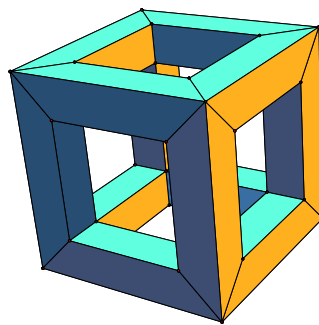


Exercise Sheet 3

Out: 02.11.2015

Due: 11.11.2015

You should work in groups of two. Don't forget to put your names and student ID numbers on the solution you hand in!



Exercise 3.1 (Combinatorics, $1+1+2+2+2+1+3 = 12$ Points). Answer the following questions!

1. Compute the Euler characteristic for the Császár-Torus (see Exercise 2.1).
2. Compute the Euler characteristic for a simplicial surface without boundary, consisting of 20 triangles and 12 vertices.
3. Draw an explicit example of a closed simplicial surface with 20 triangles and 12 vertices which is not the icosahedron.
4. Prove that the computation of the Euler characteristic by using the alternating sum “Number of vertices - Num. of edges + Num. of 2-dimensional elements” is also valid for the quadrangulated surface S shown above.
5. Compute $\chi(S)$ and the genus for S !
6. How many edges does a simplicial torus made up of 1200 vertices have?
7. Give three examples for simplicial complexes with the same Euler characteristic which are pairwise not simplicially isomorphic, i.e. not isomorphic as simplicial complexes.

Exercise 3.2 (Star and Link, 2+2+2=6 Points). Write a program which takes a geometry and computes the star and link of several user selected vertices. Moreover, for user selected faces compute the adjacent faces. In detail, do the following:

1. Create a button called **Star** which colors the faces of the stars of the selected vertices into yellow.
2. Create a button called **Link** which colors the vertices of the links (\sim stars) of the selected vertices into orange.
3. Create a button called **F-Neighbor** which colors the selected faces and their adjacent faces into green. The neighbor array of the element is generated by `geometry.getNeighbor()`.

Export your project to a runnable jar (as usual) and call it `name1_name2_starLink.jar`.