

# Elements of a Permutation Group of Degree 5

Class (Partition)	Permutation (cyclic notation)	Class	Permutation
EVEN 1111 [1]	(0) (1) (2) (3) (4)	ODD 41 [30]	(0413)
ODD 2111 [10]	(04) (13) (34) (02) (03) (12) (23) (14) (24) (01)		(0321) (0241) (0342) (1234) (0123) (0421) (1423) (0132) (0324) (1243) (0412) (0423) (1342) (0341) (0143) (0214) (0231) (0134) (0142) (1324) (0432) (0431) (0243) (0124) (0312) (0213) (0234) (1432) (0314)
EVEN 221 [15]	(14) (23) (01) (24) (02) (34) (03) (12) (02) (13) (01) (23) (13) (24) (12) (34) (04) (12) (02) (14) (03) (14) (01) (34) (03) (24) (04) (23) (04) (13)		
EVEN 311 [20]	(024) (234) (041) (143) (021) (042) (034) (013) (123) (043) (134) (032) (012) (243) (142) (023) (031) (014) (124) (132)	ODD 32 [20]	(014) (23) (143) (02) (013) (24) (043) (12) (034) (12) (032) (14) (243) (01) (024) (13) (021) (34) (023) (14) (031) (24) (123) (04) (132) (04) (142) (03) (234) (01) (134) (02) (012) (34) (124) (03) (042) (13) (041) (23)

Permutation Group of Degree 5, contd.

Class	Permutation
<i>EVEN</i> 5	[24]
	(04321)
	(03142)
	(02413)
	(01234)
	(01243)
	(03412)
	(04213)
	(03214)
	(02314)
	(01432)
	(03241)
	(04123)
	(03421)
	(01423)
	(02431)
	(01324)
	(03124)
	(04132)
	(04231)
	(02134)
	(02143)
	(02341)
	(01342)
	(04312)

PERMUTATION GROUP OF DEGREE 4

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	23	1	19	16	21	18	14	15	20	17	24	22	4	5	9	7	11	8	6	10	12	3	13
3	1	23	14	15	20	17	19	16	21	18	22	24	8	9	5	11	7	4	10	6	13	2	12
4	16	17	22	14	1	19	23	20	24	21	15	18	11	3	13	12	2	9	7	5	6	10	8
5	21	14	16	24	15	1	18	23	17	22	19	20	13	8	10	4	6	2	3	12	9	11	7
6	18	15	1	21	22	20	24	19	23	14	17	16	5	12	2	3	13	7	9	11	4	8	10
7	19	20	17	1	18	24	15	22	16	23	21	14	3	6	4	10	8	12	13	2	11	9	5
8	15	18	24	19	23	14	1	21	22	20	16	17	7	2	12	13	3	5	11	9	10	6	4
9	20	19	15	22	16	23	17	1	18	24	14	21	12	4	6	8	10	3	2	13	5	7	11
10	17	16	23	20	24	21	22	14	1	19	18	15	9	13	3	2	12	11	5	7	8	4	6
11	14	21	18	23	17	22	16	24	15	1	20	19	2	10	8	6	4	13	12	3	7	5	9
12	22	24	21	17	19	15	20	18	14	16	1	23	10	7	11	5	9	6	8	4	2	13	3
13	24	22	20	18	14	16	21	17	19	15	23	1	6	11	7	9	5	10	4	8	3	12	2
14	5	11	13	8	3	4	2	10	12	6	9	7	18	23	24	22	1	16	17	15	20	21	19
15	6	8	5	12	9	3	7	2	11	13	4	10	24	19	21	14	20	1	23	22	16	18	17
16	10	4	9	13	5	2	11	3	7	12	8	6	22	14	20	19	21	23	1	24	15	17	18
17	4	10	11	3	7	12	9	13	5	2	6	8	23	20	14	21	19	22	24	1	18	16	15
18	8	6	7	2	11	13	5	12	9	3	10	4	1	21	19	20	14	24	22	23	17	15	16
19	9	7	12	4	2	8	3	6	13	10	5	11	17	1	22	24	23	15	18	16	21	20	14
20	7	9	3	6	13	10	12	4	2	8	11	5	15	22	1	23	24	17	16	18	14	19	21
21	11	5	2	10	12	6	13	8	3	4	7	9	16	24	23	1	22	18	15	17	19	14	20
22	13	12	6	11	4	9	10	7	8	5	3	2	21	17	18	15	16	20	19	14	1	24	23
23	3	2	8	9	10	11	4	5	6	7	13	12	19	16	15	18	17	14	21	20	24	1	22
24	12	13	10	7	8	5	6	11	4	9	2	3	20	18	17	16	15	21	14	19	23	22	1

EXIT CALLED.

## Relation between permutations and partitions

We are now ready to <sup>Examine</sup> see the correspondence between permutations (as represented in cyclic notation) and partitions. To return to the set used earlier, notice that the prime permutation 0 1 2 (0) (1) (2) ~~permutes~~ corresponds to the partition in which one element is placed in each cell. The complete set of correspondences is shown below:

	Perm.	Cyclic notation	Partition	Order Inversions
CLASS A	P <sub>1</sub>	0 1 2	(0) (1) (2)	1 1 1 Even 0
CLASS B	P <sub>2</sub>	1 2 0	<del>(0 1 2)</del>	3 } odd 2
	P <sub>3</sub>	2 0 1	<del>(0 2 1)</del>	
CLASS C	P <sub>4</sub>	0 2 1	(1 2)	2 1 } even 1
	P <sub>5</sub>	2 1 0	(0 2)	
	P <sub>6</sub>	1 0 2	(0 1)	

*Correct (even)*

Inspection of the table reveals that the six distinct permutations are placed in correspondence with three different partitions. We can now speak of permutation-classes with respect to partition-type, or, more informally, of permutation classes.

The class designations indicate, in a general way, the amount of displacement effected by the permutations in that class.

Thus,      1 1 1      means all elements remain fixed  
                  3            means no elements remain fixed  
                  2 1            means 1 element remains fixed