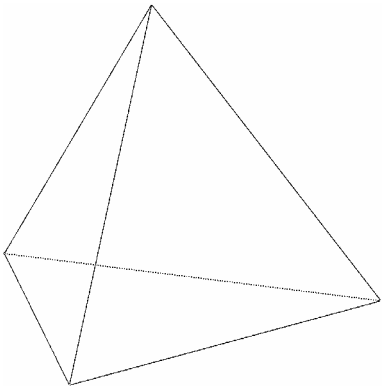
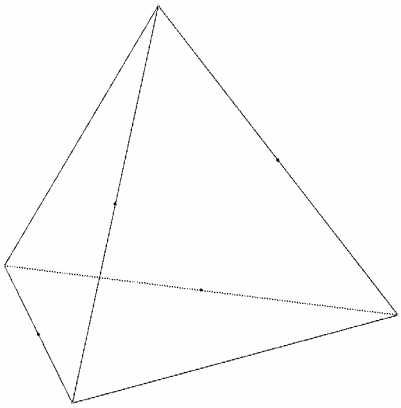
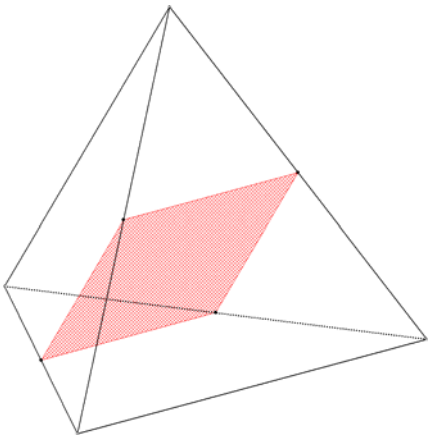
Divide the Tetrahedron in Two Equal Pieces

To design a puzzle is easy. Take an object (2D or 3D) and cut it into two congruent pieces. The challenge for others is to arrange the pieces together to make the original object.
Let us try it with a 3D object, a tetrahedron. This is a pyramid where the three lateral sides and base are equilateral triangles.

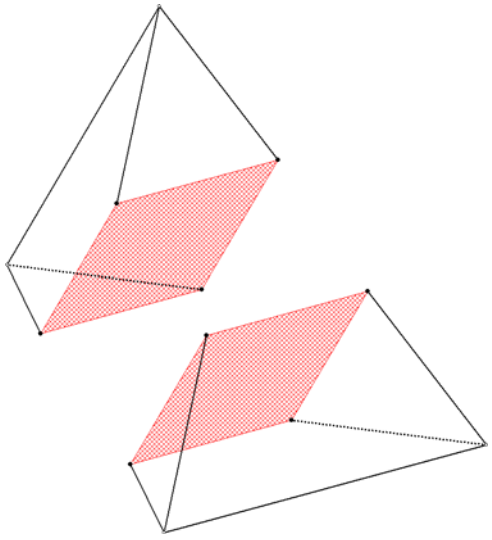


Take the midpoints of four edges as shown in the picture, and connect them. What polygon is formed? How do you know?



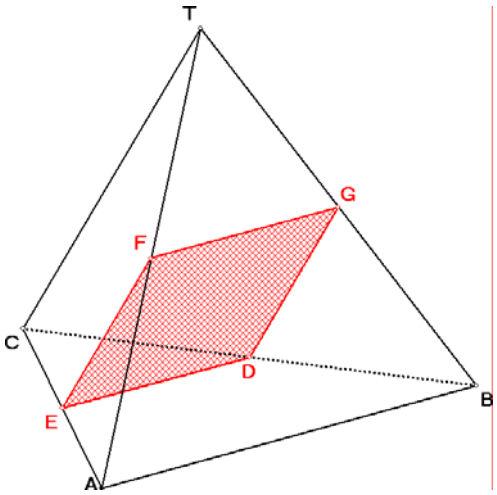


What pieces do you get after splitting along this plane?

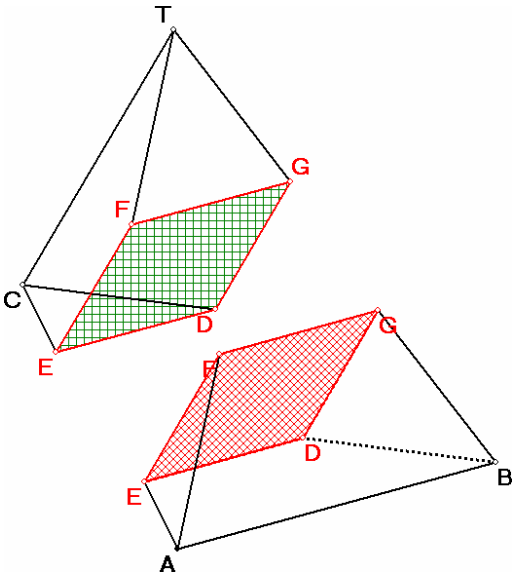


The two pieces are equal!
Not convinced?
Now create these figures yourself.

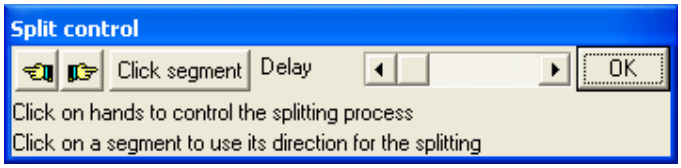
In detail



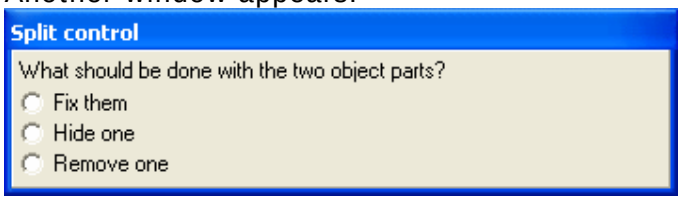
Start Geocadabra with a *New 3D object* → *Tetrahedron*.
Add midpoints by clicking with the right mouse button on Segments. Use the appropriate commands in the menu that appears.
Shade the section: M*aintenance* → *Planes* → *Apply fill pattern* → *Through 3 points*.
Click on 3 of the midpoints. The quadrilateral is shaded.
Click with the right mouse button on the shaded area and select in the menu that appears: "Split object along filled section."
The splitting process is animated, as shown in the picture below:



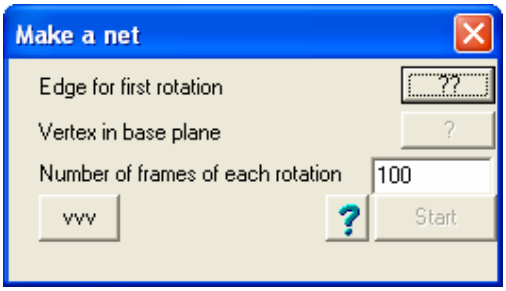
A window appears allowing one to control the distance between the two figures.



Click [OK].
Another window appears.



Select '*Remove one*' and click near point *C* or *T*. This removes the upper figure.
To make a net of the remaining figure:
Select *Maintenance* → *3D specials* → *Make net* → *Semi automatic*

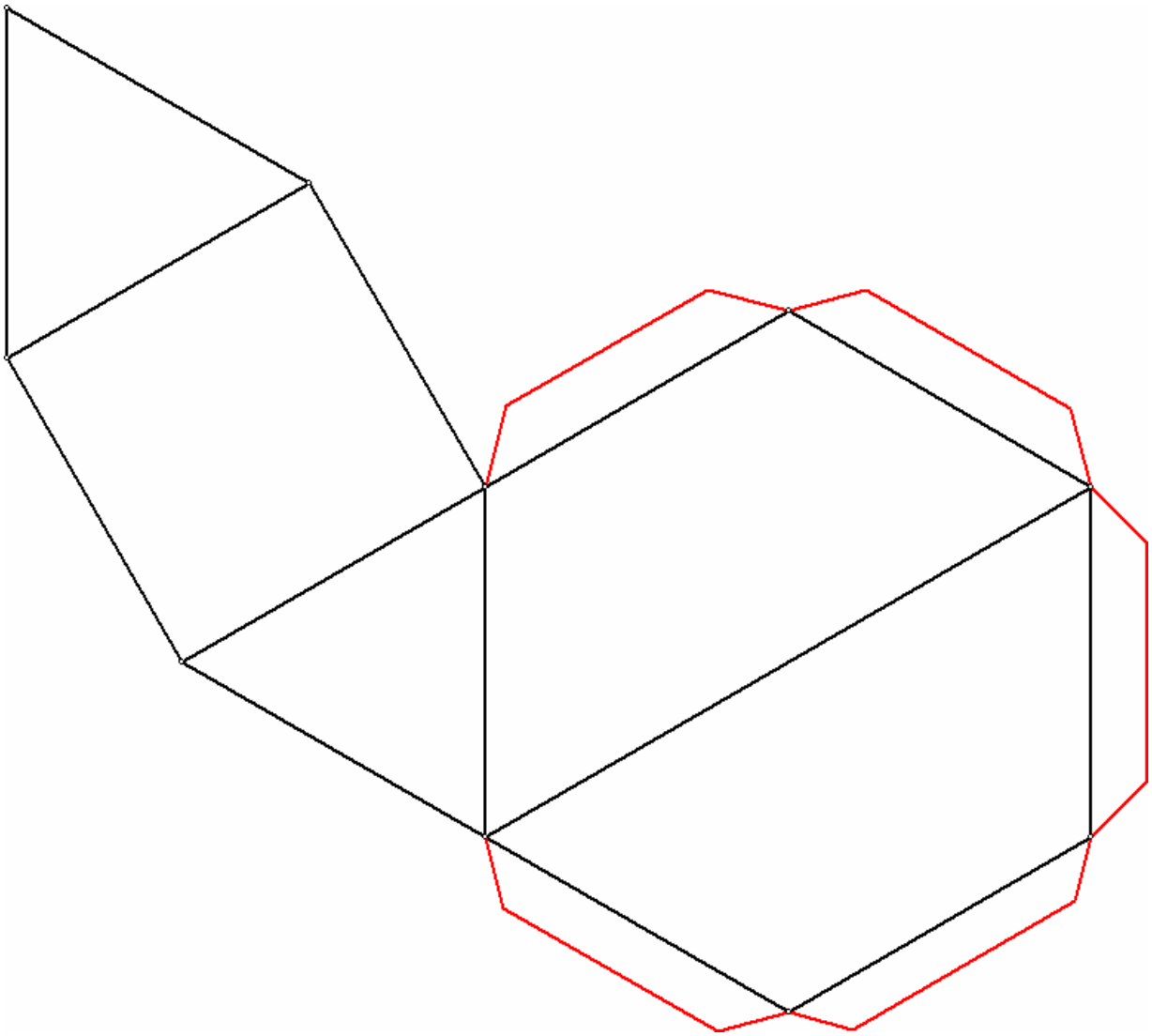


Complete the control window:
- Click [??] button besides "Edge for first rotation" and click (for instance) the edge *AB*.
- Click [?] button besides "Vertex in base plane" and click (for instance) the vertex *G*.
- Click the [Start] button.

The net is formed in an animation.

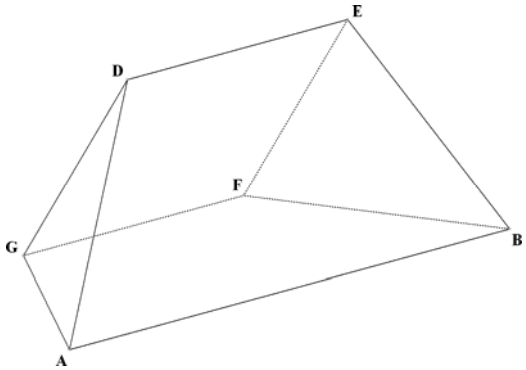
The net is rotated to a top view.
Now click near the edges if you want to make glue flaps. The distance between the mouse cursor and the edge determines the width of the glue flap.

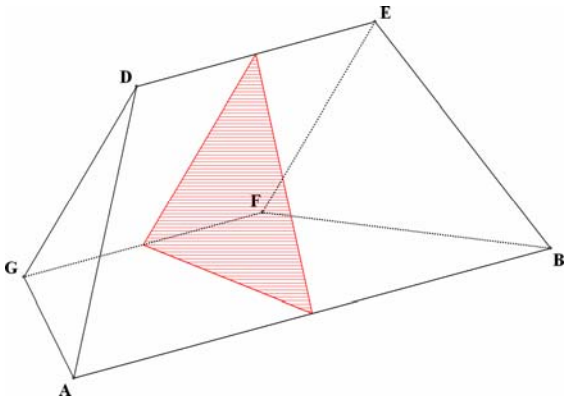
Now print the net twice; cut out the nets; then fold, glue or tape and the puzzle is ready.



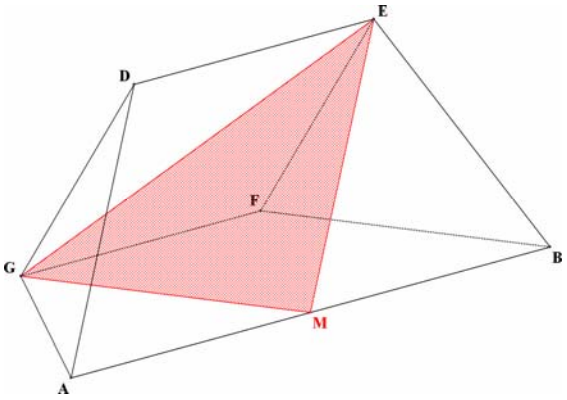
Divide the Tetrahedron in Four Equal Pieces

We can continue with dividing pieces of an existing puzzle.
In the previous example we divided a tetrahedron into two equal pieces.
Now we cut one of these again into two equal parts.
This can be done simply:

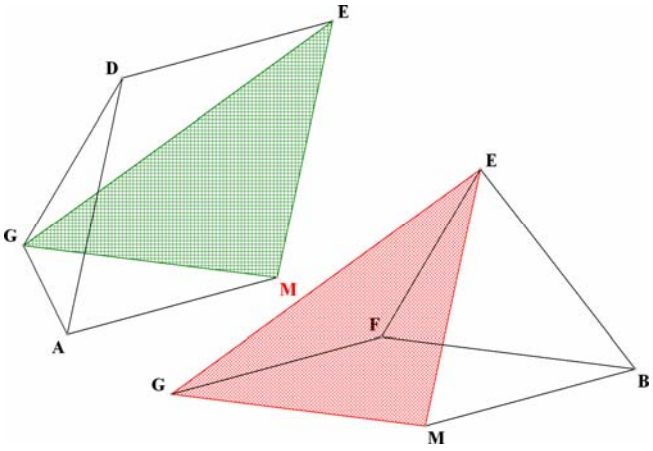




But this is not interesting.
More exciting is the next division:

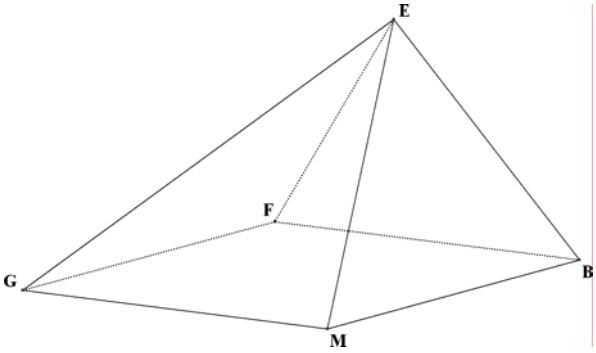
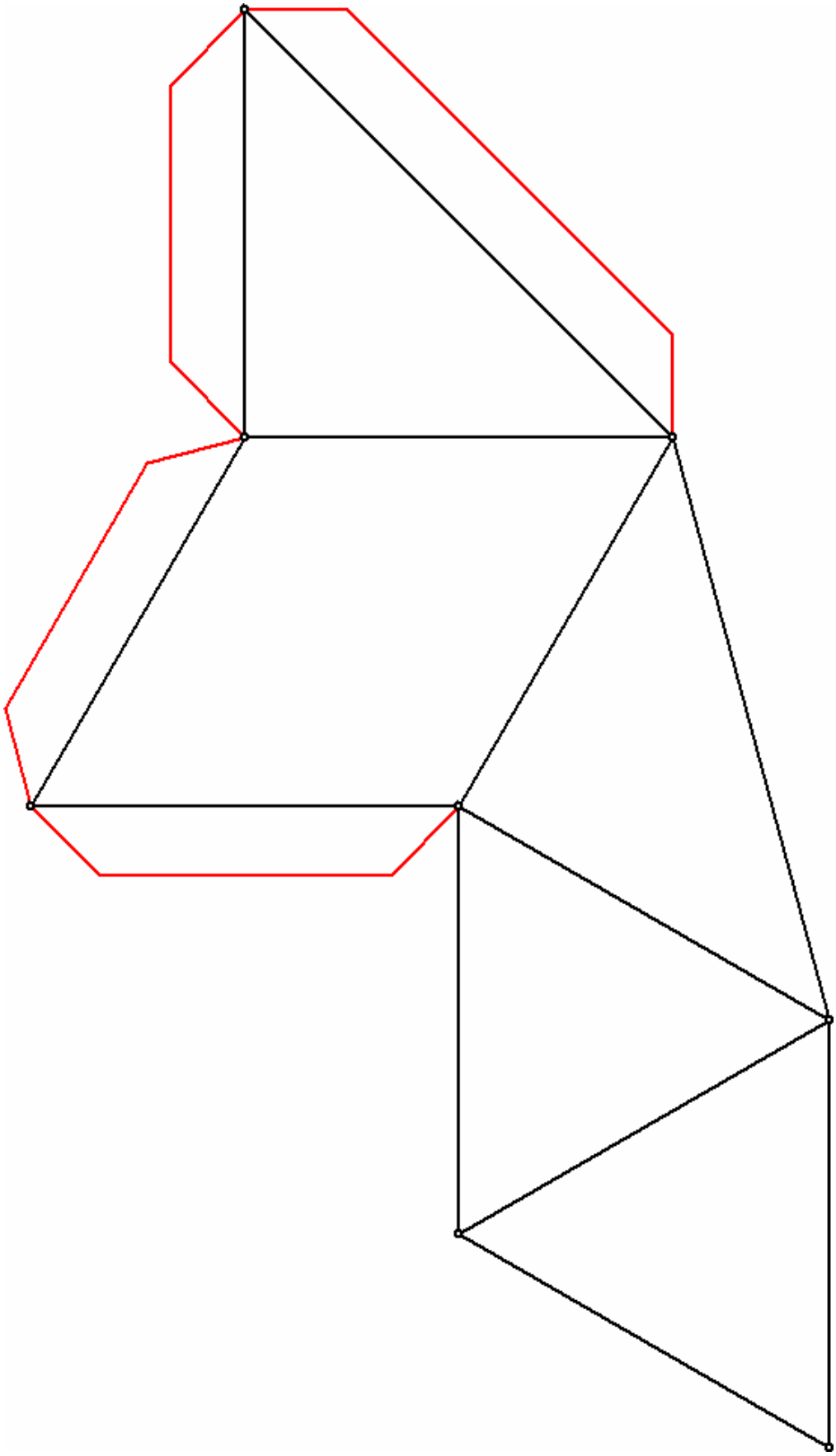


Are the two pieces congruent?



After dividing in two pieces, they look different.
By making the net (4 times) you will discover whether they are congruent or not.

We will make a net of the right-hand part (see next page).



Now print the net four times; cut out the nets, fold, glue or tape and the puzzle is ready.