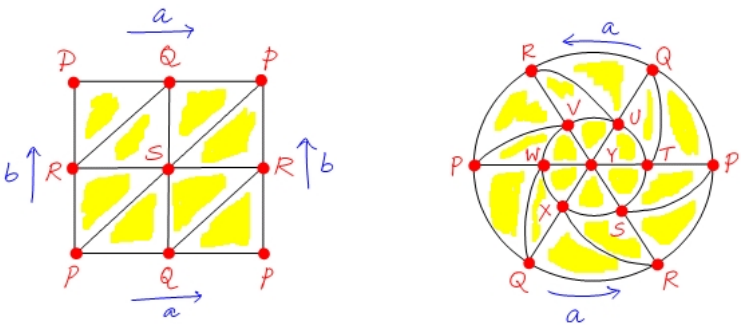
Computational Topology (Spring 2024): Homework 2

- You **must email your submission** as a **PDF file** to kbala@wsu.edu. You could write answers by hand, and scan or take photos of the writings. Put all the images in a PDF file, though.
- Your file name should identify you in the following manner. If you are Napoleon Dynamite, you should **name your submission NapoleonDynamite_Hw2.pdf**. If you want to add more bits to the title, e.g., Math529, you could name it NapoleonDynamite_Math529_Hw2.pdf, for instance. But you should **start the file name with NapoleonDynamite. And please avoid white spaces in the file name**.
- **Begin the SUBJECT of your email submission with the same `FirstnameLastname`, expression, e.g., "NapoleonDynamite Hw2 submission".**
- **This homework is due by 5:00 PM on Tuesday, February 6**.

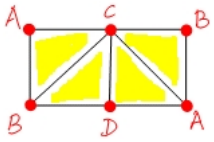
1. (35) List all the ways in which the sides of a rectangle can be identified in pairs. In each case, indicate which of the surfaces introduced in class (in Lecture 4) if any, does the resulting object represent (we saw the 2-sphere ($\mathbb{S}^2$), torus ($\mathbb{T}^2$), Möbius strip, projective plane ($\mathbb{R}P^2$), and the Klein Bottle ($\mathbb{K}^2$).

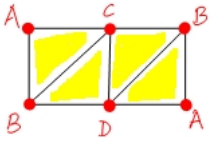
2. (20) The following are *potential* triangulations of the torus $\mathbb{T}^2$ and the real projective plane $\mathbb{R}P^2$, respectively. Decide if they are indeed correct triangulations of the two spaces. Justify your answers.



3. ~~A flag complex...~~ Moved to the next homework...

3. (30) Describe the space represented by each of the following three triangulations. Also calculate the Euler characteristic χ in each case, and compare it to the χ values of standard 2-manifolds we discussed in class ($\mathbb{S}^2$, $\mathbb{T}^2$, etc.).

(a)


(b)


(c)