Fundamentals of Topology

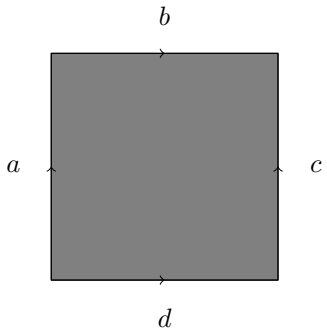
August 12, 2019

Exercise 1. Draw a simplicial model for each of the following topological objects.

Exercise 2. Indicate the number of components $H_0(X)$, the numbers of holes $H_1(X)$ and the number of voids $H_2(X)$.

Exercise 3. Is it possible to deform the object on the left to obtain the one on the right, without gluing/tearing?

Exercise 4. Consider the following sheet of paper.



Try to sketch all the possible topological objects that can be obtained by gluing **different** sides of the square. For example, gluing the sides a and c be obtain a cylinder. Alternatively we can glue a and d to get a cone cone, but a cone can be deformed into the square again, so it doesn't count as **different**!

How many different shapes are there? **Caution**, There are two ways of gluing each pair of sides!!!!