

Assignment 4

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no latex this time

$$1.1) \alpha^{-1} = \begin{pmatrix} 1 & 1 & 3 & 4 & 5 & 6 \\ 2 & 1 & 3 & 5 & 4 & 6 \end{pmatrix}$$

$$2) \beta\alpha = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 1 & 6 & 2 & 3 & 4 & 5 \end{pmatrix}$$

$$3) \alpha\beta = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 2 & 1 & 5 & 3 & 4 \end{pmatrix}$$

$$2. 1) 4 \quad 4) 7$$

$$\triangleleft 2) 5 \quad \text{scribbles}$$

$$3) 3$$

~~$$5) = 0 \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 5 & 1 & 6 & 7 & 3 \end{pmatrix}$$~~

~~$$= 0 \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 5 & 1 & 6 & 7 & 3 \end{pmatrix}$$~~

$$5) = 0 \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 5 & 1 & 6 & 7 & 3 \end{pmatrix}$$

~~$$= 0 \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 4 & 5 & 1 & 6 & 7 & 3 \end{pmatrix}$$~~

$$= 0 \begin{pmatrix} (1 \ 2 \ 4) & (3 \ 5 \ 6 \ 7) \end{pmatrix}$$

$$= 5$$

$$6) = 0 \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 5 & 4 & 3 & 2 \end{pmatrix}$$

$$= 0 \begin{pmatrix} (2 \ 5) & (3 \ 4) \end{pmatrix}$$

$$= 2$$

$$3. 1) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 3 & 4 & 2 & 1 \end{pmatrix}$$

$$= (1 \ 5) (2 \ 3 \ 4)$$

$$2) = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 2 & 4 & 5 & 1 & 3 & 6 \end{pmatrix}$$

$$= (1 \ 2 \ 4) (3 \ 5)$$

$$3) = \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 1 & 2 \end{pmatrix}$$

$$= (1 \ 4 \ 2 \ 3)$$

$$4. 1) \text{ even}$$

$$2) \text{ odd}$$

$$3) \text{ even}$$

$$4) \text{ Parity} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 5 & 3 & 4 & 2 & 1 \end{pmatrix}$$

$$= \text{even}$$

$$5) \text{ Parity} \begin{pmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 2 & 5 & 3 & 4 \end{pmatrix}$$

$$= \text{even}$$

$$5. 1) (1\ 4)(5\ 8) = (5\ 8)(1\ 4)^{-1}$$

= 75 elements

$$2) (3\ 5)(5\ 8) = (5\ 8)(3\ 8)$$

$$3) (8\ 2)(5\ 8) = (5\ 2)(8\ 2)$$

6. ~~then~~ possible orders = $\{1, 2, 3, 4, 6\}$

7. 1) element must be in form
 $(a\ b\ c\ d)(e\ f)$ or
 $(a\ ,\ b,\ c,\ d)(e)(f)$
 a, b, c, d, e, f are distinct

then number of elements is
 $6C4 \times 3! \times 2 = 180$

choose 4 elements to be a, b, c, d
 2 forms of permutation of a, b, c, d

2) available of forms
 $(a\ b)(c\ d)(e\ f)$
 $(a\ b)(c\ d)(e)(f)$
 $(a\ b)(c)(d)(e)(f)$

number of element

$$= \left(\frac{6 \times 5}{2!} \times \frac{4 \times 3}{2!} \times \frac{2 \times 1}{2!} \right) \times \frac{1}{3!} + \left(\frac{6 \times 5}{2!} \times \frac{4 \times 3}{2!} \right) \times \frac{1}{2!} + \left(\frac{6 \times 5}{2!} \times \frac{4 \times 3}{2!} \right) \times \frac{1}{1!}$$

8. 1) β^4 is 7-cycle

$\Leftrightarrow \beta^4$ has length 7

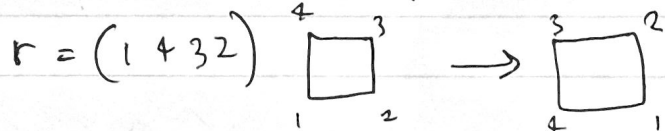
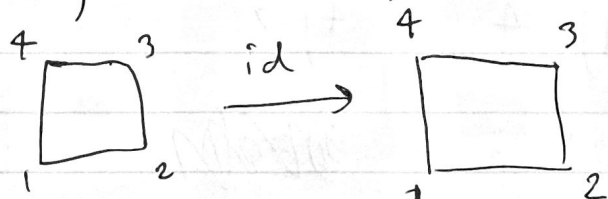
$\Leftrightarrow \beta$ has length 7

$\Leftrightarrow \beta$ is 7-cycle

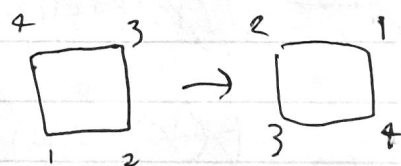
$$2) \beta^4 = (2\ 1\ 4\ 3\ 5\ 6\ 7)$$

$$\beta = (2\ 4\ 5\ 7\ 1\ 3\ 6)$$

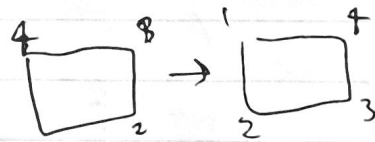
9. 1) $id = (1)$



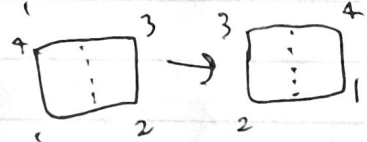
$$r_2 = (1\ 3)(4\ 2)$$



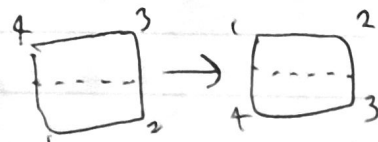
$$r_3 = (1\ 2\ 3\ 4)$$



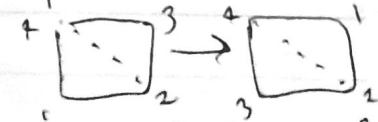
$$s_1 = (1\ 2)(3\ 4)$$



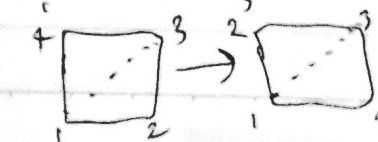
$$s_2 = (1\ 4)(2\ 3)$$



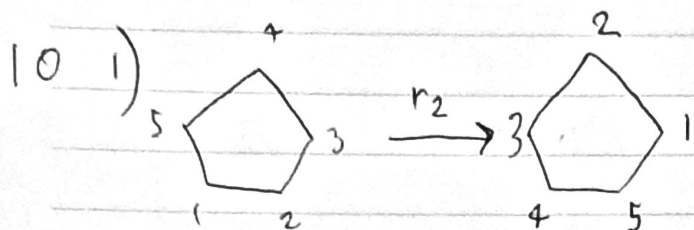
$$s_3 = (1\ 3)$$



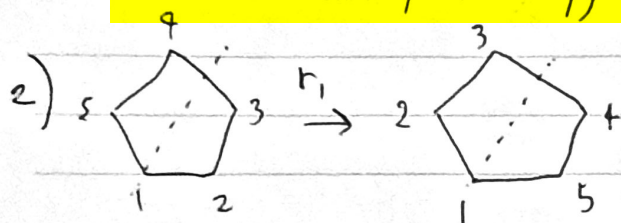
$$s_4 = (2\ 7)$$



2) r_2, s_1, s_2



This is the ~~second~~ third rotational symmetry, r_2



first reflection symmetry, s_1