Exercises For Surface Classification

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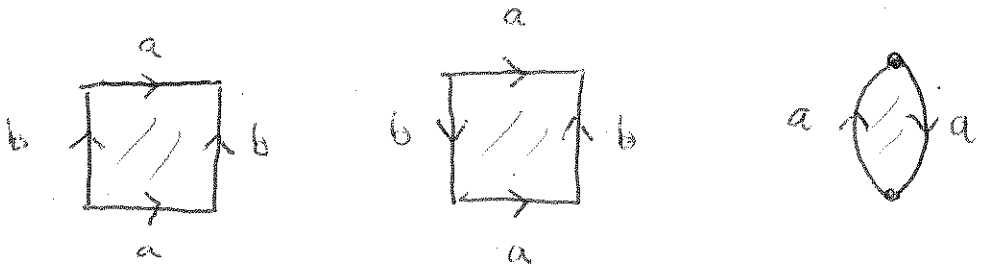
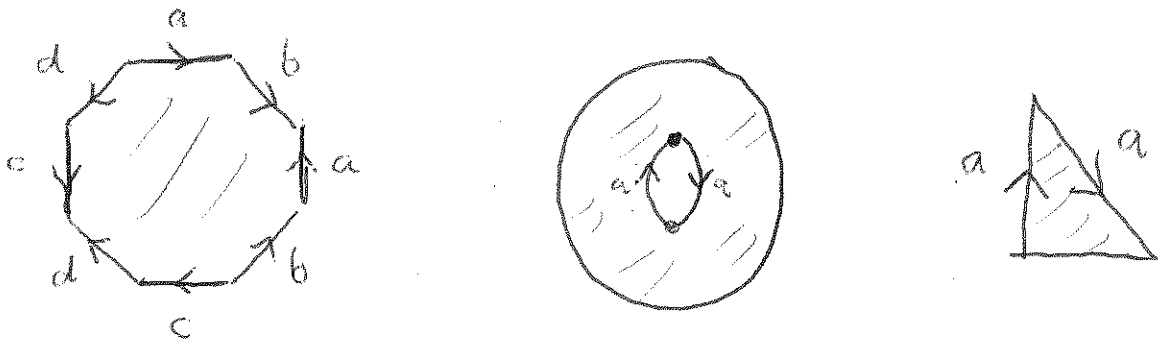
Exercise 1 Describe the surface that is the result of each identification below.

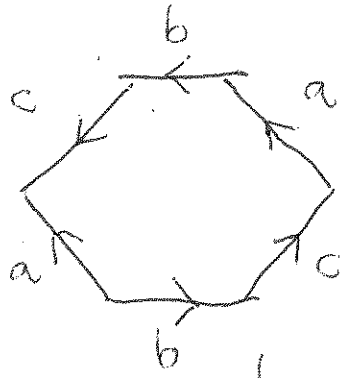


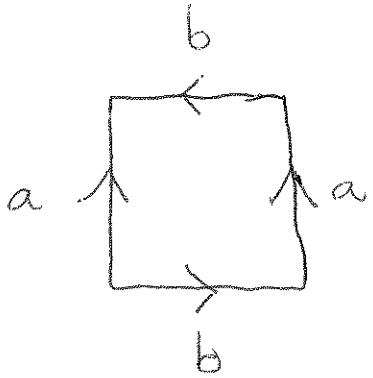


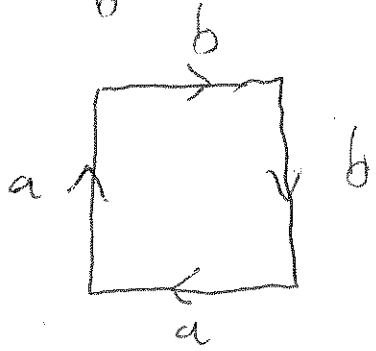
Orientability

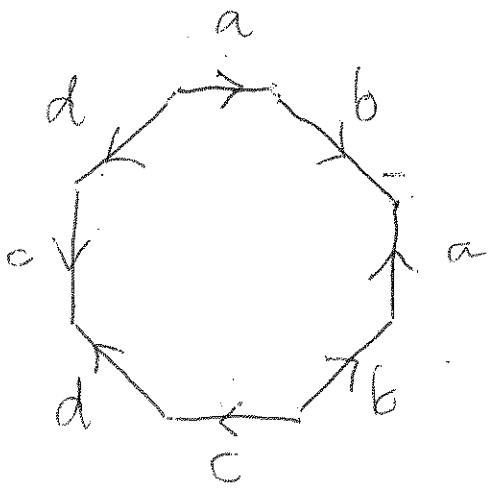
Informally, we say that a surface is *orientable* if whenever you draw an R on it and then move the R around, returning to its original position, it always looks like an R (and not like a Я). The surface is said to be *nonorientable* if it is possible to move an R around to get a Я .

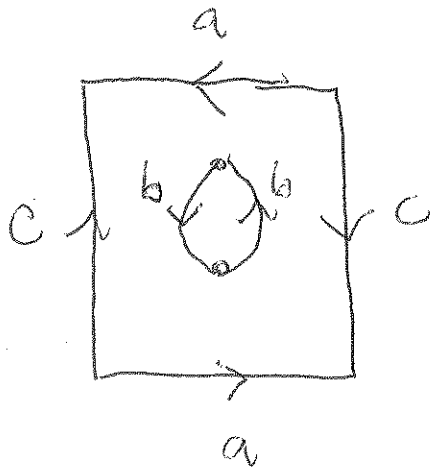
Exercise Which of the surfaces below are orientable, and which are non-orientable?









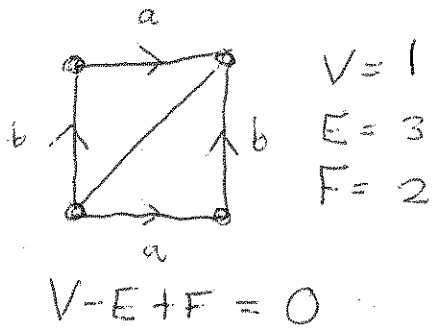


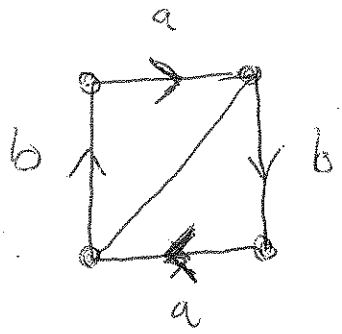
Euler Number

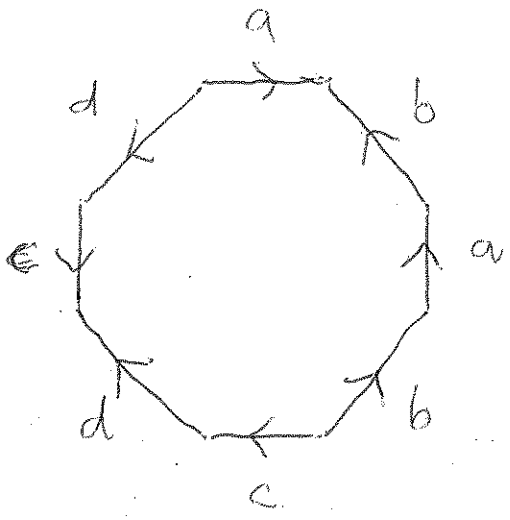
The Euler number of a graph G, which we denote $\chi(G)$, is defined to be the number of vertices (V) minus the number of edges (E) plus the number of faces (F):

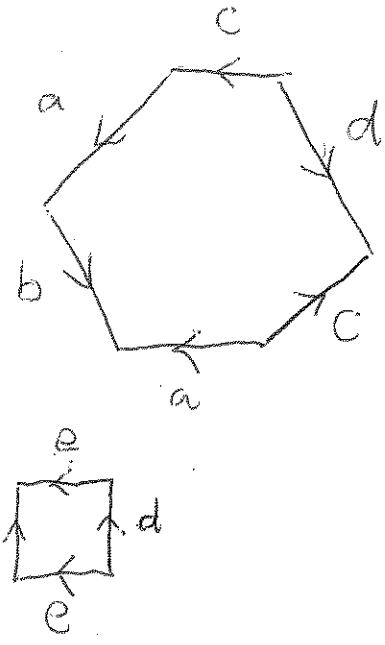
$$\chi(G) = V - E + F.$$

Exercise For each graph (which lives on a surface), compute the Euler number $V - E + F$:









Exercise What is the effect on the Euler characteristic of zipping in a perforation, handle, crosshandle, or crosscap? (See the other handout.)