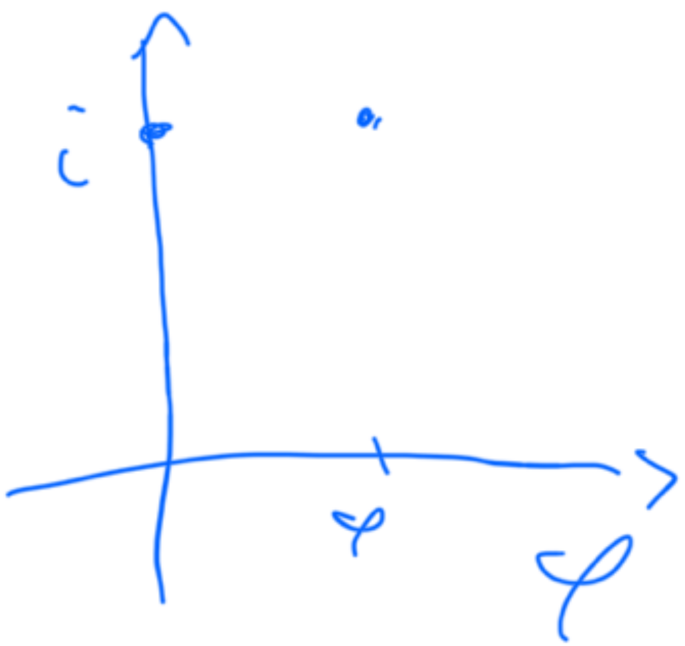
number of orbits $= \frac{1}{|G|}\sum_{\varphi\in G} |\mathrm{Fix}_G(\varphi)|$

$$M = \{(\varphi,i)\in G\times S \mid \varphi(i)=i\}.$$



$$M = \bigsqcup_{\varphi\in G}\{i\in S\mid\varphi(i)=i\}$$

$$= \bigsqcup_{i\in S}\{\varphi\in G\mid \varphi(i)=i\}$$

$$= \bigsqcup_{\varphi\in G}\mathrm{Fix}_G(\varphi)$$

$$|M| = \sum_{\varphi\in G}|\mathrm{Fix}_G(\varphi)| = \sum_{i\in S}|\mathrm{Stab}_G(i)|$$

$$= \sum_{i\in S} \frac{|G|}{|Orb_G(i)|} = \sum_{j=1}^{k} \sum_{i\in S_j} \frac{|G|}{|Orb_G(i)|}$$

$$= \sum_{j=1}^{k} \sum_{i\in S_j} \frac{|G|}{|Orb_G(s_j)|}$$

$$= |G| \sum_{j=1}^{k} \frac{|Orb_G(s_j)|}{|Orb_G(s_j)|}$$

$$= |G| \cdot \sum_{j=1}^{k} 1 = k \cdot |G|$$

$$k = \frac{1}{|G|} \sum_{\phi\in G} |fix_G(\phi)| .$$

$$|fix(R_0)| = 3^{6}$$

$|fix(R_{90})| = 27$

$|fix(R_{180})| = 81$ 3x 10

$|fix(R_{270})| = 27$

$|fix(\cdot\cdot)| = 27$ 6x

1 2 3 4 5 6
6 5 4 3 2 1
(1 6)(2 5)(3 4)

$|fix(\cdot\cdot)| = 9 \times 2 = 18$

1 2 3 4 5 6
2 3 1 5 6 4
(1 2 3)(5 6 4)

$$\frac{1}{24}\left(3^6 + 3(27+81+27) + 6\cdot 27 + 4\cdot 18\right) =$$

$$\frac{1368}{} = 57$$

24