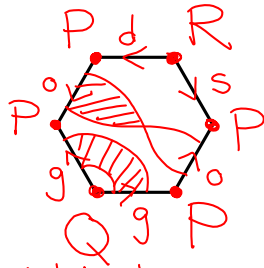


$$d o g^{-1} g o s^{-1}$$

1 word \Rightarrow 1 face
 4 letters \Rightarrow 4 edges
 3 vertices



twist \Rightarrow non-orientable

Euler characteristic

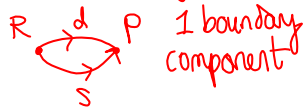
$$\chi(S) = v - e + f = 3 - 4 + 1 = 0$$

genus of non-orientable surface:

$$\chi = 2 - g - b$$

$$0 = 2 - g - 1 \Rightarrow g = 1$$

unassociated edges:



$dog^{-1}gos^{-1}$ is a non-orientable surface of genus 1 with 1 boundary component, i.e. a sphere w/ 1 crosscap & 1 hole



$$b r w e r^{-1}$$

$$f=1, e=4, v=3$$



$$\chi(S) = v - e + f = 3 - 4 + 1 = 0$$

0 twisty boiff \Rightarrow orientable

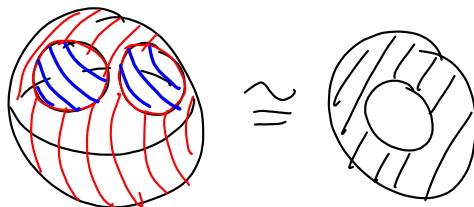
$$\chi = 2 - 2g - b = 0$$

$$2 - 2g - 2 = 0$$

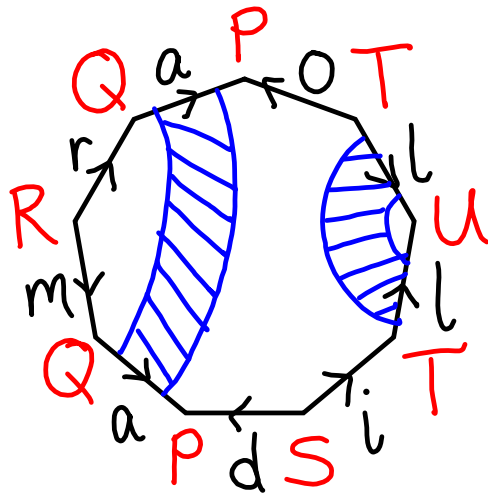
$$g = 0$$

0 handles

We have an orientable surface of genus 0 and 2 boundary components; we can think of this as a sphere with 2 holes, aka an annulus.



$\bar{1} \bar{1}$
armadillo



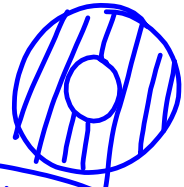
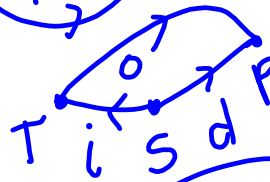
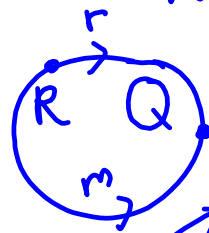
$f=1, e=7, v=6$

orientable: $\chi = 2 - 2g - b$

$\chi = 6 - 7 + 1 = 0$

$0 = 2 - 2g - 2$

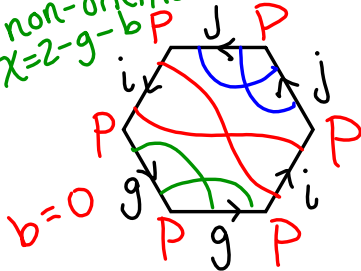
$g = 0$



annulus
(again)

jiggij

non-orientable
 $\chi = 2 - g - b$



non-orientable surface
of genus 3
i.e. a sphere w/
3 cross-caps (& no holes)

$f=1, e=3, v=1$

$\chi = 1 - 3 + 1 = -1$

$\chi = 2 - g - b$

$-1 = 2 - g - 0$

$g = 3$

