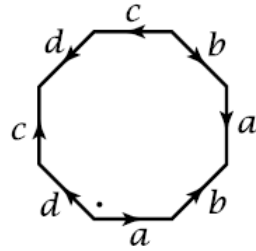


**Exercise.** Consider the CW complex  $X$  with one 0-cell, four 1-cells, labeled  $J_1 = \{a, b, c, d\}$ , and one 2-cell  $D^2$  glued to  $X^1$  in the following way. The letters depict the gluing map of  $\partial D^2$  to the 1-skeleton.



- a. Calculate the homology groups  $H_n(X; \mathbb{Z})$  using cellular homology.
- b. What surface is  $X$ ?