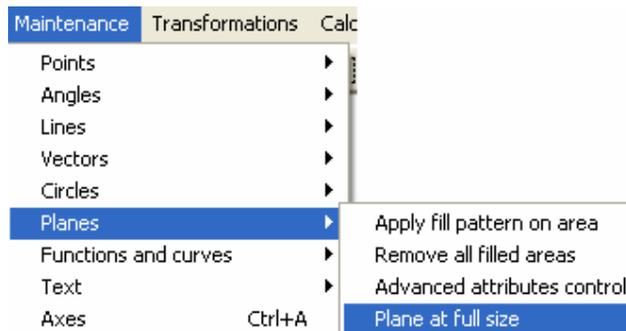
➤ Before continuing, think about it.



One possible approach is to divide the dodecahedron into an internal cube and six equal objects.



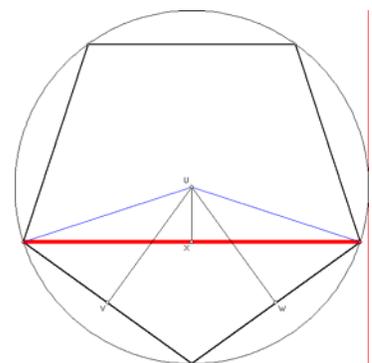
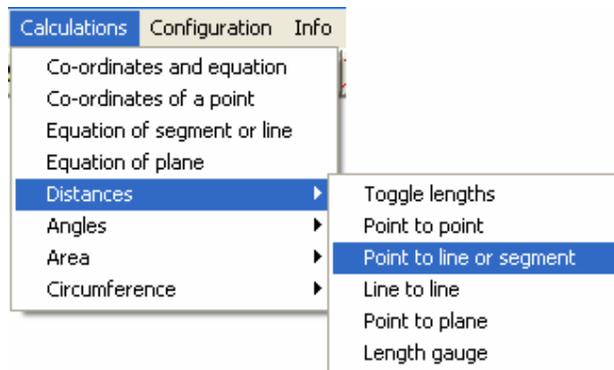
The edges of the cube are diagonals in the faces of the dodecahedron. First select one face, on which you will perform the calculations. Select the command to show the face at full size, and click on three of the vertices of the face. In an animation the object rotates to show the selected face.



Now you can start your calculations in this face. Some extra lines may help, for instance:

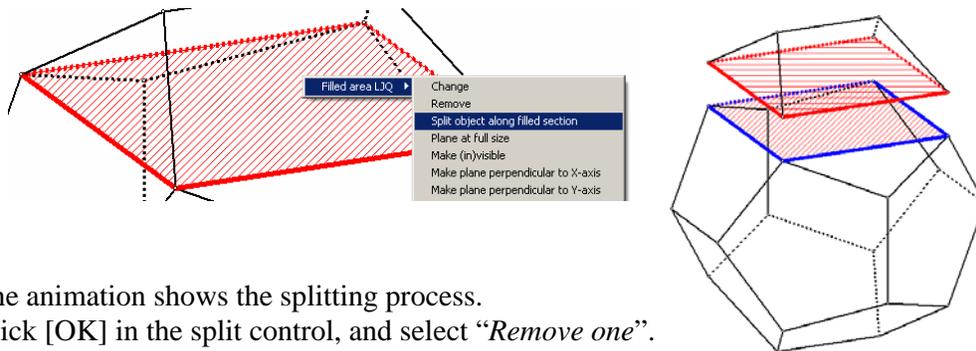
➤ Try to calculate the edge lengths of the cube.

(Hint: A quick way to draw in 3D a perpendicular segment from a point to a line, their distance can be requested, also resulting in the drawing of the distance segment.)

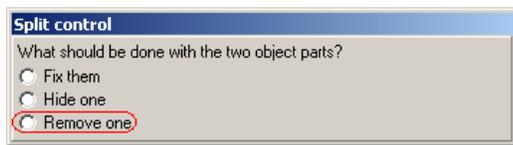


Now we concentrate on the parts of the dodecahedron outside the cube.

- Start with a new dodecahedron and try to complete to the picture on the right.
Click with the right mouse button on the filled area, and select “*Filled area, Split object along filled section*”

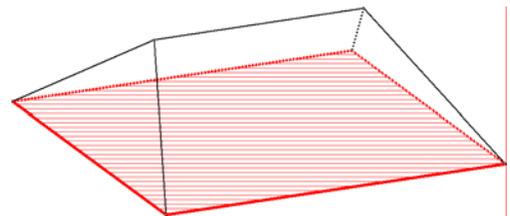


The animation shows the splitting process.
Click [OK] in the split control, and select “*Remove one*”.

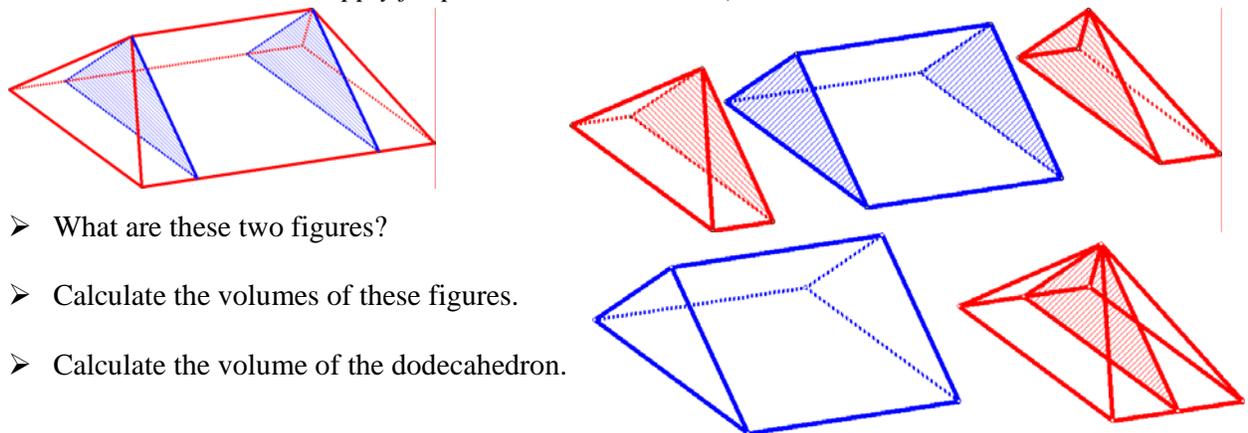


Click on one of the vertices of the lower object part to remove it. What remains looks like a roof of a house:
The bottom plane is a rectangle.

- What are its dimensions?

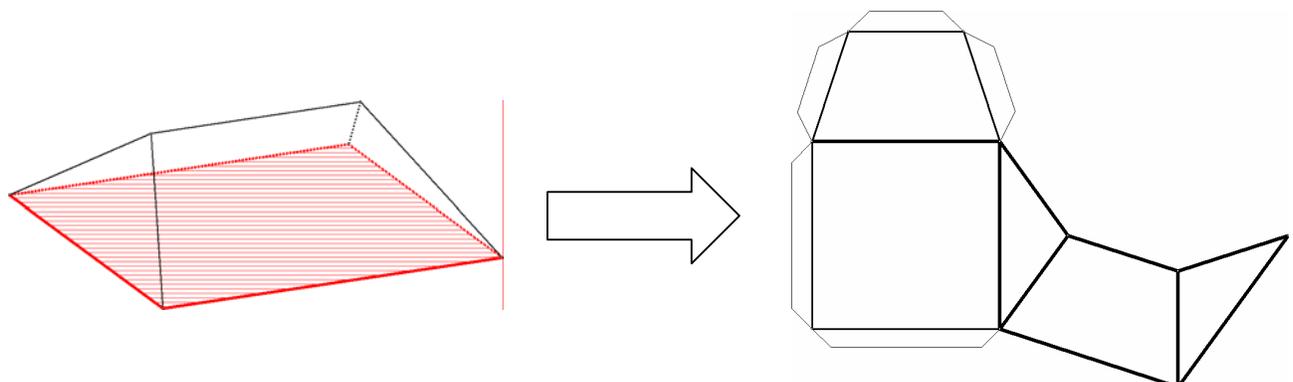


To calculate the volume of the roof, divide it further into two known basic figures.
(*The vertical planes are drawn using the command “Section through point, perpendicular to a line” in the “Maintenance, Plane, Apply fill pattern on area” menu.*)

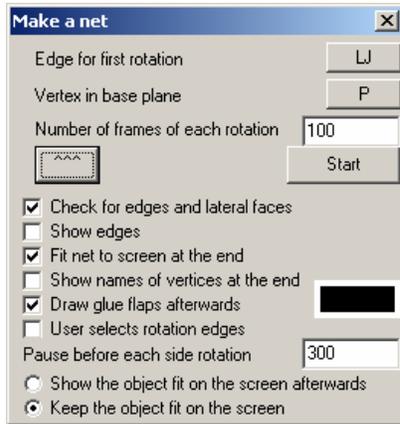


- What are these two figures?
- Calculate the volumes of these figures.
- Calculate the volume of the dodecahedron.

Fold the roof into a net.

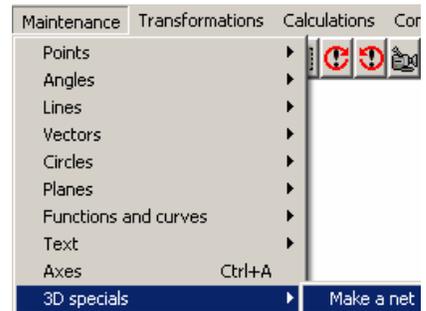


- Start with the left picture and select “3D specials, Make a net”. Complete the control window as shown, and click [Start], to make the net.



Finally print the net six times to make 6 “roofs”. Use them to build the dodecahedron.

(You can use adhesive tape to join the six “roofs” together.)



The net of the roof.

