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reviewer3@nptel.iitm.ac.in ▼

Courses » Theory of groups for physics applications

Announcements **Course** Ask a Question Progress Mentor FAQ

## Unit 3 - Week 2

### Course outline

**How to access the portal****Week 1****Week 2**

- Lecture 5: Lagrange's Theorem & Cayley's Theorem-I
- Lecture 6: Lagrange's Theorem & Cayley's Theorem-II
- Lecture 7: Factor Group Conjugacy Classes-I
- Lecture 8: Factor Group Conjugacy Classes-II
- Week2 Lecture Slides and Reading Materials
- Download Videos
- Weekly Feedback
- Quiz : Week

### Week 2-Assignment 2-MCQ

The due date for submitting this assignment has passed.

As per our records you have not submitted this assignment. **Due on 2018-08-15, 23:59 IST.**1) The number of proper subgroups of the cyclic group of order 8 is (excluding the trivial subgroup) **1 point**

- 3
- 2
- 4
- 8

**No, the answer is incorrect.****Score: 0****Accepted Answers:**

2

2) Consider the two elements of  $S_6$ ,  $g_1 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 6 & 4 & 5 & 3 & 2 & 1 \end{pmatrix}$ ,  $g_2 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 \\ 3 & 1 & 2 & 6 & 5 & 4 \end{pmatrix}$ . In cycle form these elements can be written as, **1 point**

- $g_1 = (16)(2435), g_2 = (132)(46)(5)$
- $g_1 = (15)(2436), g_2 = (13)(246)(5)$
- $g_1 = (16)(24)(35), g_2 = (132)(456)$
- None of the above

**No, the answer is incorrect.****Score: 0**

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Week 4
Week 5
Week 6
Week 7
Week 8
Week 9
Week 10
Week 11
Week 12

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

(1 6 2 5)(3 4)

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

(1 6 2 5)(3 4)

4) Consider a cyclic group of order  $p$ , where  $p$  is a prime number. The inference can be drawn **1 point** from here -

There will be at least one other group of order  $p$  and such a cyclic group has no proper subgroups

There are no other groups of order  $p$  and such a cyclic group has no proper subgroups

There are no other groups of order  $p$  but such a cyclic group has proper subgroups

None of the above

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*There are no other groups of order  $p$  and such a cyclic group has no proper subgroups*

5) Express the following element of  $S_8$  as a product of

**1 point**

transpositions  $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 3 & 5 & 2 & 7 & 1 & 8 & 6 & 4 \end{pmatrix}$

(1 3 6 8)(4 7 2 5)

(1 3 2 5)(4 7)(6 8)

(1 3 2 5)(4 7 6 8)

(4 3 5 7)(1 2 6 8)

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

(1 3 2 5)(4 7 6 8)

6) Let  $S$  be a subset of group  $S$ . Show that  $G$  is a subgroup of  $G$  if and only if given any  $a, b \in S$ , they satisfy, **1 point**

$ab \in S$

$a^2$  as well as  $b^2 \in S$

$ab^{-1} \in S$

$a^{-1}b^{-1} \in S$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

$ab^{-1} \in S$

7) The multiplication table of a finite group  $G$  is as follows :

**1 point**

	E	A	B	C	D	F	I	J	K	L	M	N
E	E	A	B	C	D	F	I	J	K	L	M	N
A	A	E	F	I	J	B	C	D	M	N	K	L
B	B	F	A	K	L	E	M	N	I	J	C	D
C	C	I	L	A	K	N	E	M	J	F	D	B
D	D	J	K	L	A	M	N	E	F	I	B	C
F	F	B	E	M	N	A	K	L	C	D	I	J
I	I	C	N	E	M	L	A	K	D	B	J	F
J	J	D	M	N	E	K	L	A	B	C	F	I
K	K	M	J	F	I	D	B	C	N	E	L	A
L	L	N	I	J	F	C	D	B	E	M	A	K
M	M	K	D	B	C	J	F	I	L	A	N	E
N	N	L	C	D	B	I	J	F	A	K	E	M

The inverse of the elements C, D, J, L, N will be,

- I, J, K, M, D  
 I, J, D, M, K  
 I, J, M, D, K  
 I, J, D, K, M

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*I, J, D, K, M*

8) It is given that the

**1 point**

set  $A \equiv \{E, P, P^2, Q, PQ, P^2Q, R, PR, P^2R, QR, PQR, P^2QR\}$  forms a group, and they also

satisfy  $P^3 = Q^2 = R^2 = E; QP = PR; RQ = QR; RP = PQR; R = P^2QP$ . Identify the conjugacy classes of this group.

- $\{E\}, \{Q, R, QR\}, \{P, PQ, PR, PQR\}, \{P^2, P^2Q, P^2R, P^2QR\}$   
  $\{E\}, \{Q, R, PQ, PR\}, \{P, QR, PQR\}, \{P^2, P^2Q, P^2R, P^2QR\}$   
  $\{E\}, \{Q, P, QR\}, \{P, PQ, PR, PQR\}, \{P^2, P^2Q, P^2R, P^2QR\}$   
  $\{E\}, \{P, R, QR\}, \{Q, PQ, PR, PQR\}, \{P^2, P^2Q, P^2R, P^2QR\}$

**No, the answer is incorrect.**

**Score: 0**

**Accepted Answers:**

*$\{E\}, \{Q, R, QR\}, \{P, PQ, PR, PQR\}, \{P^2, P^2Q, P^2R, P^2QR\}$*

9) Identify the total number of possible cycle structures the symmetric group  $S_6$  can have

**1 point**

- 11  
 10  
 12

6

No, the answer is incorrect.

Score: 0

Accepted Answers:

11

10) What is the number of left cosets of  $C_8$  in  $S_8$  ?

1 point

8!

7!

6!

5020

No, the answer is incorrect.

Score: 0

Accepted Answers:

7!

[Previous Page](#)

[End](#)