Cyclic partition for the groups of $\mathcal{PSL}(2,41)$ and $\mathcal{PSL}(2,43)$

Authors Names	ABSTRACT
<p>a. Noor Alhuda Samir Salem b. Niran Sabah Jasim</p> <p>Article History Received on: 13/ 6/2021 Revised on: 1/ 7 /2021 Accepted on: 2/ 7 /2021</p> <p>Keywords: Cyclic partition, special linear group, ordinary character table, character table of rational representations.</p> <p>DOI: https://doi.org/10.29350/jops.2021.26.4.1351</p>	<p>The ordinary character table and the character table (cha.ta.) of rational representations (ra.repr.) for projective special linear groups $\mathcal{PSL}(2,41)$ and $\mathcal{PSL}(2,43)$ find in this work to find the cyclic partition for each group</p>

1. Introduction

The projective special linear group denoted by $\mathcal{PSL}(n,F)$ gain it by factor out the special linear group $\mathcal{SL}(n,F)$ by its center, [8,9]. Author in [6] proved that for any cyclic P-group G , $K(G) = Z_p$ and $K(G) = \bigoplus_{i=1}^n Z_{p^i}$ for any cyclic group G of order P^n .

2- Base for the $\mathcal{PSL}(n,F)$

In this section we display some notions.

Theorem 2.1: [2]

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(i) The group $PSL(2, s^v)$ is simple for $s^v > 3$.

$$(ii) \quad |PSL(2, s^v)| = \begin{cases} (s^v + 1)s^v(s^v - 1) & \text{if } s = 2 \\ \frac{1}{2}(s^v + 1)s^v(s^v - 1) & \text{if } s \text{ is prime } s \neq 2 \end{cases}$$

3. Prime Effect

We employ the acumen in [1,3-5,7,10-12] to find the cyclic partition for $PSL(2,41)$ and $PSL(2,43)$.

3.1 The effect for $PSL(2,41)$

$$|PSL(2,41)| = 68880.$$

The (cha. ta.) of (ra.repr.) for $PSL(2,41)$ is

C_g	$\langle z \rangle$	$\langle z \rangle^c$	$\langle z \rangle^a$	$\langle z \rangle^{a^2}$	$\langle z \rangle^{a^4}$	$\langle z \rangle^{b^1}$	$\langle z \rangle^{b^2}$
$ C_g $	1	840	1722	1722	1722	1640	1640
$ C_G(g) $	34440	41	20	20	20	21	21
1_G	1	1	1	1	1	1	1
Ψ	41	0	1	1	1	-1	-1
$\chi_2 + \chi_4 + \chi_6 + \chi_8 + \chi_{12} + \chi_{16} + \chi_{18}$	378	8	0	0	-4	0	0
χ_{10}	42	1	1	0	-2	0	0
χ_{14}	40	-1	0	0	0	1	1
$\theta_2 + \theta_4 + \theta_6 + \theta_8 + \theta_{10} + \theta_{12} + \theta_{14} + \theta_{16} + \theta_{18} + \theta_{20}$	320	-8	0	0	0	0	0
$\xi_1 + \xi_2$	42	1	-2	2	2	0	0

The diagonalization matri

$$\begin{pmatrix} 34440 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & -5 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 6 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 5 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -7 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 4 \end{pmatrix}$$

Thus

$$K(PSL(2,41)) = Z_{34440} \oplus Z_5 \oplus Z_6 \oplus Z_5 \oplus Z_7 \oplus Z_1 \oplus Z_4$$

3.2 The a effect for $PSL(2,43)$

$$|PSL(2,43)| = 39732.$$

The (cha. ta.) of (ra.repr.) for $PSL(2,43)$ is

Cg	< z >	< z >_c	< z >_a	< z >_{a³}	< z >_{b¹}	< z >_{b²}
 Cg 	1	924	1892	1892	1806	1806
 CG(g) 	39732	43	21	21	22	22
1G	1	1	1	1	1	1
Ψ	43	0	1	1	-1	-1
$\chi_2 + \chi_4 + \chi_6 + \chi_8 + \chi_{10} + \chi_{12} + \chi_{16} + \chi_{18} + \chi_{20}$	396	9	0	-3	0	0
χ_{14}	44	1	-1	2	0	0
$\theta_2 + \theta_4 + \theta_6 + \theta_8 + \theta_{10} + \theta_{12} + \theta_{14} + \theta_{16} + \theta_{18} + \theta_{20}$	420	-10	0	0	0	2
η₁ + η₂	42	-1	0	0	2	-2

The diagonalization matrix of it is

$$\begin{pmatrix} 39732 & 0 & 0 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 & 0 & 0 \\ 0 & 0 & 7 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 11 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

Thus

$$K(\mathcal{PSL}(2,43)) = Z_{39732} \oplus Z_3 \oplus Z_7 \oplus Z_1 \oplus Z_{11} \oplus Z_1$$

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