N70-27350

NASA TECHNICAL MEMORANDUM

NASA TM X-2015

NASA TM X-2015

FORTRAN IV PROGRAM FOR COMPUTATION OF GROUP TABLES OF FINITE GROUPS — PROGRAM FOR SECOND GENERATION MACHINES

by David D. Evans and Gabriel Allen

Lewis Research Center
Cleveland, Ohio 44135

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • MAY 1970

1. Report No. NASA TM X-2015	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle FORTRAN IV PROGRAM FOR COMPUTATION OF GROUP TABLES OF FINITE GROUPS - PROGRAM FOR SECOND GENERATION MACHINES		5. Report Date May 1970
		6. Performing Organization Code
7. Author(s) David D. Evans and Gabriel Allen		8. Performing Organization Report No. E-5564
9. Performing Organization Name and Address Lewis Research Center National Aeronautics and Space Administration Cleveland, Ohio 44135		10. Work Unit No. 129-04
		11. Contract or Grant No.
12. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546		13. Type of Report and Period Covered Technical Memorandum
		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

A FORTRAN program suitable for second generation machines has been written for machine computation of group tables of finite groups. The method depends on the fact that every finite group G, of order n, is isomorphic to some subgroup T_n of the symmetric group S_n. The procedure for using the program is as follows: After finding the T_n which is isomorphic to G, the user enters the elements of T_n into the program as input data. The group table for T_n is computed and printed. Using the isomorphism between T_n and G, the user then translates back to the elements of G. The group A_5, the even permutation subgroup of S_5, is shown as an example.

17. Key Words (Suggested by Author(s)) Group; Machine computation; Mathematics; Permutation subgroup; Isomorphism		18. Distribution Statement Unclassified - unlimited	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 38	22. Price* $3.00

*For sale by the Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151

FORTRAN IV PROGRAM FOR COMPUTATION OF GROUP TABLES OF FINITE GROUPS - PROGRAM FOR SECOND GENERATION MACHINES

by David D. Evans and Gabriel Allen

Lewis Research Center

SUMMARY

A FORTRAN program suitable for second generation machines has been written for machine computation of group tables of finite groups. The method depends on the fact that every finite group G, of order n, is isomorphic to some subgroup T_n of the symmetric group S_n. The procedure for using the program is as follows: After finding the T_n which is isomorphic to G, the user enters the elements of T_n into the program as input data. The group table for T_n is computed and printed. Using the isomorphism between T_n and G, the user then translates back to the elements of G. The group A_5, the even permutation subgroup of S_5, is shown as an example.

INTRODUCTION

In the past decade, there has been a greatly expanded interest in the application of group theory to physical problems. As a result, there arose a need for detailed information about fairly large finite groups. It was natural to apply computing machines to this problem and a large number of programs were written for proving theorems and algorithms about finite groups whose group tables were entered as input data (ref. 1).

Recently a further step was taken in the direction of automating computations involving finite groups when a FORTRAN program was written for the machine computation of group tables of finite groups (ref. 2). The method made use of the fact that every finite group of order n is isomorphic to some subgroup of the symmetric group S_n. In this program, it was only necessary to enter the elements of the group as input data and the group table was then computed and printed as output. The only knowledge of group theory required by the user was that which established the isomorphism between the group of interest and the appropriate subgroup of S_n. This isomorphism was needed because both the input data and the output are in the form of group elements of S_n.

The program was machine-dependent and was written for use on the NASA Lewis Research Center's IBM 360-67. In many laboratories, only second generation machines are available. In order to enable people limited to such facilities to use this method, the program from reference 2 has been adapted to the language acceptable to the IBM 7094.

The adaptation to 7094 machines requires changes in the details of the program that are not trivial. However, the overall procedure is the same. Therefore, detailed descriptions of the listing are still included in this report, but the reader is frequently referred to reference 2 for extensive explanations of the reasons for the procedure. As shown in the example, the output is not quite as compact as in reference 2.

DEFINITIONS AND CONVENTIONS

The basic idea behind the method is explained in reference 2. The symbol S_n designates the permutation group of n objects and is of order n factorial. The even permutation group of n objects A_n is a proper subgroup of S_n. The group elements are expressed as cycles, each of which is broken down to a product of transpositions in executing the group operations. The numbers between commas in a cycle are called units. The convention adopted herein for describing the effect of a cycle is that in which the units denote objects and each unit is moved to the location currently occupied by the unit to its left.

The term standard configuration (SC) is used to describe an arrangement in which the i^{th} object is in the i^{th} location for $i = 1$ to N where N is the number of objects and/or locations. When N = 3, for example, SC means

Location	1	2	3
Object	1	2	3

The usefulness of class algebra tables for breaking up the group tables of large groups was explained sufficiently in reference 2 and will not be repeated here.

It should be noted that the first row and column of the group tables will only appear as row or column headings.

PROGRAM DESCRIPTION

General Description

Before the input or the form of the output is selected, an isomorphism must be established between the group of interest G and a subgroup T_n of S_n. Often, an isomorphism can be found between G and a subgroup T_j, of some S_j, where $j < n$. It will clearly be advantageous to use as small a permutation group as can be thought of for this purpose. The isomorphism between G and T_j should first be duly recorded. Then the program is used to compute the group table for T_j. From this table and the recorded isomorphism between T_j and G, the group table for G is obtained.

The broad outlines of the program and even most of the details are the same as in reference 2. Nevertheless, many minor changes still appear throughout the main listing, and rather extensive changes are present in subroutine SQUEZ. Therefore, a detailed description of the program is included in this report.

The program computes a group table for elements of T_j which are read in as a series of column and a series of row operations in cycle notation. The usual convention is adopted in which a row operation refers to a group operation in the vertical heading to the left of a group table, whereas a column operation refers to a group element in the horizontal heading at the top of a group table. The general procedure consists of the following steps:

(1) A set of K column operations and L row operations is read into the program.

(2) Each of these operations is broken down into its equivalent sequence of transpositions. Let the group operation P_{ij} represent the (group) product of the i^{th} row operation R_i by the j^{th} column operation C_j. Then P_{ij} will be stored as a long sequence of transpositions.

(3) The SC is rearranged in accordance with the sequence of transpositions that represent P_{ij}.

(4) The rearrangement is examined and a single group operation that effects the same rearrangement of the SC is identified as the product $R_i * C_j$.

(5) This single group operation is entered in the i^{th} row and j^{th} column of the group table array.

The entry in this location is to be interpreted as being the result of the group operation C_j followed by the group operation R_i.

An outline of the program, broken down into sections which perform recognizable functions, follows. For more detailed descriptions, the listing in appendix A can be examined.

Block 1 - set up constants. - The constants used in the program are given literal names and are declared either INTEGER or LOGICAL in TYPE statements. All the subscripted variables are dimensioned and allotted storage locations by the use of DIMENSION statements. A DATA statement is used to give literal names to the variables listed in the following table:

Variable	Literal name	Identification
(	LP	Left parenthesis
)	RP	Right parenthesis
,	CM	Comma
	BLK	Blank
E	IDNT	Identity element of group

Block 2 - read in DATA. - The data describing the group and the group operations are read into the program. The labels to be assigned to the objects and to the locations are read in from the list for IDENT which is limited to one card. It is read in with FORMAT(80A1), right shifted, and stored in INITAL(N) in the form bbbbbX, where b represents a 6-bit blank and X represents the 6-bit location in the 36-bit storage register (word) in which the integer from IDENT is stored.

In order to put the "words" in this form, use is made of four shift functions: IALS(N, NWORD) and IARS(N, NWORD), which cause the integer variable NWORD to be shifted N bits to the left and to the right, respectively, and ALS(N, WORD) and ARS(N, WORD), which cause the real variable WORD to be shifted N bits to the left and to the right, respectively. (The latter two functions are in subroutine SQUEZ, which is called in block 2, but which is described in a later section.)

All of these functions are standard on the IBM 7094. The machine at Lewis Research Center has these functions in its function library, and they can be called directly. For those users who do not have direct access to these functions, a map listing for all four is provided in appendix B.

Description of Input

The input cards are read in the following order:

First card	TITLE	one card with FORMAT(80A1)
Second card	IDENT	one card with FORMAT(80A1)

Note that the input for IDENT must be long enough to include the maximum number of objects to be moved in any group operation. Thus, the list for IDENT must be of the form $(A_1, A_2, \ldots, A_j)$ where j is the subscript of S_j and A_i is any alphanumeric symbol.

The next set of cards contains the ACROSS (column) operations. There can be as many as four cards with FORMAT(80A1), and each operation is followed by a period.

A blank card follows the preceding set. It is needed to signal the end of the ACROSS input.

The next set contains the DOWN (row) operations. There can be as many as four cards with FORMAT(80A1), and again each operation is followed by a period.

A blank card follows the preceding set, signalling the end of the DOWN input.

The input for both ACROSS and DOWN operations is in cycle notation.

Several error checks are run on IDENT. These include checking the maximum number of nonblank units (which is six in this version of the program), the presence of blank spaces on the card, and the illegal use of parentheses.

The group elements themselves are read in from the list for INPUT(J, K), which is also read in with FORMAT(80A1). The complete set of column operations is read first. Then the complete set of row operations is read. Each of these sets is limited to four cards and is followed by a blank card.

The example which follows is the class algebra block K_5*K_4 of group A_5. The symbol K_4 represents the class of 20 group elements expressible as three unit cycles, while K_5 is the class of 15 group elements expressible as products of two independent transpositions. (See ref. 2 for further details.)

```
K5*K4
(1,2,3,4,5)
(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).
Card 5 is blank
(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).
Card 9 is blank
```

Cards 3 and 4 are ACROSS (column) operations and cards 6, 7, and 8 are DOWN (row) operations.

Block 3 - store each group operation as product of transpositions. - In this block, each group operation is decomposed into its equivalent product of transpositions and then stored in PAIRS(I, NOP, K) (see appendix A). The third subscript K is 1 or 2 according to whether the operation is a column or row operation, respectively. Thus, an entry in PAIRS(I, NOP, K) is the I^{th} unit of the group element in the NOP^{th} column (K=1) or NOP^{th} row (K=2). Note that the four shift functions described in block 2 are used here, also.

The example used herein is the group product of (1, 3), (2, 4), and (5, 2, 1). This is an entry under (521) and to the right of (1, 3)(2, 4) in the K_5*K_4 class product of A_5 (see ref. 2 and the last class product block in appendix C). The input for this block (which was shown in the preceding section) shows that the element (521) was the 15th ACROSS (column) operation and therefore corresponds to $K = 1$, $NOP = 15$. Before being stored in a PAIRS array, the element is considered to be of the form (52)(21). Therefore the contents of {PAIRS(-, 15, 1)} is [5221]. The element (1, 3)(2, 4) is the 2nd DOWN (row) element; and it, therefore, corresponds to $K = 2$, $NOP = 2$. The contents of the four registers which constitute the complete {PAIRS(-, 2, 2)} array are [1324].

Block 4 - set up arrays in standard configuration. - In this block, a number of standard configurations are set up. If N_C and N_R are the total number of column and row operations, respectively, then $N_C \times N_R$ SC's are set up. A given SC is set up by storing the quantity bbbbbI in location ANS(I, I1, I2) (see listing in appendix A). For a fixed I1 and I2, the complete set of ANS(I, I1, I2) over the full range of I takes on the form of an SC. (See example in block 5.) Note that the second and third subscripts of ANS refer to column and row operations, respectively. On the other hand, a given PAIRS array describes either a column or a row operation, but never mixes these types.

Block 5 - perform group multiplication. - In this block, the detailed operations for all the group products, $P_{I2, I1}$ (operation I2 * operation I1) are actually performed. The method used is to transpose, successively, units from the SC of ANS(-, I1, I2) in accordance with the indicated operation of PAIRS(-, I1, 1) followed by the operation of PAIRS(-, I2, 2). The operations may be understood by following the procedure on a single complete ANS(-, I1, I2) array.

The storage location ascribed to ANS(J, I1, I2) is considered to be the J^{th} location of the SC. The quantity stored in ANS(J, I1, I2) is considered to be the "thing" which moved to the J^{th} location as a result of the operation (operation I2 * operation I1) on the SC. Schematically, upon entering block 5, the {ANS(-, I1, I2)} array is in the SC. Thus, for A_5, {ANS(-, I1, I2)} = [12345].

Continuing with the example of (13)(24)(521), when $K = 1$, $I1 = 15$, and when $K = 2$, $I2 = 2$. Therefore, {ANS(-, I1, I2)} = {ANS(-, 15, 2)}. The first rearrangement of the SC of this ANS array is the one effected by {PAIRS(-, 15, 1)}. After being operated on by {PAIRS(-, 15, 1}, the {ANS(-, 15, 2)} array has the content [51342]. Following this rearrangement by {PAIRS(-, 15, 1)}, the I2th row operation {PAIRS(-, 2, 2)} is brought into play. The content of {ANS(-, 15, 2]} upon leaving block 5 and entering block 6 is thus [53124].

Block 6 - identification of the group product element. - In effect, the permuted stored values in each ANS array leaving block 5 are examined and a determination is made of the single group operation which would have permuted the SC to this ANS array in a single step. In block 6, this single operation is determined and stored in {OUT(-, I1, I2)}. Thus, an array {OUT(-, I1, I2)} represents the one group operation which has the same effect on the standard ANS array (SC) as does the product of the two operations (operation I2 * operation I1).

In order to understand how the identification is made, reference may be made to the content of {ANS(-, 15, 2)} upon entering block 6. The content of a given register of ANS is the same as the label of the location in the SC. Since, in the SC, the location and object have the same label, an examination of the content of a particular register in ANS provides (partial) information about the rearrangement of two objects. Referring to the ANS(-, 15, 2) array shows the content of register (1, 15, 2) to be the integer 5. This is taken to mean that the object 5 now occupies the position originally held by object 1. In cycle notation, this fact is indicated by placing a 1 to the left of 5; thus: 1, 5.

The next step is to examine the content of register 5, which is 4. Therefore, the next entry in the cycle has been found and the result is 1, 5, 4.

Since the content of register 5 was 4, the content of register 4 is examined next. This is found to be a 2, so that the cycle chain is now 1, 5, 4, 2 and register 2 is examined next. A 3 is found there and the chain is now complete: (1, 5, 4, 2, 3). The completion of the chain is tantamount to concluding that the operation (521) followed by the operation (13)(24) is equivalent to the single operation (15423). This cycle is the same group operation as (54231) which is the actual entry at the intersection of the column headed by (521) and the row headed by (13)(24) in the class product block $K_5 * K_4$ (see appendix C). As explained in reference 2 all equivalent cycles are printed in a unique manner in which the smallest integer in the cycle is at the extreme right.

Block 7 - output and error messages. - The group table is listed in this block. The error messages are also contained here.

Subroutine SQUEZ. - The usual manner of storing a single datum on the IBM 7094 is in a word of 36 bits. All the data in this program are integer type of such a size that only one byte in each word reserved for a datum is utilized. This results in a very inefficient use of storage. SQUEZ packs six pieces of data into one storage word. It also eliminates extraneous blanks.

The three variables from the main program to which SQUEZ is applied are: IDENT, INPUT, and OUT. It should be noted that the stored entries in OUT are of mixed form. At the time that SQUEZ is called, the punctuation marks in OUT are stored in the usual form Xbbbbb; whereas the numbers are stored in the right-shifted form bbbbbX. SQUEZ left-shifts either of such forms or any combination thereof until every byte in a given stored word contains useful information.

An example of the effect of SQUEZ can be seen by examining the form of the group element (1, 2, 3) before and after being "SQUEZed." If this element were part of an OUT array in the main program, then the seven words required to store it would have the following form:

(bbbbbbbbbb1, bbbbbbbbbb2, bbbbbbbbbb3)bbbbb

Each grouping of six typed symbols shows a single stored word. Upon leaving SQUEZ, the group element is stored in only two words of the following form:

$$\underbrace{(1,2,3)\mathrm{b}\mathrm{b}\mathrm{b}\mathrm{b}\mathrm{b}}$$

A flowchart for this subroutine is given in figure 1.

SUMMARY OF PROCEDURE

A FORTRAN program for use on second generation (7094) computing machines has been written for the computation of group tables for finite groups. Use is made of the existence of an isomorphism between any finite group of order n and some subgroup T_n of the symmetric group S_n. The elements of T_n are entered as input data. The program then performs the group operations on these elements and identifies the products of these operations.

Each element entered as input data is expressed as a product of transpositions. The indicated interchanges for a group product of two such elements are then applied to a standard configuration. The resulting configuration is then identified with that configuration which a single group element would cause if applied to the standard configuration. This group element is called the product of the first two and entered in the row and column headed by the original two elements of T_n.

The complete table of A_5, the group of even permutations of five objects, is shown as a worked out example in appendix C.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, March 11, 1970,
129-04.

APPENDIX A

PROGRAM LISTING

Main Program

```
C      BLOCK(1) SETS UP CONSTANTS

       DIMENSION INPUT(440,2), INITAL(6), IDENT(80), NPAIR(24,2), NOUT(24
      1,24), LINE(21), NIN(24,2), NINPUT(2), NOPA(2), KN(6)
       EQUIVALENCE(CHAR,CAR)
       INTEGER RP,CM,TEMP,BLK,CHAR,PER,PAIRS(18,24,2),ANS(6,24,24),OUT(15
      1,24,24),TITLE(80)
       LOGICAL COMMA,ONE
       DATA LP,RP,CM,BLK,PER,IDNT/1H(,1H),1H,,1H ,1H.,1HE/

C      BLOCK(2) READS IN DATA

1      READ (5,66) TITLE

C      TITLE IS NAME OF GROUP OR PART OF GROUP

       READ (5,66) IDENT

C      IDENT= THE NUMBERS OR LETTERS USED IN THE PERMUTATION GROUP

       WRITE(6,80) TITLE
       WRITE(6,81) IDENT
       ILP=0
       IRP=0
       N=0
       CHAR=BLK

C      BLK IS STORED IN OCTAL FORM AS 606060606060
C      A NON-BLANK CHARACTER HAS THE FORM XX6060606060

       DO 5 I=1,80
       TEMP=IDENT(I)
       IF (TEMP.EQ.BLK) GO TO 5
       IF (TEMP.EQ.LP) GO TO 2
       IF (TEMP.EQ.RP) GO TO 3
       IF (TEMP.EQ.CM) GO TO 4

C      SEE COMMENTS AND SYMBOL LIST SECTION FOLLOWING FORMAT STATEMENTS

       CAR=OR(IALS(6,CHAR),IARS(30,TEMP))
       GO TO 5
2      ILP=ILP+1
       GO TO 5
3      IRP=IRP+1
4      N=N+1
       IF (N.GT.6) GO TO 61
       IF (CHAR.EQ.BLK) GO TO 62
       INITAL(N)=CHAR


C      ENTRIES IN INITAL(N) ARE STORED AS BBBBBX
       CHAR=BLK
5      CONTINUE
```

```
      IF (ILP.NE.1.OR.IRP.NE.1) GO TO 63
      ID=80
      CALL SQUEZ (IDENT,ID)
      DO 8 K=1,2
      DO 7 I=1,5
      JS=(I-1)*80+1
      JE=I*80
      READ (5,66) (INPUT(J,K),J=JS,JE)
      WRITE(6,90) (INPUT(J,K),J=JS,JE)
      DO 6 J=JS,JE
      IF (INPUT(J,K).NE.BLK) GO TO 7
6     CONTINUE

C     NINPUT(K) IS THE SL IN TYPE K INPUT. IT  IS SET EQ TO 80(NUMBER OF INPUT
C     CARDS OF TYPE K) +1.

      NINPUT(K)=JS
      GO TO 8
7     CONTINUE
8     CONTINUE

C     BLOCK(3) STORES EACH OPERATION IN PAIRS ARRAY AS A PRODUCT OF
C              TRANSPOSITIONS

      DO 19 K=1,2


C     NPAIR(I,K) IS THE TOTAL NUMBER OF UNITS USED TO REPRESENT THE ITH GROUP
C     OPERATION IN TYPE K WHEN THE OPERATION IS STORED AS A PRODUCT OF
C     TRANSPOSITIONS

      NPAIR(1,K)=0
      NOP=1
      IPRN=0
      CHAR=BLK
      II=0
      ONE=.TRUE.
      COMMA=.FALSE.
      IE=NINPUT(K)
      DO 16 I=1,IE
      TEMP=INPUT(I,K)
      IF (TEMP.EQ.BLK) GO TO 16
      IF (TEMP.EQ.LP) GO TO 9
      IF (TEMP.EQ.RP) GO TO 10
      IF (TEMP.EQ.CM) GO TO 11
      IF (TEMP.EQ.PER) GO TO 14
      CAR=OR(IALS(6,CHAR),IARS(30,TEMP))
      GO TO 15
9     IPRN=IPRN+1
      ONE=.TRUE.
      IF (IPRN.LT.0.OR.IPRN.GT.1) GO TO 57
      GO TO 15
10    IPRN=IPRN-1
      IF (.NOT.COMMA) GO TO 58
      COMMA=.FALSE.
      ONE=.TRUE.
      IF (IPRN.LT.0.OR.IPRN.GT.1) GO TO 57
      GO TO 12
11    COMMA=.TRUE.
12    NPAIR(NOP,K)=NPAIR(NOP,K)+1
      IF (NPAIR(NOP,K).GT.17) GO TO 59
      IF (CHAR.EQ.BLK) GO TO 56
      IJ=NPAIR(NOP,K)
```

```
C      AN ENTRY IN PAIRS IS STORED IN FORM BBBBBX

       PAIRS(IJ,NCP,K)=CHAR
       IF (ONE) GO TO 13
       NPAIR(NCP,K)=NPAIR(NCP,K)+1
       IJ=NPAIR(NCP,K)
       PAIRS(IJ,NCP,K)=CHAR
13     CHAR=BLK
       ONE=.FALSE.
       GO TO 15
14     NCP=NCP+1
       IF (NCP.GT.24) GO TO 60
       NPAIR(NCP,K)=0
15     II=II+1
       INPUT(II,K)=TEMP
16     CONTINUE

C      HERE NINPUT(K) IS SET EQ 1 + SL OF TYPE K

       NINPUT(K)=II+1
       IF (INPUT(II,K).NE.PER) GO TO 17
       NCP=NCP-1
       GO TO 18
17     INPUT(II+1,K)=PER
18     IF (NPAIR(1,K).EQ.0) GO TO 1

C      NCPA(K) EQ THE TOTAL NUMBER OF GROUP OPERATIONS OF TYPE K
C      TYPE K MEANS K=1 FOR COLUMN OPERATIONS, K=2 FOR ROW OPERATIONS

       NCPA(K)=NCP
19     CONTINUE

C      BLOCK(4) SETS UP ANS ARRAY IN STANDARD FORM OR CONFIGURATION

C      AN ENTRY IN ANS IS STORED AS BBBBBX


       NCP1=NOPA(1)
       NCP2=NOPA(2)
       DO 20 I1=1,NCP1
       DO 20 I2=1,NCP2
       DO 20 I=1,N
20     ANS(I,I1,I2)=INITAL(I)

C      BLOCK(5) PERFORMS THE PRODUCT OPERATIONS

       DO 27 I1=1,NCP1
       K1=NPAIR(I1,1)
       DO 27 I2=1,NCP2
       K2=NPAIR(I2,2)
       DO 23 I=1,K1,2
       J=K1-I+1
       J1=0
       J2=0
       DO 22 L=1,N
       IF (ANS(L,I1,I2).NE.PAIRS(J,I1,1)) GO TO 21
       J1=L
21     IF (ANS(L,I1,I2).NE.PAIRS(J-1,I1,1)) GO TO 22
       J2=L
22     CONTINUE
       IF (J1.EQ.0.OR.J2.EQ.0) GO TO 55
       ITMP=ANS(J1,I1,I2)
       ANS(J1,I1,I2)=ANS(J2,I1,I2)
       ANS(J2,I1,I2)=ITMP
23     CONTINUE
```

```
      DO 26 I=1,K2,2
      J=K2-I+1
      J1=0
      J2=0
      DO 25 L=1,N
      IF (ANS(L,I1,I2).NE.PAIRS(J,I2,2)) GO TO 24
      J1=L
24    IF (ANS(L,I1,I2).NE.PAIRS(J-1,I2,2)) GO TO 25
      J2=L
25    CONTINUE
      IF (J1.EQ.0.OR.J2.EQ.0) GO TO 55
      ITMP=ANS(J1,I1,I2)
      ANS(J1,I1,I2)=ANS(J2,I1,I2)
      ANS(J2,I1,I2)=ITMP
26    CONTINUE
27    CONTINUE

C     BLOCK(6) IDENTIFIES THE SINGLE GROUP ELEMENT WHICH HAS THE SAME
C              EFFECT AS BLOCK(5)

C     MAX IS THE MAXIMUM NUMBER OF 36 BIT WORDS NEEDED TO CONTAIN THE LONGEST
C     GROUP ELEMENT (INCLUDING PUNCTUATION) AFTER SQUEZ HAS BEEN APPLIED.

      MAX=0
      DO 38 I1=1,NOP1
      DO 38 I2=1,NOP2
      OUT(1,I1,I2)=LP
      OUT(2,I1,I2)=ANS(1,I1,I2)
      OUT(3,I1,I2)=CM

C     JRP IS A TEMPORARY STORAGE FOR SL IN THE I1,I2 CYCLE (SEE MAX). ITS
C     FINAL VALUE IS STORED IN NOUT(I1,I2).(SEE STATEMENTS 36 AND 37)

      JRP=0
      J=3
      K1=1
      DO 28 KK=1,N
28    KN(KK)=KK
      KN(1)=0
      DO 35 I=1,N
      DO 29 L=1,N
      K=L
      IF (OUT(J-1,I1,I2).EQ.INITAL(K)) GO TO 30
29    CONTINUE
30    IF (K.EQ.K1) GO TO 31

C     KN(K) EQ 0 MEANS THE CONTENT OF THE KTH LOCATION IN THE ANS ARRAY
C     HAS BEEN INDENTIFIED.

      KN(K)=0
      J=J+1
      OUT(J,I1,I2)=ANS(K,I1,I2)
      J=J+1
      OUT(J,I1,I2)=CM
      GO TO 35
31    KN(K)=0
      DO 32 KK=1,N
      K=KN(KK)
      IF (K.NE.0) GO TO 33
32    CONTINUE
33    K1=K
      IF (OUT(J-2,I1,I2).NE.LP) GO TO 34
      IF (K.EQ.0) GO TO 36
      OUT(J-1,I1,I2)=ANS(K,I1,I2)
      GO TO 35
```

```
34    CUT(J,I1,I2)=RP
      JRP=J
      IF (K.EQ.0) GO TO 36
      J=J+1
      CUT(J,I1,I2)=LP
      J=J+1
      CUT(J,I1,I2)=ANS(K,I1,I2)
      J=J+1
      CUT(J,I1,I2)=CM
35    CONTINUE
36    J=JRP
      IF (J.EQ.0) GO TO 37
      CALL SQUEZ (CUT(1,I1,I2),J)

C     NCUT(I1,I2) IS THE NUMBER OF SYMBOLS IN THE I1,I2 CYCLE (SEE MAX)
C     NOTE THAT AFTER RETURN FROM SQUEZ,JEQ THE TOTAL NUMBER OF WORDS REQUIRED
C     FOR CUT (-,I1,I2) ARRAY IN SQUEEZED FORM

37    NCUT(I1,I2)=J
      IF (J.LE.MAX) GO TO 38
      MAX=J
38    CONTINUE

C     BLOCK(7) SETS UP THE OUTPUT FORMAT AND WRITES ERROR MESSAGES

      DO 41 K=1,2

C     THE DO 41 LOOP DOES SOME LOGISTICAL PRELIMINARIES FOR THE ROW AND COLUMN
C     HEADINGS OF THE  GROUP TABLE

      J=0
      J1=1
      IE=NINPUT(K)
      DO 40 I=1,IE
      IF (INPUT(I,K).NE.PER) GO TO 40

C     NIN(J),K) EQ NUMBER OF WORDS REQUIRED TO THE SL IN THE REPRESENTATION OF
C     THE JTH GROUP OPERATION OF TYPE K

      MX=I-J1+1
      CALL SQUEZ (INPUT(J1,K),MX)
      IF (MX.LE.MAX) GO TO 39
      MAX=MX
39    J1=MX+J1
      J=J+1
      NIN(J,K)=MX
40    CONTINUE
41    CONTINUE

C     TITLE AND IDENT (SEE SYMBOL LIST) ARE WRITTEN BETWEEN HERE AND DO 54 STATE
C     MENT.

      NC=21
      MAX=MAX+1
      NUM=NC/MAX-1
      IF (NUM.LT.2) GO TO 64
      NM=(NCP1+NUM-1)/NUM
      WRITE (6,67) (IDENT(I),I=1,ID)
      WRITE (6,68) TITLE

C     SET UP FOR THE FIRST ROW (COLUMN HEADINGS) OF GROUP TABLE

      K1=1
      DO 54 I=1,NM
```

```
C     MAKE FIRST 21 WORDS BLANK. NOTE THAT EACH SQUEEZED WORD TAKES UP 6 SPACES
C     TO PRINT OUT

      DO 42 L=1,21
42    LINE(L)=BLK
      L1=MAX
      DO 44 J=1,NUM
      I1=(I-1)*NUM+J
      IF (I1.GT.NCP1) GO TO 45
      K2=NIN(I1,1)+K1-1
      DO 43 K=K1,K2
      L1=L1+1
43    LINE(L1)=INPUT(K,1)
      L1=(J+1)*MAX
44    K1=K2+1
45    WRITE (6,69) LINE

C     STATEMENT 45 HAS WRITTEN THE FIRST LINE OF THE TABLE (COLUMN HEADINGS)

C     THE MAIN BODY OF THE TABLE IS WRITTEN LINE BY LINE BETWEEN THE STATEMENT
C     K3 EQ 1 AND STATEMENT NUMBER 52.

      K3=1
      DO 53 I2=1,NCP2
      L1=0

C     THE FIRST 21 WORDS BLANKED OUT (SEE COMMENT ON DO 42)

      DO 46 L=1,21
46    LINE(L)=BLK
      K4=NIN(I2,2)+K3-1
      DO 47 K=K3,K4
      L1=L1+1
47    LINE(L1)=INPUT(K,2)
      K3=K4+1
      L1=MAX
      DO 51 J=1,NUM
      I1=(I-1)*NUM+J
      IF (I1.GT.NCP1) GO TO 52
      K5=NOUT(I1,I2)
      IF (K5.EQ.0) GO TO 49
      DO 48 K=1,K5
      L1=L1+1
48    LINE(L1)=OUT(K,I1,I2)
      GO TO 50
49    L1=L1+1
      LINE(L1)=IDNT
50    L1=(J+1)*MAX
51    CONTINUE
52    WRITE (6,70) LINE
53    CONTINUE
54    CONTINUE

C     WRITE STATEMENTS FOR ERROR MESSAGES

      GO TO 1

55    WRITE (6,71) (IDENT(I),I=1,IC)
      WRITE(6,79) TITLE
      GO TO 1
56    WRITE (6,72)
      GO TO 1
57    WRITE (6,73)
      GO TO 1
```

```
58     WRITE (6,74)
       GC TC 1
59     WRITE (6,75)
       GC TC 1
60     WRITE (6,76)
       GC TC 1
61     WRITE (6,77)
       GC TC 65
62     WRITE (6,72)
       GC TC 65
63     WRITE (6,73)
       GC TC 65
64     WRITE (6,78)
       GC TC 1
65     RETLRN

66     FCRMAT (80A1)
   67 FCRMAT(1HJ,10X,6HGROUP ,11A6)
   68 FCRMAT(1HJ,50X,30A1)
   69 FCRMAT(1HL,21A6)
   7C FCRMAT(1HJ,21A6)

C      FCRMATS FCR ERROR MESSAGES

   71 FCRMAT(1HJ,44HILLEGAL ELEMENT IN GROUP. IDENTITY GRCUP IS ,11A6)
   72 FCRMAT(1HJ,29HBLANK IS NCT A VALID ELEMENT.)
   73 FCRMAT(1HJ,22HILLEGAL USE OF PARENS.)
   74 FCRMAT(1HJ,14HILLEGAL GROUP.)
   75 FCRMAT(1HJ,34HTHE PAIRS ARRAY HAS BEEN EXCEEDED.)
   76 FCRMAT(1HJ,34HTOC MANY OPERATIONS.  LIMIT IS 24.)
   77 FCRMAT(1HJ,39HMORE THAN 6 ELEMENTS IN IDENTITY GRCLP.)
   78 FCRMAT(1HJ,45HNOT ENCUGH ROOM ON PRINT LINE TO PRINT TABLE.)
   79 FCRMAT(1HJ,27HCHECK INPUT CARDS IN GROUP ,80A1)
   80 FCRMAT(1H1,80A1)
   81 FCRMAT(1HJ,80A1)
   9C FCRMAT(1HJ,80A1)

C      THE FCLLCWING VARIABLES ARE SQEEZED  IDENT, INPUT, AND OUT.

C      STCRAGE FCR A WORD ON THE 7094 IS ALLOTTED 36 BITS. A WORD CAN BE 6
C      ALPHANUMERIC CHARACTERS LONG. EACH CHARACTER IS REPRESENTED BY ONE BYTE
C      (6 BITS LCNG).
C      A BYTE REPRESENTING A BLANK IS CODED IN CCTAL AS 6C
C      A FLLL BLANK WORC IS CODED IN OCTAL AS 6C6C60606C6C
C      A SINGLE NCN-BLANK CHARACTER IS STORED AS XX6060606060
C      IALS(6,CHAR) SHIFTS THE CHARACTERS IN THE WORD CHAR 6 BITS (OR ONE BYTE)
C      TC THE LEFT. THE LAST BYTE IS THEN REPLACED BY ZERCES(NOT BLANKS).A BLANK
C      WCRC CPERATEC ON BY IALS(6,CHAR) WOULD ASSLME THE FORM 606060606060.
C      IARS(30,TEMP) SHIFTS THE CHARACTERS IN TEMP 30 BITS(5 BYTES) TO THE RIGHT
C      AGAIN, THE 5 BYTES ARE REPLACED BY ZEROES THE FORM CF A NON-BLANK WORD
C      OPERATEC CN BY IARS (30,TEMP) WOLLD BE CCOC000000XX.
C      THE LCGICAL OR BETWEEN TWO QLANTITES A AND B STORES   1 IN A GIVEN BIT
C      LCCATION IF EITHER A OR B HAS  1  IN THAT LCCATICN 0 IS STORED IN A
C      GIVEN BIT LCCATION ONLY IF BCTH A AND B HAVE 0 IN THAT LOCATION
C      THE EFFECT CF OR(IALS(6,CHAR) IARS(3C,TEMP) ON A NCN-BLANK TEMP OF THE
C      FCRM XX6C6C606060 IS TO CHANGE IT TO THE FORM 606C606060XX

       ENC
```

Subroutine SQUEZ

```
      SUBROUTINE SQUEZ(OUT,N)
      DIMENSION OUT(80)
      DATA MASK,BLANK,ZERO,BLANK1/
     *O770000000000,O600000000000,O000000000000,O606060606060 /
      IA=0
      IB=0
      TEMP=ZERO
      DO 1 I=1,N
      DO 1 J=1,6
      PART=AND(MASK,ALS(6*(J-1),OUT(I)))
      IF(PART.EQ.BLANK) GO TO 1
      IA=IA+1
      TEMP=OR(TEMP,ARS(6*(IA-1),PART))
      IF(IA.NE.6) GO TO 1
      IB=IB+1
      OUT(IB)=TEMP
      IA=0
      TEMP=ZERO
    1 CONTINUE
      IF(IA.EQ.0) GO TO 2
      IB=IB+1
      OUT(IB)=TEMP
      IA=IA+1
      DO 3 J=IA,6
    3 OUT(IB)=OR(OUT(IB),ARS(6*(J-1),BLANK))
    2 M=IB+1
      IF(M.GT.N) GO TO 4
      DO 5 J=M,N
    5 OUT(J)=BLANK1
      N=IB
    4 RETURN
      END
```

APPENDIX B

MAP LISTING OF SHIFT ROUTINES

```
        ENTRY   ALSF
        ENTRY   ALS
        ENTRY   ARSF
        ENTRY   ARS
        ENTRY   ALGRF
        ENTRY   ALGR
        ENTRY   ALGLF
        ENTRY   ALGL
        ENTRY   EXORF
        ENTRY   EXOR
        ENTRY   IEXOR
        ENTRY   IALS
        ENTRY   IALSF
        ENTRY   IARS
        ENTRY   IARSF
        ENTRY   LRS
        ENTRY   LRSF
        ENTRY   LGR
        ENTRY   LGRF
        ENTRY   LLSF
        ENTRY   LLS
        ENTRY   LGL
        ENTRY   LGLF
        ENTRY   XLRSF
        ENTRY   XLRS
        ENTRY   XLLSF
        ENTRY   XLLS
IARS    NULL
ARSF    NULL
IARSF   NULL


ARS     CLA*    3,4
        STA     *+2
        CAL*    4,4
        ARS     **
        XCL
        XCA
        TRA     1,4
IALS    NULL
IALSF   NULL
ALSF    NULL
ALS     CLA*    3,4
        STA     *+2
        CAL*    4,4
        ALS     **
        XCL
        XCA
        TRA     1,4
XLRS    NULL
XLRSF   NULL
LRSF    NULL
LRS     CLA*    3,4
        STA     *+3
        CAL*    4,4
        LDQ     TEMP
        LRS     **
```

```
        STQ     TEMP
        XCL
        XCA
        TRA     1,4
XLLS    NULL
LLSF    NULL
XLLSF   NULL
LLS     CLA*    3,4
        STA     *+3
        CAL*    4,4
        LDQ     TEMP
        LLS     **
        STQ     TEMP
        XCL
        XCA
        TRA     1,4
EXORF   NULL
IEXOR   NULL
EXOR    CAL*    3,4
        ERA*    4,4
        XCL
        XCA
        TRA     1,4
ALGL    NULL
LGLF    NULL
ALGLF   NULL
LGL     CLA*    3,4

        STA     *+3
        CAL*    4,4
        LDQ     TEMP
        LGL     **
        STQ     TEMP
        XCL
        XCA
        TRA     1,4
ALGR    NULL
ALGRF   NULL
LGRF    NULL
LGR     CLA*    3,4
        STA     *+3
        CAL*    4,4
        LDQ     TEMP
        LGR     **
        STQ     TEMP
        XCL
        XCA
        TRA     1,4
TEMP    OCT
        END
```

APPENDIX C

EXAMPLE OF COMPUTER OUTPUT - GROUP A_5

K2*K2
(1,2,3,4,5)
(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

GROUP (1,2,3,4,5)

K2*K2

	(1,2,3,4,5).	(1,2,5,3,4).	(1,4,5,2,3).	(1,4,2,3,5).	(1,3,5,4,2).	(1,3,4,2,5).
(1,2,3,4,5).	(3,5,2,4,1)	(3,5,4,2,1)	(5,3,2,4,1)	(5,2,4,3,1)	(4,3,1)	(4,3,5,2,1)
(1,2,5,3,4).	(5,2,4,3,1)	(5,4,2,3,1)	(4,3,2)	(4,5,2)	(4,5,1)	(4,5,2,3,1)
(1,4,5,2,3).	(3,5,4,2,1)	(3,5,1)	(5,3,4,2,1)	(5,4,3,2,1)	(4,3,2)	(5,4,3)
(1,4,2,3,5).	(3,2,5,4,1)	(3,2,1)	(2,5,3,4,1)	(2,5,4,3,1)	(5,2,4,3,1)	(5,4,3,2,1)
(1,3,5,4,2).	(5,3,2)	(4,3,2)	(2,5,1)	(2,5,3,4,1)	(5,2,3,4,1)	(5,3,2,4,1)
(1,3,4,2,5).	(5,3,2,4,1)	(5,4,3,2,1)	(2,4,1)	(2,4,5,3,1)	(4,5,2,3,1)	(4,5,3,2,1)
(5,4,3,2,1).	E	(4,5,2)	(3,5,1)	(3,4,1)	(2,5,3,4,1)	(2,4,1)
(5,2,1,4,3).	(5,4,2)	E	(3,4,2,5,1)	(3,2,5,4,1)	(5,3,2,4,1)	(5,4,1)
(5,4,1,3,2).	(5,3,1)	(5,2,4,3,1)	E	(4,5,3)	(2,3,4,5,1)	(2,4,5,3,1)
(5,3,2,4,1).	(4,3,1)	(4,5,2,3,1)	(5,4,3)	E	(2,5,1)	(2,3,1)
(5,3,1,2,4).	(4,3,5,2,1)	(4,2,3,5,1)	(5,4,3,2,1)	(5,2,1)	E	(3,5,2)
(5,2,4,3,1).	(4,2,1)	(4,5,1)	(3,5,4,2,1)	(3,2,1)	(5,3,2)	E

	(5,4,3,2,1).	(5,2,1,4,3).	(5,4,1,3,2).	(5,3,2,4,1).	(5,3,1,2,4).	(5,2,4,3,1).
(1,2,3,4,5).	E	(5,3,1)	(4,2,1)	(5,4,2)	(3,2,5,4,1)	(5,3,2)
(1,2,5,3,4).	(3,5,1)	E	(4,2,3,5,1)	(3,5,4,2,1)	(5,4,3,2,1)	(3,2,1)
(1,4,5,2,3).	(2,4,1)	(5,3,2,4,1)	E	(2,5,1)	(3,4,2,5,1)	(2,5,3,4,1)
(1,4,2,3,5).	(4,5,2)	(2,4,5,3,1)	(5,2,1)	E	(3,4,1)	(4,5,3)
(1,3,5,4,2).	(4,5,2,3,1)	(2,3,4,5,1)	(5,2,4,3,1)	(4,3,1)	E	(4,5,1)
(1,3,4,2,5).	(3,5,2)	(2,3,1)	(4,3,5,2,1)	(5,4,3)	(5,4,1)	E
(5,4,3,2,1).	(4,2,5,3,1)	(3,4,2,5,1)	(2,4,5,3,1)	(4,5,2,3,1)	(3,5,2)	(4,2,3,5,1)
(5,2,1,4,3).	(2,4,5,3,1)	(3,2,4,5,1)	(5,3,1)	(2,3,1)	(3,4,2)	(2,3,4,5,1)
(5,4,1,3,2).	(4,2,3,5,1)	(3,4,2)	(2,4,3,5,1)	(4,3,5,2,1)	(5,2,1)	(4,2,1)
(5,3,2,4,1).	(3,4,2,5,1)	(5,4,2)	(2,3,4,5,1)	(3,4,5,2,1)	(4,3,5,2,1)	(3,5,4,2,1)
(5,3,1,2,4).	(3,4,1)	(5,4,1)	(3,4,2)	(3,4,2,5,1)	(4,3,2,5,1)	(3,2,5,4,1)
(5,2,4,3,1).	(2,5,3,4,1)	(3,2,5,4,1)	(4,5,3)	(2,3,4,5,1)	(4,2,3,5,1)	(2,3,5,4,1)

K3*K3
(1,2,3,4,5)
(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

GROUP (1,2,3,4,5)

K3*K3

	(1,3,5,2,4).	(1,5,4,2,3).	(1,5,3,4,2).	(1,2,5,4,3).	(1,5,2,3,4).	(1,4,5,3,2).
(1,3,5,2,4).	(5,4,3,2,1)	(2,5,1)	(2,3,1)	(4,5,1)	(2,5,4,3,1)	(3,4,2)
(1,5,4,2,3).	(4,5,3)	(4,3,5,2,1)	(4,3,2,5,1)	(3,5,2,4,1)	(4,5,3,2,1)	(2,5,1)
(1,5,3,4,2).	(4,5,1)	(3,5,2,4,1)	(3,2,5,4,1)	(3,5,2)	(3,2,4,5,1)	(2,5,4,3,1)
(1,2,5,4,3).	(3,4,2)	(4,5,3,2,1)	(4,5,1)	(5,3,2,4,1)	(4,2,1)	(3,5,1)
(1,5,2,3,4).	(4,5,3,2,1)	(2,4,3,5,1)	(2,5,4,3,1)	(3,5,1)	(2,4,5,3,1)	(5,4,2)
(1,4,5,3,2).	(2,5,1)	(3,4,1)	(3,5,2,4,1)	(3,4,2)	(3,5,1)	(5,2,4,3,1)
(5,3,1,4,2).	E	(3,4,5,2,1)	(3,2,4,5,1)	(5,2,3,4,1)	(3,2,1)	(2,4,3,5,1)
(5,1,3,2,4).	(2,5,4,3,1)	E	(3,5,2)	(4,2,1)	(5,4,3)	(5,2,3,4,1)
(5,1,2,4,3).	(5,4,2,3,1)	(5,3,2)	E	(4,5,3,2,1)	(5,4,2)	(3,4,1)
(5,2,1,3,4).	(4,3,2,5,1)	(2,4,1)	(2,3,5,4,1)	E	(2,4,3,5,1)	(5,4,2,3,1)
(5,1,4,3,2).	(2,3,1)	(4,5,3)	(4,5,2)	(5,3,4,2,1)	E	(3,5,2,4,1)
(5,4,1,2,3).	(5,3,4,2,1)	(4,3,2,5,1)	(4,3,1)	(3,2,4,5,1)	(4,2,5,3,1)	E

	(5,3,1,4,2).	(5,1,3,2,4).	(5,1,2,4,3).	(5,2,1,3,4).	(5,1,4,3,2).	(5,4,1,2,3).
(1,3,5,2,4).	E	(5,3,4,2,1)	(4,5,3,2,1)	(5,4,2,3,1)	(4,5,3)	(4,3,2,5,1)
(1,5,4,2,3).	(2,4,3,5,1)	E	(3,4,1)	(5,3,2)	(2,4,1)	(3,4,5,2,1)
(1,5,3,4,2).	(2,3,5,4,1)	(4,3,1)	E	(4,3,2,5,1)	(2,3,1)	(4,5,2)
(1,2,5,4,3).	(3,2,4,5,1)	(3,5,2)	(5,2,3,4,1)	E	(3,5,2,4,1)	(5,3,4,2,1)
(1,5,2,3,4).	(5,4,3)	(4,2,1)	(3,2,1)	(4,2,5,3,1)	E	(3,2,4,5,1)
(1,4,5,3,2).	(5,2,3,4,1)	(2,5,4,3,1)	(5,4,2)	(2,4,3,5,1)	(5,4,2,3,1)	E
(5,3,1,4,2).	(2,3,4,5,1)	(5,4,3)	(5,4,1)	(4,3,2)	(2,3,5,4,1)	(5,2,1)
(5,1,3,2,4).	(5,2,1)	(2,5,3,4,1)	(4,2,5,3,1)	(2,3,5,4,1)	(5,3,4,2,1)	(4,3,1)
(5,1,2,4,3).	(3,2,1)	(5,2,3,4,1)	(4,5,2,3,1)	(5,4,1)	(3,4,5,2,1)	(4,2,5,3,1)
(5,2,1,3,4).	(5,4,1)	(4,2,5,3,1)	(5,3,2)	(4,2,3,5,1)	(5,3,1)	(4,3,2)
(5,1,4,3,2).	(3,4,5,2,1)	(2,3,5,4,1)	(5,4,2,3,1)	(2,4,1)	(3,5,4,2,1)	(5,3,1)
(5,4,1,2,3).	(4,3,2)	(5,2,1)	(3,4,5,2,1)	(5,3,1)	(4,5,2)	(3,4,2,5,1)

```
K4*K4
(1,2,3,4,5)
(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

GROUP (1,2,3,4,5)
```

K4*K4

	(1,2,3).	(2,3,4).	(1,3,4).	(1,2,4).	(1,2,5).	(1,3,5).
(1,2,3).	(3,2,1)	(2,1)(4,3)	(3,4,2)	(3,1)(4,2)	(3,1)(5,2)	(3,5,2)
(2,3,4).	(3,1)(4,2)	(4,3,2)	(4,1)(3,2)	(3,4,1)	(3,4,2,5,1)	(4,2,3,5,1)
(1,3,4).	(2,4,1)	(3,1)(4,2)	(4,3,1)	(2,1)(4,3)	(2,5,3,4,1)	(4,1)(5,3)
(1,2,4).	(4,1)(3,2)	(2,3,1)	(3,1)(4,2)	(4,2,1)	(4,1)(5,2)	(3,5,2,4,1)
(1,2,5).	(5,1)(3,2)	(2,3,4,5,1)	(3,4,2,5,1)	(5,1)(4,2)	(5,2,1)	(3,1)(5,2)
(1,3,5).	(2,5,1)	(3,4,2,5,1)	(5,1)(4,3)	(2,4,3,5,1)	(2,1)(5,3)	(5,3,1)
(2,3,5).	(3,1)(5,2)	(5,2)(4,3)	(5,2,3,4,1)	(3,5,2,4,1)	(3,5,1)	(5,1)(3,2)
(1,4,5).	(2,3,4,5,1)	(4,2,3,5,1)	(3,5,1)	(2,5,1)	(2,1)(5,4)	(3,1)(5,4)
(2,4,5).	(4,5,2,3,1)	(3,5,2)	(3,5,2,4,1)	(4,1)(5,2)	(4,5,1)	(3,2,4,5,1)
(3,4,5).	(2,4,5,3,1)	(4,2)(5,3)	(4,1)(5,3)	(2,5,3,4,1)	(2,3,4,5,1)	(4,5,1)
(3,2,1).	E	(3,4,1)	(2,1)(4,3)	(4,3,2)	(5,3,2)	(2,1)(5,3)
(4,3,2).	(4,3,1)	E	(2,4,1)	(4,1)(3,2)	(4,3,2,5,1)	(2,4,3,5,1)
(4,3,1).	(2,1)(4,3)	(4,2,1)	E	(2,3,1)	(2,5,4,3,1)	(5,4,3)
(4,2,1).	(3,4,2)	(4,1)(3,2)	(3,2,1)	E	(5,4,2)	(3,5,4,2,1)
(5,2,1).	(3,5,2)	(5,2,3,4,1)	(3,4,5,2,1)	(4,5,2)	E	(3,2,1)
(5,3,1).	(2,1)(5,3)	(5,3,4,2,1)	(4,5,3)	(2,4,5,3,1)	(2,3,1)	E
(5,3,2).	(5,3,1)	(4,5,3)	(2,5,3,4,1)	(5,3,2,4,1)	(5,1)(3,2)	(2,5,1)
(5,4,1).	(2,3,5,4,1)	(5,4,2,3,1)	(3,1)(5,4)	(2,1)(5,4)	(2,4,1)	(3,4,1)
(5,4,2).	(5,4,2,3,1)	(3,2)(5,4)	(3,2,5,4,1)	(5,4,1)	(5,1)(4,2)	(3,4,2,5,1)
(5,4,3).	(2,5,4,3,1)	(5,4,2)	(5,4,1)	(2,3,5,4,1)	(2,4,3,5,1)	(5,1)(4,3)

	(2,3,5).	(1,4,5).	(2,4,5).	(3,4,5).	(3,2,1).	(4,3,2).
(1,2,3).	(2,1)(5,3)	(4,5,2,3,1)	(2,4,5,3,1)	(2,3,4,5,1)	E	(2,4,1)
(2,3,4).	(4,2)(5,3)	(2,3,4,5,1)	(4,5,3)	(3,2)(5,4)	(4,2,1)	E
(1,3,4).	(3,5,2,4,1)	(4,5,3)	(3,4,5,2,1)	(3,1)(5,4)	(4,1)(3,2)	(3,2,1)
(1,2,4).	(2,3,5,4,1)	(4,5,2)	(2,1)(5,4)	(2,4,5,3,1)	(3,4,1)	(2,1)(4,3)
(1,2,5).	(2,3,1)	(4,1)(5,2)	(2,4,1)	(2,5,3,4,1)	(3,5,1)	(2,4,3,5,1)
(1,3,5).	(3,1)(5,2)	(4,1)(5,3)	(3,5,2,4,1)	(3,4,1)	(5,1)(3,2)	(3,2,4,5,1)
(2,3,5).	(5,3,2)	(4,2,3,5,1)	(4,2)(5,3)	(3,4,2)	(5,2,1)	(4,5,2)
(1,4,5).	(4,5,2,3,1)	(5,4,1)	(4,1)(5,2)	(4,1)(5,3)	(3,2,4,5,1)	(4,3,2,5,1)
(2,4,5).	(3,2)(5,4)	(5,1)(4,2)	(5,4,2)	(4,2)(5,3)	(3,4,5,2,1)	(5,2)(4,3)
(3,4,5).	(4,5,2)	(5,1)(4,3)	(5,2)(4,3)	(5,4,3)	(4,5,3,2,1)	(5,3,2)
(3,2,1).	(3,5,1)	(4,5,3,2,1)	(3,2,4,5,1)	(3,4,5,2,1)	(2,3,1)	(3,1)(4,2)
(4,3,2).	(5,4,3)	(3,2,4,5,1)	(3,2)(5,4)	(4,5,2)	(2,1)(4,3)	(3,4,2)
(4,3,1).	(4,3,5,2,1)	(3,1)(5,4)	(4,5,2,3,1)	(4,5,1)	(4,3,2)	(4,1)(3,2)
(4,2,1).	(4,2,3,5,1)	(2,1)(5,4)	(4,5,1)	(4,5,3,2,1)	(3,1)(4,2)	(4,3,1)
(5,2,1).	(5,1)(3,2)	(4,2,1)	(5,1)(4,2)	(5,3,4,2,1)	(3,1)(5,2)	(5,2,4,3,1)
(5,3,1).	(5,2,1)	(4,3,1)	(5,2,4,3,1)	(5,1)(4,3)	(5,3,2)	(5,3,2,4,1)
(5,3,2).	E	(4,3,2,5,1)	(4,3,2)	(5,2)(4,3)	(2,1)(5,3)	(4,2)(5,3)
(5,4,1).	(5,2,3,4,1)	E	(5,2,1)	(5,3,1)	(3,2,5,4,1)	(5,4,3,2,1)
(5,4,2).	(3,4,2)	(2,5,1)	E	(5,3,2)	(3,5,4,2,1)	(5,4,3)
(5,4,3).	(5,2)(4,3)	(3,5,1)	(3,5,2)	E	(5,4,3,2,1)	(3,2)(5,4)

	(4,3,1).	(4,2,1).	(5,2,1).	(5,3,1).	(5,3,2).	(5,4,1).
(1,2,3).	(4,1)(3,2)	(4,3,1)	(5,3,1)	(5,1)(3,2)	(2,5,1)	(5,4,2,3,1)
(2,3,4).	(2,3,1)	(2,1)(4,3)	(5,3,4,2,1)	(5,4,2,3,1)	(5,4,2)	(5,2,3,4,1)
(1,3,4).	E	(3,4,2)	(5,2,3,4,1)	(5,4,1)	(3,2,5,4,1)	(5,1)(4,3)
(1,2,4).	(4,3,2)	E	(5,4,1)	(5,3,2,4,1)	(2,5,3,4,1)	(5,1)(4,2)
(1,2,5).	(4,3,2,5,1)	(4,5,1)	E	(5,3,2)	(2,1)(5,3)	(5,4,2)
(1,3,5).	(4,5,1)	(4,2,3,5,1)	(3,5,2)	E	(3,2,1)	(5,4,3)
(2,3,5).	(4,5,2,3,1)	(4,3,5,2,1)	(2,1)(5,3)	(2,3,1)	E	(2,3,5,4,1)
(1,4,5).	(5,1)(4,3)	(5,1)(4,2)	(4,5,2)	(4,5,3)	(4,5,3,2,1)	E
(2,4,5).	(5,2,4,3,1)	(5,2,1)	(2,1)(5,4)	(2,4,5,3,1)	(4,5,3)	(2,4,1)
(3,4,5).	(5,3,1)	(5,3,4,2,1)	(3,4,5,2,1)	(3,1)(5,4)	(3,2)(5,4)	(3,4,1)
(3,2,1).	(4,2,1)	(4,1)(3,2)	(5,1)(3,2)	(5,2,1)	(3,1)(5,2)	(5,4,3,2,1)
(4,3,2).	(3,1)(4,2)	(3,2,1)	(5,4,3,2,1)	(5,2,4,3,1)	(5,2)(4,3)	(5,3,2,4,1)
(4,3,1).	(3,4,1)	(3,1)(4,2)	(5,2,4,3,1)	(5,1)(4,3)	(4,3,2,5,1)	(5,3,1)
(4,2,1).	(2,1)(4,3)	(2,4,1)	(5,1)(4,2)	(5,3,4,2,1)	(4,2,5,3,1)	(5,2,1)
(5,2,1).	(4,3,5,2,1)	(4,1)(5,2)	(2,5,1)	(2,1)(5,3)	(5,3,1)	(2,1)(5,4)
(5,3,1).	(4,1)(5,3)	(4,2,5,3,1)	(3,1)(5,2)	(3,5,1)	(5,1)(3,2)	(3,1)(5,4)
(5,3,2).	(4,2,5,3,1)	(4,5,3,2,1)	(3,2,1)	(3,1)(5,2)	(3,5,2)	(3,2,5,4,1)
(5,4,1).	(5,4,3)	(5,4,2)	(4,1)(5,2)	(4,1)(5,3)	(5,3,2,4,1)	(4,5,1)
(5,4,2).	(2,5,4,3,1)	(2,1)(5,4)	(4,2,1)	(4,2,5,3,1)	(4,2)(5,3)	(4,1)(5,2)
(5,4,3).	(3,1)(5,4)	(3,5,4,2,1)	(4,3,5,2,1)	(4,3,1)	(4,3,2)	(4,1)(5,3)

	(5,4,2).	(5,4,3).
(1,2,3).	(2,5,4,3,1)	(2,3,5,4,1)
(2,3,4).	(5,2)(4,3)	(3,5,2)
(1,3,4).	(3,4,2,5,1)	(3,5,1)
(1,2,4).	(2,5,1)	(2,4,3,5,1)
(1,2,5).	(2,1)(5,4)	(2,5,4,3,1)
(1,3,5).	(3,5,4,2,1)	(3,1)(5,4)
(2,3,5).	(5,4,3)	(3,2)(5,4)
(1,4,5).	(4,2,1)	(4,3,1)
(2,4,5).	E	(4,3,2)
(3,4,5).	(3,4,2)	E
(3,2,1).	(3,2,5,4,1)	(3,5,4,2,1)
(4,3,2).	(5,3,2)	(4,2)(5,3)
(4,3,1).	(4,2,5,3,1)	(4,1)(5,3)
(4,2,1).	(4,1)(5,2)	(4,3,5,2,1)
(5,2,1).	(5,4,1)	(5,4,3,2,1)
(5,3,1).	(5,4,2,3,1)	(5,4,1)
(5,3,2).	(3,2)(5,4)	(5,4,2)
(5,4,1).	(5,1)(4,2)	(5,1)(4,3)
(5,4,2).	(4,5,2)	(5,2)(4,3)
(5,4,3).	(4,2)(5,3)	(4,5,3)

K5*K5
(1,2,3,4,5)
(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

GROUP (1,2,3,4,5)

K5*K5

	(1,2)(3,4).	(1,3)(2,4).	(1,4)(2,3).	(1,2)(3,5).	(1,3)(2,5).	(1,5)(2,3).
(1,2)(3,4).	E	(4,1)(3,2)	(3,1)(4,2)	(5,4,3)	(4,3,2,5,1)	(5,2,4,3,1)
(1,3)(2,4).	(4,1)(3,2)	E	(2,1)(4,3)	(4,2,3,5,1)	(5,4,2)	(5,3,4,2,1)
(1,4)(2,3).	(3,1)(4,2)	(2,1)(4,3)	E	(3,5,2,4,1)	(2,5,3,4,1)	(5,4,1)
(1,2)(3,5).	(4,5,3)	(5,3,2,4,1)	(4,2,5,3,1)	E	(5,1)(3,2)	(3,1)(5,2)
(1,3)(2,5).	(5,2,3,4,1)	(4,5,2)	(4,3,5,2,1)	(5,1)(3,2)	E	(2,1)(5,3)
(1,5)(2,3).	(3,4,2,5,1)	(2,4,3,5,1)	(4,5,1)	(3,1)(5,2)	(2,1)(5,3)	E
(1,2)(4,5).	(5,4,3)	(3,2,5,4,1)	(5,4,2,3,1)	(4,5,3)	(3,2,4,5,1)	(4,5,2,3,1)
(1,4)(2,5).	(5,2,4,3,1)	(3,4,5,2,1)	(3,5,2)	(5,3,2,4,1)	(3,4,1)	(2,3,5,4,1)
(1,5)(2,4).	(4,3,2,5,1)	(3,5,1)	(2,3,4,5,1)	(4,2,5,3,1)	(3,5,4,2,1)	(3,4,2)
(1,3)(4,5).	(2,3,5,4,1)	(5,4,2)	(5,4,3,2,1)	(2,3,4,5,1)	(4,5,2)	(4,5,3,2,1)
(1,4)(3,5).	(2,4,5,3,1)	(5,3,4,2,1)	(5,3,2)	(2,4,1)	(5,2,3,4,1)	(3,2,5,4,1)
(1,5)(3,4).	(2,5,1)	(4,2,3,5,1)	(3,2,4,5,1)	(2,5,4,3,1)	(4,3,5,2,1)	(4,3,2)
(2,3)(4,5).	(3,5,4,2,1)	(2,5,4,3,1)	(5,4,1)	(3,4,5,2,1)	(2,4,5,3,1)	(4,5,1)
(2,4)(3,5).	(4,5,3,2,1)	(5,3,1)	(2,5,3,4,1)	(4,2,1)	(5,4,2,3,1)	(3,4,2,5,1)
(2,5)(3,4).	(5,2,1)	(4,5,2,3,1)	(3,5,2,4,1)	(5,4,3,2,1)	(4,3,1)	(2,4,3,5,1)

	(1,2)(4,5).	(1,4)(2,5).	(1,5)(2,4).	(1,3)(4,5).	(1,4)(3,5).	(1,5)(3,4).
(1,2)(3,4).	(4,5,3)	(3,4,2,5,1)	(5,2,3,4,1)	(4,5,3,2,1)	(3,5,4,2,1)	(5,2,1)
(1,3)(2,4).	(4,5,2,3,1)	(2,5,4,3,1)	(5,3,1)	(4,5,2)	(2,4,3,5,1)	(5,3,2,4,1)
(1,4)(2,3).	(3,2,4,5,1)	(5,3,2)	(5,4,3,2,1)	(2,3,4,5,1)	(3,5,2)	(5,4,2,3,1)
(1,2)(3,5).	(5,4,3)	(4,2,3,5,1)	(3,5,2,4,1)	(5,4,3,2,1)	(4,2,1)	(3,4,5,2,1)
(1,3)(2,5).	(5,4,2,3,1)	(4,3,1)	(2,4,5,3,1)	(5,4,2)	(4,3,2,5,1)	(2,5,3,4,1)
(1,5)(2,3).	(3,2,5,4,1)	(4,5,3,2,1)	(4,3,2)	(2,3,5,4,1)	(4,5,2,3,1)	(3,4,2)
(1,2)(4,5).	E	(5,1)(4,2)	(4,1)(5,2)	(3,2,1)	(5,3,4,2,1)	(4,3,5,2,1)
(1,4)(2,5).	(5,1)(4,2)	E	(2,1)(5,4)	(3,4,2,5,1)	(5,3,2)	(2,5,4,3,1)
(1,5)(2,4).	(4,1)(5,2)	(2,1)(5,4)	E	(3,5,2,4,1)	(2,4,5,3,1)	(4,3,2)
(1,3)(4,5).	(2,3,1)	(5,2,4,3,1)	(4,2,5,3,1)	E	(5,1)(4,3)	(4,1)(5,3)
(1,4)(3,5).	(2,4,3,5,1)	(3,5,2)	(3,5,4,2,1)	(5,1)(4,3)	E	(3,1)(5,4)
(1,5)(3,4).	(2,5,3,4,1)	(3,4,5,2,1)	(3,4,2)	(4,1)(5,3)	(3,1)(5,4)	E
(2,3)(4,5).	(3,2,1)	(5,3,2,4,1)	(4,3,2,5,1)	(2,3,1)	(5,2,3,4,1)	(4,2,3,5,1)
(2,4)(3,5).	(4,3,5,2,1)	(2,3,5,4,1)	(3,5,1)	(5,2,4,3,1)	(2,4,1)	(3,2,4,5,1)
(2,5)(3,4).	(5,3,4,2,1)	(3,4,1)	(2,3,4,5,1)	(4,2,5,3,1)	(3,2,5,4,1)	(2,5,1)

	(2,3)(4,5).	(2,4)(3,5).	(2,5)(3,4).
(1,2)(3,4).	(2,4,5,3,1)	(2,3,5,4,1)	(2,5,1)
(1,3)(2,4).	(3,4,5,2,1)	(3,5,1)	(3,2,5,4,1)
(1,4)(2,3).	(4,5,1)	(4,3,5,2,1)	(4,2,5,3,1)
(1,2)(3,5).	(2,5,4,3,1)	(2,4,1)	(2,3,4,5,1)
(1,3)(2,5).	(3,5,4,2,1)	(3,2,4,5,1)	(3,4,1)
(1,5)(2,3).	(5,4,1)	(5,2,4,3,1)	(5,3,4,2,1)
(1,2)(4,5).	(2,3,1)	(2,5,3,4,1)	(2,4,3,5,1)
(1,4)(2,5).	(4,2,3,5,1)	(4,5,3,2,1)	(4,3,1)
(1,5)(2,4).	(5,2,3,4,1)	(5,3,1)	(5,4,3,2,1)
(1,3)(4,5).	(3,2,1)	(3,4,2,5,1)	(3,5,2,4,1)
(1,4)(3,5).	(4,3,2,5,1)	(4,2,1)	(4,5,2,3,1)
(1,5)(3,4).	(5,3,2,4,1)	(5,4,2,3,1)	(5,2,1)
(2,3)(4,5).	E	(5,2)(4,3)	(4,2)(5,3)
(2,4)(3,5).	(5,2)(4,3)	E	(3,2)(5,4)
(2,5)(3,4).	(4,2)(5,3)	(3,2)(5,4)	E

K2*K3

(1,2,3,4,5)

(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).

(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).

(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

GROUP (1,2,3,4,5)

K2*K3

	(1,3,5,2,4).	(1,5,4,2,3).	(1,5,3,4,2).	(1,2,5,4,3).	(1,5,2,3,4).	(1,4,5,3,2).
(1,2,3,4,5).	(4,2,5,3,1)	(4,3,2)	(5,4,3)	(3,2,1)	(4,2)(5,3)	(5,4,1)
(1,2,5,3,4).	(4,2,1)	(3,2,4,5,1)	(3,1)(5,4)	(5,1)(3,2)	(3,1)(4,2)	(5,4,3)
(1,4,5,2,3).	(5,3,2)	(2,1)(4,3)	(2,4,3,5,1)	(3,4,1)	(2,1)(5,3)	(5,1)(4,2)
(1,4,2,3,5).	(5,3,1)	(5,2)(4,3)	(4,3,2)	(3,4,5,2,1)	(5,3,2)	(2,4,1)
(1,3,5,4,2).	(5,1)(4,3)	(4,1)(5,2)	(4,1)(3,2)	(4,5,2)	(4,3,2,5,1)	(2,3,1)
(1,3,4,2,5).	(4,3,1)	(4,5,2)	(3,2)(5,4)	(5,2,1)	(4,3,2)	(2,3,5,4,1)
(5,4,3,2,1).	(2,3,4,5,1)	(4,1)(5,3)	(4,1)(5,2)	(4,2)(5,3)	(4,5,1)	(3,1)(5,2)
(5,2,1,4,3).	(5,1)(3,2)	(2,5,3,4,1)	(2,4,1)	(4,5,3)	(2,5,1)	(3,1)(4,2)
(5,4,1,3,2).	(2,1)(4,3)	(4,5,1)	(4,5,2,3,1)	(5,1)(4,2)	(4,3,1)	(3,5,2)
(5,3,2,4,1).	(2,1)(5,4)	(3,5,1)	(3,1)(5,2)	(4,2,3,5,1)	(3,1)(5,4)	(5,2)(4,3)
(5,3,1,2,4).	(5,4,2)	(3,2,1)	(3,5,1)	(4,1)(3,2)	(3,5,4,2,1)	(5,1)(4,3)
(5,2,4,3,1).	(3,2)(5,4)	(2,1)(5,3)	(2,5,1)	(4,1)(5,3)	(2,1)(5,4)	(3,4,2,5,1)

	(5,3,1,4,2).	(5,1,3,2,4).	(5,1,2,4,3).	(5,2,1,3,4).	(5,1,4,3,2).	(5,4,1,2,3).
(1,2,3,4,5).	(5,4,3,2,1)	(4,1)(5,2)	(3,1)(5,2)	(4,1)(5,3)	(5,2,1)	(3,1)(4,2)
(1,2,5,3,4).	(3,2)(5,4)	(4,3,5,2,1)	(5,2,1)	(4,3,1)	(3,5,2)	(5,1)(4,2)
(1,4,5,2,3).	(5,1)(4,3)	(5,4,2)	(3,2,5,4,1)	(4,2)(5,3)	(5,4,1)	(3,2,1)
(1,4,2,3,5).	(2,1)(4,3)	(5,4,1)	(3,1)(5,4)	(5,3,2,4,1)	(2,1)(5,4)	(3,1)(5,2)
(1,3,5,4,2).	(2,4,1)	(5,3,1)	(4,5,3)	(5,1)(3,2)	(2,4,5,3,1)	(5,2)(4,3)
(1,3,4,2,5).	(2,1)(5,4)	(4,1)(5,3)	(5,3,1)	(4,1)(3,2)	(2,1)(5,3)	(5,2,4,3,1)
(5,4,3,2,1).	(3,5,2,4,1)	(2,3,1)	(3,4,2)	(2,5,1)	(3,1)(4,2)	(4,5,3)
(5,2,1,4,3).	(3,4,1)	(5,4,2,3,1)	(3,2)(5,4)	(5,1)(4,2)	(3,1)(5,4)	(5,3,2)
(5,4,1,3,2).	(4,5,2)	(2,1)(5,3)	(5,3,4,2,1)	(2,3,1)	(4,2)(5,3)	(5,1)(4,3)
(5,3,2,4,1).	(3,5,2)	(2,1)(4,3)	(4,2,1)	(2,5,4,3,1)	(3,4,2)	(4,5,1)
(5,3,1,2,4).	(5,1)(3,2)	(5,2)(4,3)	(4,1)(5,2)	(5,4,3)	(5,2,3,4,1)	(4,2,1)
(5,2,4,3,1).	(3,5,1)	(3,4,2)	(4,1)(3,2)	(5,4,2)	(3,4,1)	(4,5,3,2,1)

K2*K4
(1,2,3,4,5)
(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

GROUP (1,2,3,4,5)

K2*K4

	(1,2,3).	(2,3,4).	(1,3,4).	(1,2,4).	(1,2,5).	(1,3,5).
(1,2,3,4,5).	(3,2,4,5,1)	(2,4,3,5,1)	(4,2,3,5,1)	(3,4,2,5,1)	(3,4,5,2,1)	(4,5,2,3,1)
(1,2,5,3,4).	(5,3,2,4,1)	(2,4,5,3,1)	(4,2,5,3,1)	(5,3,4,2,1)	(5,2,3,4,1)	(4,1)(5,2)
(1,4,5,2,3).	(3,4,5,2,1)	(4,3,5,2,1)	(3,5,2)	(3,1)(5,2)	(3,1)(5,4)	(3,2)(5,4)
(1,4,2,3,5).	(3,4,2,5,1)	(4,3,2,5,1)	(5,1)(3,2)	(3,5,1)	(3,5,4,2,1)	(5,4,2,3,1)
(1,3,5,4,2).	(5,4,2)	(3,2,5,4,1)	(5,4,3,2,1)	(5,4,3)	(4,2)(5,3)	(5,3,4,2,1)
(1,3,4,2,5).	(5,1)(4,2)	(3,2,4,5,1)	(4,3,2,5,1)	(5,1)(4,3)	(5,3,4,2,1)	(4,2,5,3,1)
(5,4,3,2,1).	(5,4,3)	(5,4,1)	(2,1)(5,4)	(3,2)(5,4)	(4,3,2)	(2,1)(4,3)
(5,2,1,4,3).	(5,2)(4,3)	(4,1)(5,2)	(5,2,1)	(3,5,2)	(5,4,3)	(5,4,3,2,1)
(5,4,1,3,2).	(5,4,1)	(3,1)(5,4)	(2,5,4,3,1)	(5,4,3,2,1)	(5,3,2,4,1)	(2,5,3,4,1)
(5,3,2,4,1).	(4,1)(5,3)	(5,3,1)	(2,4,5,3,1)	(4,5,3,2,1)	(4,1)(3,2)	(2,4,1)
(5,3,1,2,4).	(4,5,3,2,1)	(2,1)(5,3)	(4,2)(5,3)	(4,2,5,3,1)	(4,5,2,3,1)	(4,5,2)
(5,2,4,3,1).	(4,3,5,2,1)	(5,2,1)	(4,5,2)	(4,5,2,3,1)	(4,3,1)	(4,3,2)

	(2,3,5).	(1,4,5).	(2,4,5).	(3,4,5).	(3,2,1).	(4,3,2).
(1,2,3,4,5).	(2,4,5,3,1)	(5,2,3,4,1)	(2,5,3,4,1)	(2,3,5,4,1)	(4,5,1)	(2,5,1)
(1,2,5,3,4).	(2,4,1)	(5,2)(4,3)	(2,1)(4,3)	(2,5,4,3,1)	(4,1)(5,3)	(2,1)(5,3)
(1,4,5,2,3).	(4,5,3,2,1)	(5,4,2,3,1)	(4,2,5,3,1)	(4,2,3,5,1)	(4,5,2)	(4,1)(5,2)
(1,4,2,3,5).	(4,2,5,3,1)	(2,3,5,4,1)	(4,1)(5,3)	(4,1)(3,2)	(5,1)(4,2)	(4,5,1)
(1,3,5,4,2).	(3,4,2,5,1)	(2,1)(5,3)	(3,5,1)	(3,2,1)	(5,4,2,3,1)	(3,1)(5,4)
(1,3,4,2,5).	(3,1)(4,2)	(2,5,3,4,1)	(3,4,1)	(3,2,5,4,1)	(4,2,3,5,1)	(3,5,1)
(5,4,3,2,1).	(5,1)(4,3)	(3,2,1)	(5,1)(3,2)	(5,2,1)	(2,5,4,3,1)	(5,4,2,3,1)
(5,2,1,4,3).	(4,3,2,5,1)	(3,5,4,2,1)	(4,2,3,5,1)	(4,2,1)	(5,2,4,3,1)	(4,5,2,3,1)
(5,4,1,3,2).	(3,4,1)	(5,3,2)	(3,2,1)	(3,1)(5,2)	(2,3,5,4,1)	(3,5,4,2,1)
(5,3,2,4,1).	(5,4,1)	(4,3,2)	(5,4,3,2,1)	(5,2,4,3,1)	(2,5,3,4,1)	(5,3,4,2,1)
(5,3,1,2,4).	(2,1)(5,4)	(5,2,4,3,1)	(2,5,4,3,1)	(2,4,3,5,1)	(4,5,3)	(2,5,3,4,1)
(5,2,4,3,1).	(5,4,3,2,1)	(3,1)(4,2)	(5,4,2,3,1)	(5,1)(4,2)	(5,2)(4,3)	(5,2,3,4,1)

	(4,3,1).	(4,2,1).	(5,2,1).	(5,3,1).	(5,3,2).	(5,4,1).
(1,2,3,4,5).	(5,1)(3,2)	(5,1)(4,3)	(4,5,3)	(3,2)(5,4)	(2,1)(5,4)	(3,4,2)
(1,2,5,3,4).	(5,3,2)	(4,5,3)	(3,4,1)	(3,2,5,4,1)	(2,3,5,4,1)	(3,4,2,5,1)
(1,4,5,2,3).	(5,2,3,4,1)	(5,2,4,3,1)	(2,4,5,3,1)	(2,3,4,5,1)	(4,5,1)	(2,3,1)
(1,4,2,3,5).	(2,3,4,5,1)	(2,4,3,5,1)	(4,2)(5,3)	(3,4,2)	(4,2,1)	(3,5,2)
(1,3,5,4,2).	(2,1)(5,4)	(2,3,5,4,1)	(4,2,3,5,1)	(4,2,1)	(3,1)(4,2)	(4,3,5,2,1)
(1,3,4,2,5).	(2,5,1)	(2,3,4,5,1)	(3,4,2)	(5,4,2)	(3,5,4,2,1)	(5,2)(4,3)
(5,4,3,2,1).	(3,5,4,2,1)	(3,2,5,4,1)	(4,3,2,5,1)	(4,3,5,2,1)	(5,2,4,3,1)	(4,5,3,2,1)
(5,2,1,4,3).	(3,4,5,2,1)	(3,5,2,4,1)	(2,4,3,5,1)	(2,1)(4,3)	(4,3,1)	(2,1)(5,3)
(5,4,1,3,2).	(5,4,2)	(3,2)(5,4)	(4,1)(3,2)	(4,1)(5,2)	(3,5,2,4,1)	(4,3,2,5,1)
(5,3,2,4,1).	(4,2)(5,3)	(5,3,2)	(3,2,5,4,1)	(3,5,2,4,1)	(5,2,3,4,1)	(3,2,4,5,1)
(5,3,1,2,4).	(5,3,2,4,1)	(5,3,1)	(3,1)(5,4)	(3,2,4,5,1)	(2,3,4,5,1)	(3,1)(4,2)
(5,2,4,3,1).	(3,5,2,4,1)	(3,1)(5,2)	(2,5,4,3,1)	(2,4,3,5,1)	(5,1)(4,3)	(2,4,5,3,1)

	(5,4,2).	(5,4,3).
(1,2,3,4,5).	(2,1)(4,3)	(2,3,1)
(1,2,5,3,4).	(2,3,4,5,1)	(2,5,1)
(1,4,5,2,3).	(4,3,1)	(4,1)(3,2)
(1,4,2,3,5).	(4,3,5,2,1)	(4,5,2,3,1)
(1,3,5,4,2).	(3,5,2,4,1)	(3,4,5,2,1)
(1,3,4,2,5).	(3,4,5,2,1)	(3,1)(5,2)
(5,4,3,2,1).	(5,3,2,4,1)	(5,3,4,2,1)
(5,2,1,4,3).	(4,1)(5,3)	(4,5,3,2,1)
(5,4,1,3,2).	(3,2,4,5,1)	(3,4,2,5,1)
(5,3,2,4,1).	(5,1)(3,2)	(5,1)(4,2)
(5,3,1,2,4).	(2,3,1)	(2,4,1)
(5,2,4,3,1).	(5,3,1)	(5,3,2,4,1)

```
   K2*K5
  (1,2,3,4,5)
(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

 (1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
 (5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

         GROUP (1,2,3,4,5)
                                                  K2*K5


                 (1,2)(3,4).     (1,3)(2,4).     (1,4)(2,3).     (1,2)(3,5).     (1,3)(2,5).     (1,5)(2,3).
(1,2,3,4,5).     (3,5,1)         (4,3,2,5,1)     (5,1)(4,2)      (3,1)(5,4)      (4,5,3,2,1)     (4,5,2)
(1,2,5,3,4).     (5,3,1)         (4,5,3,2,1)     (4,2)(5,3)      (5,4,1)         (4,1)(3,2)      (3,5,2,4,1)
(1,4,5,2,3).     (3,5,2,4,1)     (5,2)(4,3)      (5,2,1)         (3,2,4,5,1)     (4,5,3)         (2,1)(5,4)
(1,4,2,3,5).     (3,2,4,5,1)     (5,1)(4,3)      (2,5,1)         (3,1)(4,2)      (5,3,4,2,1)     (5,4,2)
(1,3,5,4,2).     (3,2)(5,4)      (5,4,1)         (2,5,4,3,1)     (3,4,2)         (5,1)(4,2)      (4,2,5,3,1)
(1,3,4,2,5).     (5,1)(3,2)      (4,5,1)         (2,4,3,5,1)     (5,4,2,3,1)     (4,2,1)         (4,2)(5,3)
(5,4,3,2,1).     (5,4,2)         (2,3,5,4,1)     (3,1)(5,4)      (5,2)(4,3)      (2,4,3,5,1)     (4,3,1)
(5,2,1,4,3).     (4,5,2)         (5,2,3,4,1)     (3,1)(5,2)      (4,3,2)         (5,1)(4,3)      (2,5,4,3,1)
(5,4,1,3,2).     (5,4,2,3,1)     (2,1)(5,4)      (5,4,3)         (5,2,3,4,1)     (2,4,1)         (4,1)(5,3)
(5,3,2,4,1).     (4,2,5,3,1)     (2,1)(5,3)      (4,5,3)         (4,1)(5,2)      (2,3,5,4,1)     (3,4,1)
(5,3,1,2,4).     (4,1)(5,3)      (5,3,2)         (5,3,4,2,1)     (4,5,1)         (3,2)(5,4)      (3,4,5,2,1)
(5,2,4,3,1).     (4,1)(5,2)      (3,5,2)         (3,4,5,2,1)     (4,3,2,5,1)     (5,4,3)         (2,1)(4,3)

                 (1,2)(4,5).     (1,4)(2,5).     (1,5)(2,4).     (1,3)(4,5).     (1,4)(3,5).     (1,5)(3,4).
(1,2,3,4,5).     (3,4,1)         (5,3,4,2,1)     (5,2)(4,3)      (4,1)(3,2)      (5,4,2,3,1)     (3,5,2)
(1,2,5,3,4).     (5,1)(4,3)      (3,4,2)         (3,4,5,2,1)     (4,3,2,5,1)     (5,4,2)         (3,1)(5,2)
(1,4,5,2,3).     (3,1)(4,2)      (5,3,1)         (2,5,4,3,1)     (3,4,2)         (5,1)(3,2)      (2,3,5,4,1)
(1,4,2,3,5).     (3,5,2,4,1)     (2,1)(5,3)      (5,4,3)         (5,2,3,4,1)     (2,3,1)         (3,2)(5,4)
(1,3,5,4,2).     (3,5,2)         (2,4,3,5,1)     (4,1)(5,3)      (5,2,1)         (2,1)(4,3)      (4,5,3,2,1)
(1,3,4,2,5).     (5,2,3,4,1)     (2,1)(4,3)      (4,5,3)         (4,1)(5,2)      (2,5,4,3,1)     (5,3,2)
(5,4,3,2,1).     (5,3,2)         (3,2,4,5,1)     (4,1)(3,2)      (2,1)(5,3)      (3,4,5,2,1)     (4,2,1)
(5,2,1,4,3).     (4,2)(5,3)      (3,5,1)         (2,3,5,4,1)     (5,3,4,2,1)     (3,2,1)         (2,1)(5,4)
(5,4,1,3,2).     (5,1)(3,2)      (4,3,2)         (4,5,3,2,1)     (2,5,1)         (5,2)(4,3)      (4,2,5,3,1)
(5,3,2,4,1).     (4,3,2,5,1)     (3,2)(5,4)      (3,2,1)         (2,4,3,5,1)     (4,5,2)         (3,1)(4,2)
(5,3,1,2,4).     (4,3,1)         (5,4,2,3,1)     (3,1)(5,2)      (4,3,2)         (5,1)(4,2)      (3,5,2,4,1)
(5,2,4,3,1).     (4,2,5,3,1)     (3,1)(5,4)      (2,3,1)         (4,2)(5,3)      (3,2,4,5,1)     (2,4,1)

                 (2,3)(4,5).     (2,4)(3,5).     (2,5)(3,4).
(1,2,3,4,5).     (2,4,1)         (2,5,4,3,1)     (2,1)(5,3)
(1,2,5,3,4).     (2,4,3,5,1)     (2,1)(5,4)      (2,3,1)
(1,4,5,2,3).     (4,2,1)         (4,3,2,5,1)     (4,1)(5,3)
(1,4,2,3,5).     (4,1)(5,2)      (4,3,1)         (4,5,3,2,1)
(1,3,5,4,2).     (3,1)(5,2)      (3,4,1)         (3,2,4,5,1)
(1,3,4,2,5).     (3,5,2,4,1)     (3,1)(5,4)      (3,2,1)
(5,4,3,2,1).     (5,3,1)         (5,2,3,4,1)     (5,1)(4,2)
(5,2,1,4,3).     (4,2,5,3,1)     (4,1)(3,2)      (4,5,1)
(5,4,1,3,2).     (3,5,1)         (3,4,5,2,1)     (3,1)(4,2)
(5,3,2,4,1).     (5,1)(4,3)      (5,2,1)         (5,4,2,3,1)
(5,3,1,2,4).     (2,1)(4,3)      (2,5,1)         (2,3,5,4,1)
(5,2,4,3,1).     (5,3,4,2,1)     (5,1)(3,2)      (5,4,1)
```

K3*K2
(1,2,3,4,5)
(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

GROUP (1,2,3,4,5)

K3*K2

	(1,2,3,4,5).	(1,2,5,3,4).	(1,4,5,2,3).	(1,4,2,3,5).	(1,3,5,4,2).	(1,3,4,2,5).
(1,3,5,2,4).	(4,2,5,3,1)	(4,3,1)	(5,4,2)	(5,3,2)	(5,1)(3,2)	(5,3,1)
(1,5,4,2,3).	(3,2,1)	(3,2,4,5,1)	(2,1)(5,3)	(2,1)(4,3)	(5,2)(4,3)	(4,3,2)
(1,5,3,4,2).	(4,3,2)	(3,2)(5,4)	(2,4,3,5,1)	(2,4,1)	(4,1)(5,2)	(4,1)(3,2)
(1,2,5,4,3).	(5,2,1)	(5,1)(4,2)	(3,2,1)	(3,4,5,2,1)	(4,5,3)	(4,5,2)
(1,5,2,3,4).	(3,1)(4,2)	(3,1)(5,4)	(4,2)(5,3)	(4,3,2)	(4,3,2,5,1)	(4,3,1)
(1,4,5,3,2).	(5,4,3)	(3,5,2)	(5,1)(4,3)	(5,4,1)	(2,4,1)	(2,3,5,4,1)
(5,3,1,4,2).	(5,4,3,2,1)	(5,1)(3,2)	(2,1)(4,3)	(2,1)(5,4)	(4,5,2)	(3,2)(5,4)
(5,1,3,2,4).	(4,1)(5,3)	(4,3,5,2,1)	(5,4,1)	(5,3,1)	(2,3,1)	(2,1)(5,3)
(5,1,2,4,3).	(4,1)(5,2)	(4,2,1)	(3,2,5,4,1)	(3,1)(5,2)	(5,3,1)	(5,2,1)
(5,2,1,3,4).	(4,2)(5,3)	(5,4,3)	(5,1)(4,2)	(5,3,2,4,1)	(4,1)(3,2)	(4,1)(5,3)
(5,1,4,3,2).	(5,4,1)	(5,2,1)	(3,4,1)	(3,1)(5,4)	(2,4,5,3,1)	(2,1)(5,4)
(5,4,1,2,3).	(3,1)(5,2)	(3,1)(4,2)	(5,3,2)	(5,2)(4,3)	(5,1)(4,3)	(5,2,4,3,1)

	(5,4,3,2,1).	(5,2,1,4,3).	(5,4,1,3,2).	(5,3,2,4,1).	(5,3,1,2,4).	(5,2,4,3,1).
(1,3,5,2,4).	(2,3,4,5,1)	(3,2)(5,4)	(5,1)(4,3)	(2,1)(4,3)	(4,2,1)	(2,1)(5,4)
(1,5,4,2,3).	(4,1)(5,2)	(2,5,3,4,1)	(4,5,2)	(4,5,1)	(3,5,1)	(4,1)(5,3)
(1,5,3,4,2).	(3,1)(5,2)	(2,5,1)	(4,5,2,3,1)	(3,1)(5,4)	(5,4,3)	(3,5,1)
(1,2,5,4,3).	(4,1)(5,3)	(3,4,1)	(4,2)(5,3)	(4,2,3,5,1)	(5,1)(3,2)	(4,1)(3,2)
(1,5,2,3,4).	(2,5,1)	(5,3,2)	(4,5,1)	(2,1)(5,4)	(3,5,4,2,1)	(2,1)(5,3)
(1,4,5,3,2).	(3,1)(4,2)	(5,1)(4,2)	(2,3,1)	(3,1)(5,2)	(5,2)(4,3)	(3,4,2,5,1)
(5,3,1,4,2).	(3,5,2,4,1)	(2,4,1)	(3,5,2)	(3,5,1)	(5,1)(4,3)	(3,4,1)
(5,1,3,2,4).	(3,4,2)	(5,4,2,3,1)	(2,1)(4,3)	(5,2)(4,3)	(4,1)(5,2)	(5,4,2)
(5,1,2,4,3).	(4,5,3)	(3,1)(5,4)	(5,3,4,2,1)	(3,4,2)	(4,1)(3,2)	(3,2)(5,4)
(5,2,1,3,4).	(2,3,1)	(5,1)(3,2)	(4,3,1)	(2,5,4,3,1)	(5,4,2)	(2,5,1)
(5,1,4,3,2).	(4,2)(5,3)	(3,1)(4,2)	(2,1)(5,3)	(3,5,2)	(5,2,3,4,1)	(3,4,2)
(5,4,1,2,3).	(4,5,1)	(4,5,3)	(5,1)(4,2)	(4,2,1)	(3,2,1)	(4,5,3,2,1)

K3*K4
(1,2,3,4,5)
(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

GROUP (1,2,3,4,5)

K3*K4

	(1,2,3).	(2,3,4).	(1,3,4).	(1,2,4).	(1,2,5).	(1,3,5).
(1,3,5,2,4).	(4,1)(5,2)	(3,1)(5,2)	(5,2,4,3,1)	(4,3,5,2,1)	(4,1)(5,3)	(5,3,2,4,1)
(1,5,4,2,3).	(3,5,4,2,1)	(5,4,3,2,1)	(3,2)(5,4)	(3,1)(5,4)	(3,1)(4,2)	(3,4,2)
(1,5,3,4,2).	(4,2)(5,3)	(5,3,2,4,1)	(4,5,3,2,1)	(4,5,3)	(3,4,2)	(4,2,1)
(1,2,5,4,3).	(5,4,3,2,1)	(2,1)(5,4)	(5,4,2)	(5,4,2,3,1)	(5,2,4,3,1)	(5,2)(4,3)
(1,5,2,3,4).	(3,5,2,4,1)	(5,2,4,3,1)	(4,5,2,3,1)	(3,4,5,2,1)	(3,4,1)	(4,1)(3,2)
(1,4,5,3,2).	(4,5,3)	(4,1)(5,3)	(2,1)(5,3)	(5,3,2)	(3,2)(5,4)	(2,1)(5,4)
(5,3,1,4,2).	(5,3,4,2,1)	(4,5,3,2,1)	(5,3,2)	(5,3,1)	(5,4,2,3,1)	(5,4,2)
(5,1,3,2,4).	(4,5,1)	(3,5,1)	(2,4,3,5,1)	(4,3,2,5,1)	(4,5,3,2,1)	(2,4,5,3,1)
(5,1,2,4,3).	(4,3,2,5,1)	(2,5,1)	(5,1)(4,2)	(4,2,3,5,1)	(4,3,5,2,1)	(5,2,4,3,1)
(5,2,1,3,4).	(4,5,2)	(3,5,2,4,1)	(4,3,5,2,1)	(5,2)(4,3)	(4,5,3)	(4,5,3,2,1)
(5,1,4,3,2).	(5,1)(4,3)	(4,5,1)	(2,5,1)	(5,1)(3,2)	(5,4,3,2,1)	(2,5,4,3,1)
(5,4,1,2,3).	(3,2,5,4,1)	(2,5,4,3,1)	(5,4,2,3,1)	(3,5,4,2,1)	(3,5,2,4,1)	(5,2,3,4,1)

	(2,3,5).	(1,4,5).	(2,4,5).	(3,4,5).	(3,2,1).	(4,3,2).
(1,3,5,2,4).	(3,2,5,4,1)	(4,2)(5,3)	(3,5,4,2,1)	(3,1)(4,2)	(5,2,3,4,1)	(3,4,5,2,1)
(1,5,4,2,3).	(5,3,4,2,1)	(2,3,1)	(5,3,1)	(5,1)(3,2)	(5,4,2)	(5,4,1)
(1,5,3,4,2).	(5,1)(4,2)	(2,1)(4,3)	(5,1)(4,3)	(5,4,3,2,1)	(4,2,5,3,1)	(5,3,1)
(1,2,5,4,3).	(2,1)(4,3)	(3,1)(5,2)	(2,3,1)	(2,5,1)	(5,4,3)	(2,3,5,4,1)
(1,5,2,3,4).	(5,3,2,4,1)	(3,4,2)	(5,3,4,2,1)	(5,4,2,3,1)	(4,1)(5,2)	(5,2,1)
(1,4,5,3,2).	(4,5,1)	(5,4,3,2,1)	(4,3,2,5,1)	(4,3,5,2,1)	(2,4,5,3,1)	(4,2,5,3,1)
(5,3,1,4,2).	(4,2,1)	(2,5,4,3,1)	(4,3,1)	(4,3,2,5,1)	(4,2)(5,3)	(4,1)(5,3)
(5,1,3,2,4).	(3,1)(5,4)	(5,3,2,4,1)	(3,2,5,4,1)	(3,5,2,4,1)	(2,3,4,5,1)	(3,4,2,5,1)
(5,1,2,4,3).	(2,5,4,3,1)	(3,5,2,4,1)	(2,3,5,4,1)	(2,4,1)	(5,1)(4,3)	(2,3,4,5,1)
(5,2,1,3,4).	(3,2,4,5,1)	(5,3,4,2,1)	(3,4,2,5,1)	(3,5,4,2,1)	(4,5,2,3,1)	(3,1)(5,2)
(5,1,4,3,2).	(4,3,1)	(3,2,5,4,1)	(4,1)(3,2)	(4,1)(5,2)	(2,4,3,5,1)	(4,2,3,5,1)
(5,4,1,2,3).	(2,5,3,4,1)	(3,5,2)	(2,1)(5,3)	(2,3,1)	(5,4,1)	(2,1)(5,4)

	(4,3,1).	(4,2,1).	(5,2,1).	(5,3,1).	(5,3,2).	(5,4,1).
(1,3,5,2,4).	(4,5,2)	(3,5,2)	(2,3,5,4,1)	(2,4,1)	(3,4,1)	(2,4,3,5,1)
(1,5,4,2,3).	(2,3,5,4,1)	(2,5,4,3,1)	(4,2,5,3,1)	(4,2,3,5,1)	(5,1)(4,2)	(4,5,2,3,1)
(1,5,3,4,2).	(2,1)(5,3)	(2,5,3,4,1)	(3,4,2,5,1)	(3,5,4,2,1)	(5,4,2,3,1)	(3,4,5,2,1)
(1,2,5,4,3).	(3,2,5,4,1)	(3,1)(5,4)	(4,3,1)	(4,3,2,5,1)	(2,4,3,5,1)	(4,2,5,3,1)
(1,5,2,3,4).	(3,5,2)	(5,2)(4,3)	(2,5,3,4,1)	(2,3,5,4,1)	(5,4,1)	(2,3,4,5,1)
(1,4,5,3,2).	(5,3,4,2,1)	(5,3,2,4,1)	(3,2,4,5,1)	(3,4,5,2,1)	(4,5,2,3,1)	(3,2,1)
(5,3,1,4,2).	(2,5,3,4,1)	(2,4,5,3,1)	(3,1)(4,2)	(3,4,2,5,1)	(4,2,3,5,1)	(3,1)(5,2)
(5,1,3,2,4).	(5,1)(4,2)	(5,1)(3,2)	(3,2)(5,4)	(4,5,2)	(3,4,5,2,1)	(4,3,2)
(5,1,2,4,3).	(3,2,4,5,1)	(3,5,1)	(5,4,3)	(4,3,2)	(2,1)(4,3)	(4,2)(5,3)
(5,2,1,3,4).	(5,2,1)	(5,2,3,4,1)	(2,3,4,5,1)	(2,1)(5,4)	(3,1)(5,4)	(2,1)(4,3)
(5,1,4,3,2).	(3,4,2,5,1)	(3,2,4,5,1)	(4,3,2)	(5,2)(4,3)	(4,3,5,2,1)	(5,3,2)
(5,4,1,2,3).	(3,2)(5,4)	(5,4,3)	(4,1)(5,3)	(4,1)(3,2)	(2,4,1)	(4,2,3,5,1)

	(5,4,2).	(5,4,3).
(1,3,5,2,4).	(3,5,1)	(3,2,4,5,1)
(1,5,4,2,3).	(5,2,4,3,1)	(5,2,3,4,1)
(1,5,3,4,2).	(5,2,3,4,1)	(5,2,1)
(1,2,5,4,3).	(2,4,5,3,1)	(2,5,3,4,1)
(1,5,2,3,4).	(5,1)(4,3)	(5,1)(3,2)
(1,4,5,3,2).	(4,1)(3,2)	(4,2,1)
(5,3,1,4,2).	(4,5,2,3,1)	(4,1)(5,2)
(5,1,3,2,4).	(3,2,1)	(3,1)(4,2)
(5,1,2,4,3).	(2,1)(5,3)	(2,4,5,3,1)
(5,2,1,3,4).	(3,4,1)	(3,2,1)
(5,1,4,3,2).	(4,5,3,2,1)	(4,2,5,3,1)
(5,4,1,2,3).	(2,4,3,5,1)	(2,3,4,5,1)

K3*K5
(1,2,3,4,5)
(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

GROUP (1,2,3,4,5)

K3*K5

	(1,2)(3,4).	(1,3)(2,4).	(1,4)(2,3).	(1,2)(3,5).	(1,3)(2,5).	(1,5)(2,3).
(1,3,5,2,4).	(4,5,2,3,1)	(5,2,1)	(5,2)(4,3)	(4,1)(3,2)	(5,4,1)	(2,5,3,4,1)
(1,5,4,2,3).	(3,2,5,4,1)	(5,4,3)	(2,1)(5,4)	(3,4,2,5,1)	(4,2)(5,3)	(4,2,1)
(1,5,3,4,2).	(5,3,2)	(4,1)(5,3)	(2,4,5,3,1)	(5,4,2)	(4,2,3,5,1)	(3,1)(4,2)
(1,2,5,4,3).	(5,4,1)	(3,2)(5,4)	(3,5,4,2,1)	(5,1)(4,3)	(4,3,2)	(4,3,5,2,1)
(1,5,2,3,4).	(3,1)(5,2)	(4,3,5,2,1)	(4,5,2)	(3,2,5,4,1)	(4,1)(5,3)	(2,4,1)
(1,4,5,3,2).	(4,2)(5,3)	(2,5,3,4,1)	(5,3,1)	(4,5,2)	(2,3,4,5,1)	(3,1)(5,4)
(5,3,1,4,2).	(5,3,2,4,1)	(4,5,3)	(2,1)(5,3)	(5,1)(4,2)	(3,4,2)	(3,5,4,2,1)
(5,1,3,2,4).	(4,2,3,5,1)	(2,5,1)	(5,1)(4,3)	(4,5,2,3,1)	(2,1)(5,4)	(4,5,3)
(5,1,2,4,3).	(4,5,1)	(5,1)(3,2)	(3,4,2,5,1)	(4,3,1)	(5,4,3,2,1)	(5,2)(4,3)
(5,2,1,3,4).	(3,5,2)	(4,1)(5,2)	(5,2,4,3,1)	(3,2)(5,4)	(4,5,1)	(2,4,5,3,1)
(5,1,4,3,2).	(5,1)(4,2)	(2,3,4,5,1)	(3,5,1)	(5,2,4,3,1)	(2,1)(4,3)	(5,4,3)
(5,4,1,2,3).	(3,1)(5,4)	(5,4,3,2,1)	(5,4,2)	(3,4,1)	(5,3,2,4,1)	(4,1)(5,2)

	(1,2)(4,5).	(1,4)(2,5).	(1,5)(2,4).	(1,3)(4,5).	(1,4)(3,5).	(1,5)(3,4).
(1,3,5,2,4).	(4,2,3,5,1)	(5,4,3)	(2,1)(5,3)	(5,1)(4,2)	(4,3,2)	(2,4,5,3,1)
(1,5,4,2,3).	(3,1)(5,2)	(2,4,5,3,1)	(4,3,1)	(3,5,2)	(2,3,4,5,1)	(4,1)(3,2)
(1,5,3,4,2).	(5,2)(4,3)	(2,3,4,5,1)	(3,4,1)	(4,3,5,2,1)	(2,1)(5,4)	(3,2,1)
(1,2,5,4,3).	(5,3,1)	(3,1)(4,2)	(4,5,2,3,1)	(5,3,2)	(3,4,2,5,1)	(4,1)(5,2)
(1,5,2,3,4).	(3,4,2,5,1)	(4,5,3)	(2,1)(4,3)	(4,2,3,5,1)	(3,2)(5,4)	(2,3,1)
(1,4,5,3,2).	(4,3,2)	(5,1)(3,2)	(3,2,5,4,1)	(2,1)(4,3)	(5,2,1)	(3,5,4,2,1)
(5,3,1,4,2).	(5,2,4,3,1)	(2,3,1)	(3,1)(5,4)	(5,2)(4,3)	(2,5,1)	(3,2,5,4,1)
(5,1,3,2,4).	(4,1)(3,2)	(5,4,3,2,1)	(5,3,2)	(2,4,1)	(5,2,4,3,1)	(4,2)(5,3)
(5,1,2,4,3).	(4,1)(5,3)	(3,5,4,2,1)	(3,5,2)	(5,3,2,4,1)	(3,1)(4,2)	(4,5,2)
(5,2,1,3,4).	(3,4,2)	(5,1)(4,3)	(2,5,3,4,1)	(4,2,1)	(5,4,3,2,1)	(2,1)(5,3)
(5,1,4,3,2).	(5,3,2,4,1)	(3,2,1)	(3,2)(5,4)	(2,5,3,4,1)	(3,1)(5,2)	(5,4,2)
(5,4,1,2,3).	(3,5,1)	(4,2)(5,3)	(4,3,5,2,1)	(5,1)(3,2)	(3,4,2)	(4,5,2,3,1)

	(2,3)(4,5).	(2,4)(3,5).	(2,5)(3,4).
(1,3,5,2,4).	(3,4,2,5,1)	(3,2,1)	(3,1)(5,4)
(1,5,4,2,3).	(5,2,1)	(5,1)(4,3)	(5,3,2,4,1)
(1,5,3,4,2).	(5,2,4,3,1)	(5,4,1)	(5,1)(3,2)
(1,2,5,4,3).	(2,1)(5,3)	(2,3,4,5,1)	(2,4,1)
(1,5,2,3,4).	(5,1)(4,2)	(5,4,3,2,1)	(5,3,1)
(1,4,5,3,2).	(4,3,1)	(4,1)(5,2)	(4,2,3,5,1)
(5,3,1,4,2).	(4,3,5,2,1)	(4,5,1)	(4,1)(3,2)
(5,1,3,2,4).	(3,4,1)	(3,1)(5,2)	(3,5,4,2,1)
(5,1,2,4,3).	(2,5,3,4,1)	(2,3,1)	(2,1)(5,4)
(5,2,1,3,4).	(3,1)(4,2)	(3,2,5,4,1)	(3,5,1)
(5,1,4,3,2).	(4,1)(5,3)	(4,5,2,3,1)	(4,2,1)
(5,4,1,2,3).	(2,5,1)	(2,1)(4,3)	(2,4,5,3,1)

K4*K2
(1,2,3,4,5)
(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

GROUP (1,2,3,4,5)

K4*K2

	(1,2,3,4,5).	(1,2,5,3,4).	(1,4,5,2,3).	(1,4,2,3,5).	(1,3,5,4,2).	(1,3,4,2,5).
(1,2,3).	(3,4,5,2,1)	(3,4,2,5,1)	(4,5,3,2,1)	(4,3,5,2,1)	(5,4,3)	(5,2)(4,3)
(2,3,4).	(3,2,4,5,1)	(3,2,5,4,1)	(2,4,5,3,1)	(2,4,3,5,1)	(4,3,5,2,1)	(4,3,2,5,1)
(1,3,4).	(2,4,5,3,1)	(2,5,4,3,1)	(4,5,2)	(4,2)(5,3)	(4,2,3,5,1)	(4,2,5,3,1)
(1,2,4).	(4,5,2,3,1)	(4,2,5,3,1)	(3,2)(5,4)	(3,5,2)	(3,5,1)	(3,1)(5,2)
(1,2,5).	(5,2,3,4,1)	(5,3,4,2,1)	(4,1)(3,2)	(4,5,2,3,1)	(3,1)(5,4)	(3,4,5,2,1)
(1,3,5).	(2,5,3,4,1)	(2,1)(4,3)	(4,1)(5,2)	(4,2,5,3,1)	(5,4,2,3,1)	(5,3,4,2,1)
(2,3,5).	(3,4,2,5,1)	(3,4,1)	(4,2,5,3,1)	(4,3,2,5,1)	(5,4,3,2,1)	(5,1)(4,3)
(1,4,5).	(2,3,5,4,1)	(2,1)(5,3)	(5,2,3,4,1)	(5,4,2,3,1)	(3,1)(4,2)	(3,5,4,2,1)
(2,4,5).	(4,2,3,5,1)	(4,1)(5,3)	(5,4,2,3,1)	(5,1)(3,2)	(3,2,1)	(3,5,1)
(3,4,5).	(2,4,3,5,1)	(2,3,5,4,1)	(5,2,4,3,1)	(5,1)(4,2)	(4,2,1)	(4,2,3,5,1)
(3,2,1).	(4,5,3)	(5,2)(4,3)	(4,5,1)	(4,1)(5,3)	(2,3,5,4,1)	(2,5,3,4,1)
(4,3,2).	(4,5,1)	(4,1)(5,2)	(3,1)(5,4)	(3,5,1)	(2,1)(5,3)	(2,5,1)
(4,3,1).	(2,1)(5,4)	(2,5,1)	(3,4,5,2,1)	(3,5,4,2,1)	(4,2)(5,3)	(5,4,2)
(4,2,1).	(3,2)(5,4)	(5,3,2)	(2,3,4,5,1)	(2,3,5,4,1)	(3,5,2,4,1)	(3,2,5,4,1)
(5,2,1).	(3,4,2)	(4,5,3)	(4,2,3,5,1)	(4,1)(3,2)	(3,2,5,4,1)	(3,4,1)
(5,3,1).	(2,1)(4,3)	(2,3,4,5,1)	(4,3,5,2,1)	(4,2,1)	(5,4,2)	(3,4,2)
(5,3,2).	(5,1)(4,3)	(5,2,3,4,1)	(4,3,1)	(4,5,1)	(2,1)(5,4)	(2,3,4,5,1)
(5,4,1).	(2,3,1)	(2,4,5,3,1)	(3,5,2)	(3,4,2)	(3,4,2,5,1)	(3,1)(4,2)
(5,4,2).	(5,1)(3,2)	(5,3,2,4,1)	(2,3,1)	(2,3,4,5,1)	(3,4,5,2,1)	(3,2,4,5,1)
(5,4,3).	(2,5,1)	(2,4,1)	(3,1)(5,2)	(3,4,2,5,1)	(5,3,4,2,1)	(5,1)(4,2)

	(5,4,3,2,1).	(5,2,1,4,3).	(5,4,1,3,2).	(5,3,2,4,1).	(5,3,1,2,4).	(5,2,4,3,1).
(1,2,3).	(5,4,1)	(4,1)(5,3)	(5,4,2)	(5,1)(4,2)	(3,2,4,5,1)	(5,3,2,4,1)
(2,3,4).	(5,2,1)	(2,1)(5,3)	(4,1)(5,2)	(5,4,1)	(3,1)(5,4)	(5,3,1)
(1,3,4).	(5,1)(3,2)	(3,5,2)	(4,3,2,5,1)	(5,4,3,2,1)	(2,1)(5,4)	(5,2,1)
(1,2,4).	(5,1)(4,3)	(5,4,3)	(3,4,2,5,1)	(5,3,4,2,1)	(4,5,3,2,1)	(5,4,3,2,1)
(1,2,5).	(5,4,3)	(4,3,1)	(3,5,4,2,1)	(4,2)(5,3)	(5,3,2,4,1)	(4,3,2)
(1,3,5).	(3,2)(5,4)	(4,5,2,3,1)	(5,4,3,2,1)	(4,3,2)	(2,4,1)	(4,5,2)
(2,3,5).	(2,1)(5,4)	(4,5,3,2,1)	(5,4,1)	(2,4,1)	(3,1)(4,2)	(2,4,5,3,1)
(1,4,5).	(4,3,2)	(5,2,4,3,1)	(3,2,1)	(5,3,2)	(2,5,3,4,1)	(5,2)(4,3)
(2,4,5).	(2,1)(4,3)	(5,4,3,2,1)	(3,4,1)	(2,5,3,4,1)	(4,2,5,3,1)	(2,5,4,3,1)
(3,4,5).	(3,2,1)	(5,2,1)	(4,1)(3,2)	(3,2,5,4,1)	(2,5,4,3,1)	(3,1)(5,2)
(3,2,1).	(5,4,2,3,1)	(4,2,3,5,1)	(2,5,4,3,1)	(5,2,4,3,1)	(4,5,2)	(5,1)(4,2)
(4,3,2).	(5,3,4,2,1)	(3,5,4,2,1)	(2,5,3,4,1)	(5,2,3,4,1)	(4,5,2,3,1)	(5,4,2,3,1)
(4,3,1).	(5,3,2,4,1)	(3,5,2,4,1)	(5,3,2)	(5,1)(3,2)	(2,3,4,5,1)	(5,2,3,4,1)
(4,2,1).	(5,2,4,3,1)	(2,4,3,5,1)	(3,1)(5,2)	(5,3,1)	(4,5,3)	(5,1)(4,3)
(5,2,1).	(2,5,4,3,1)	(4,3,2,5,1)	(3,1)(5,4)	(2,4,5,3,1)	(4,2)(5,3)	(2,4,3,5,1)
(5,3,1).	(3,2,5,4,1)	(4,1)(5,2)	(3,2)(5,4)	(3,2,4,5,1)	(2,4,3,5,1)	(3,5,2,4,1)
(5,3,2).	(3,5,4,2,1)	(4,2,1)	(2,3,5,4,1)	(3,5,2,4,1)	(5,2,4,3,1)	(3,1)(4,2)
(5,4,1).	(4,3,2,5,1)	(5,2)(4,3)	(3,2,4,5,1)	(4,5,3,2,1)	(2,1)(5,3)	(4,3,5,2,1)
(5,4,2).	(4,3,5,2,1)	(2,1)(4,3)	(3,5,2,4,1)	(4,1)(5,3)	(5,3,1)	(4,3,1)
(5,4,3).	(4,5,3,2,1)	(3,4,5,2,1)	(5,3,2,4,1)	(4,1)(3,2)	(2,3,1)	(4,5,2,3,1)

K4*K3
(1,2,3,4,5)
(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

GROUP (1,2,3,4,5)

K4*K3

	(1,3,5,2,4).	(1,5,4,2,3).	(1,5,3,4,2).	(1,2,5,4,3).	(1,5,2,3,4).	(1,4,5,3,2).
(1,2,3).	(4,2)(5,3)	(5,4,3,2,1)	(5,1)(4,3)	(3,2,5,4,1)	(5,3,4,2,1)	(4,5,1)
(2,3,4).	(4,1)(5,3)	(5,2,4,3,1)	(5,4,3,2,1)	(3,1)(5,2)	(5,3,2,4,1)	(2,1)(5,4)
(1,3,4).	(4,3,5,2,1)	(5,1)(4,2)	(5,4,2,3,1)	(2,5,1)	(5,2,4,3,1)	(3,2)(5,4)
(1,2,4).	(3,5,4,2,1)	(5,1)(3,2)	(5,3,1)	(4,3,2,5,1)	(5,4,2,3,1)	(4,5,3)
(1,2,5).	(3,1)(4,2)	(3,2)(5,4)	(4,5,3)	(5,4,3,2,1)	(3,4,2)	(4,1)(5,3)
(1,3,5).	(5,2,4,3,1)	(5,4,2)	(3,4,2)	(2,1)(5,4)	(5,2)(4,3)	(4,1)(3,2)
(2,3,5).	(5,3,2,4,1)	(2,5,4,3,1)	(2,1)(4,3)	(3,1)(5,4)	(2,5,3,4,1)	(4,2,1)
(1,4,5).	(3,1)(5,2)	(3,4,2)	(4,2)(5,3)	(2,1)(4,3)	(3,5,2)	(5,3,2,4,1)
(2,4,5).	(3,2,5,4,1)	(2,3,1)	(2,1)(5,3)	(4,3,1)	(2,3,5,4,1)	(5,3,4,2,1)
(3,4,5).	(4,1)(5,2)	(3,1)(4,2)	(3,5,4,2,1)	(2,3,1)	(3,5,2,4,1)	(5,4,3,2,1)
(3,2,1).	(2,4,3,5,1)	(5,4,1)	(5,2,3,4,1)	(5,4,2)	(5,1)(4,3)	(4,5,2,3,1)
(4,3,2).	(2,3,5,4,1)	(5,3,1)	(5,2,1)	(4,2,5,3,1)	(5,4,1)	(3,4,5,2,1)
(4,3,1).	(3,5,2)	(5,3,4,2,1)	(5,1)(4,2)	(2,5,3,4,1)	(5,2,1)	(3,2,4,5,1)
(4,2,1).	(3,5,1)	(5,2,3,4,1)	(5,3,2,4,1)	(5,2)(4,3)	(5,1)(3,2)	(2,4,5,3,1)
(5,2,1).	(3,2,4,5,1)	(2,3,5,4,1)	(2,5,3,4,1)	(5,4,3)	(2,3,4,5,1)	(4,2,5,3,1)
(5,3,1).	(4,5,2)	(3,5,4,2,1)	(3,4,2,5,1)	(2,3,5,4,1)	(3,4,5,2,1)	(4,3,2,5,1)
(5,3,2).	(2,4,1)	(3,1)(5,4)	(3,4,5,2,1)	(5,4,2,3,1)	(3,4,1)	(4,3,5,2,1)
(5,4,1).	(3,4,5,2,1)	(4,2,3,5,1)	(4,2,5,3,1)	(2,4,3,5,1)	(4,5,2,3,1)	(5,3,2)
(5,4,2).	(3,4,1)	(4,5,2,3,1)	(4,5,3,2,1)	(5,2,4,3,1)	(4,1)(3,2)	(2,1)(5,3)
(5,4,3).	(5,2,3,4,1)	(4,2,5,3,1)	(4,2,1)	(2,4,5,3,1)	(4,1)(5,2)	(3,2,1)

	(5,3,1,4,2).	(5,1,3,2,4).	(5,1,2,4,3).	(5,2,1,3,4).	(5,1,4,3,2).	(5,4,1,2,3).
(1,2,3).	(4,3,2,5,1)	(4,5,2)	(3,5,2,4,1)	(4,5,3)	(4,1)(5,2)	(3,5,4,2,1)
(2,3,4).	(2,5,4,3,1)	(4,5,1)	(3,5,1)	(4,5,3,2,1)	(2,5,1)	(3,5,2,4,1)
(1,3,4).	(5,4,2)	(4,5,3,2,1)	(2,1)(5,3)	(4,5,2,3,1)	(5,3,2)	(2,4,3,5,1)
(1,2,4).	(5,3,2)	(3,4,5,2,1)	(4,3,5,2,1)	(3,1)(5,4)	(5,2)(4,3)	(4,2,3,5,1)
(1,2,5).	(4,5,3,2,1)	(3,5,2,4,1)	(5,2,4,3,1)	(3,4,1)	(4,3,5,2,1)	(5,4,2,3,1)
(1,3,5).	(4,2,1)	(5,3,2,4,1)	(2,4,5,3,1)	(5,2,3,4,1)	(4,5,3,2,1)	(2,5,4,3,1)
(2,3,5).	(4,3,1)	(5,1)(4,2)	(3,2,4,5,1)	(5,3,4,2,1)	(4,5,1)	(3,2,5,4,1)
(1,4,5).	(5,3,4,2,1)	(3,2,5,4,1)	(2,5,4,3,1)	(3,5,2,4,1)	(5,4,3,2,1)	(2,3,1)
(2,4,5).	(5,3,1)	(3,4,2,5,1)	(4,3,2,5,1)	(3,5,4,2,1)	(5,1)(4,3)	(4,1)(3,2)
(3,4,5).	(5,4,2,3,1)	(4,3,2,5,1)	(2,5,1)	(4,3,5,2,1)	(5,1)(3,2)	(2,4,1)
(3,2,1).	(4,1)(5,2)	(2,4,5,3,1)	(4,2)(5,3)	(2,3,4,5,1)	(4,2,5,3,1)	(5,4,3)
(4,3,2).	(3,1)(5,2)	(2,3,4,5,1)	(4,2,3,5,1)	(2,1)(5,4)	(3,4,2,5,1)	(4,1)(5,3)
(4,3,1).	(3,4,2,5,1)	(3,2)(5,4)	(2,3,5,4,1)	(4,5,2)	(3,2,5,4,1)	(2,1)(5,3)
(4,2,1).	(2,5,3,4,1)	(3,1)(5,4)	(5,4,3)	(3,2,4,5,1)	(2,5,4,3,1)	(3,5,2)
(5,2,1).	(4,1)(5,3)	(3,1)(4,2)	(4,3,2)	(3,4,2,5,1)	(4,3,1)	(3,2)(5,4)
(5,3,1).	(4,2,3,5,1)	(4,3,2)	(2,4,1)	(5,2)(4,3)	(4,1)(3,2)	(2,1)(5,4)
(5,3,2).	(4,5,2,3,1)	(2,4,3,5,1)	(5,1)(4,2)	(2,1)(4,3)	(4,2,3,5,1)	(5,4,1)
(5,4,1).	(4,2)(5,3)	(3,2,1)	(2,1)(4,3)	(3,1)(5,2)	(4,3,2)	(2,3,4,5,1)
(5,4,2).	(2,4,5,3,1)	(3,5,1)	(5,1)(4,3)	(3,2,1)	(2,4,3,5,1)	(5,2,3,4,1)
(5,4,3).	(3,1)(4,2)	(5,1)(3,2)	(2,3,4,5,1)	(5,2,1)	(3,2,4,5,1)	(2,5,3,4,1)

K4*K5
(1,2,3,4,5)
(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

GROUP (1,2,3,4,5)

K4*K5

	(1,2)(3,4).	(1,3)(2,4).	(1,4)(2,3).	(1,2)(3,5).	(1,3)(2,5).	(1,5)(2,3).
(1,2,3).	(3,4,1)	(4,3,2)	(4,2,1)	(3,5,1)	(5,3,2)	(5,2,1)
(2,3,4).	(3,2,1)	(4,3,1)	(2,4,1)	(3,5,4,2,1)	(4,2,5,3,1)	(5,1)(4,2)
(1,3,4).	(2,3,1)	(4,2,1)	(4,3,2)	(2,3,5,4,1)	(4,1)(5,2)	(5,3,2,4,1)
(1,2,4).	(4,3,1)	(3,2,1)	(3,4,2)	(4,1)(5,3)	(3,2,5,4,1)	(5,2,3,4,1)
(1,2,5).	(5,1)(4,3)	(3,2,4,5,1)	(4,2,3,5,1)	(5,3,1)	(3,2,1)	(3,5,2)
(1,3,5).	(2,3,4,5,1)	(5,1)(4,2)	(4,3,2,5,1)	(2,3,1)	(5,2,1)	(5,3,2)
(2,3,5).	(3,4,5,2,1)	(5,2,4,3,1)	(4,1)(5,2)	(3,2,1)	(5,3,1)	(2,5,1)
(1,4,5).	(2,4,3,5,1)	(3,4,2,5,1)	(5,1)(3,2)	(2,4,5,3,1)	(3,4,5,2,1)	(3,2)(5,4)
(2,4,5).	(4,3,5,2,1)	(3,1)(5,2)	(5,2,3,4,1)	(4,5,3,2,1)	(3,1)(5,4)	(2,3,4,5,1)
(3,4,5).	(2,1)(5,3)	(4,2,5,3,1)	(5,3,2,4,1)	(2,1)(5,4)	(4,5,2,3,1)	(3,2,4,5,1)
(3,2,1).	(3,4,2)	(2,4,1)	(4,3,1)	(3,5,2)	(2,5,1)	(5,3,1)
(4,3,2).	(4,2,1)	(2,3,1)	(3,4,1)	(4,3,5,2,1)	(2,5,4,3,1)	(5,1)(4,3)
(4,3,1).	(2,4,1)	(3,4,2)	(3,2,1)	(2,4,3,5,1)	(5,2)(4,3)	(5,4,3,2,1)
(4,2,1).	(4,3,2)	(3,4,1)	(2,3,1)	(4,2)(5,3)	(3,4,2,5,1)	(5,4,2,3,1)
(5,2,1).	(5,2)(4,3)	(3,5,2,4,1)	(4,5,2,3,1)	(5,3,2)	(3,5,1)	(2,3,1)
(5,3,1).	(2,5,3,4,1)	(4,2)(5,3)	(4,5,3,2,1)	(2,5,1)	(3,5,2)	(3,2,1)
(5,3,2).	(5,3,4,2,1)	(2,4,5,3,1)	(4,1)(5,3)	(5,2,1)	(2,3,1)	(3,5,1)
(5,4,1).	(2,5,4,3,1)	(3,5,4,2,1)	(3,2)(5,4)	(2,5,3,4,1)	(3,5,2,4,1)	(4,1)(3,2)
(5,4,2).	(5,4,3,2,1)	(3,1)(5,4)	(2,3,5,4,1)	(5,3,4,2,1)	(3,1)(4,2)	(4,2,3,5,1)
(5,4,3).	(2,1)(5,4)	(5,4,2,3,1)	(3,2,5,4,1)	(2,1)(4,3)	(5,2,4,3,1)	(4,3,2,5,1)

	(1,2)(4,5).	(1,4)(2,5).	(1,5)(2,4).	(1,3)(4,5).	(1,4)(3,5).	(1,5)(3,4).
(1,2,3).	(3,1)(5,4)	(4,2,5,3,1)	(5,2,4,3,1)	(3,2)(5,4)	(4,2,3,5,1)	(5,2,3,4,1)
(2,3,4).	(3,4,5,2,1)	(2,5,3,4,1)	(5,1)(4,3)	(4,5,2,3,1)	(2,3,5,4,1)	(5,1)(3,2)
(1,3,4).	(2,3,4,5,1)	(5,2)(4,3)	(5,3,4,2,1)	(4,5,1)	(5,4,3)	(5,3,1)
(1,2,4).	(4,5,1)	(5,4,2)	(5,2,1)	(3,2,4,5,1)	(4,2)(5,3)	(5,2,4,3,1)
(1,2,5).	(5,4,1)	(4,2,1)	(4,5,2)	(3,2,5,4,1)	(4,2,5,3,1)	(5,2)(4,3)
(1,3,5).	(2,3,5,4,1)	(4,3,5,2,1)	(4,2)(5,3)	(5,4,1)	(4,3,1)	(4,5,3)
(2,3,5).	(3,5,4,2,1)	(4,1)(5,3)	(2,4,3,5,1)	(5,4,2,3,1)	(4,1)(3,2)	(2,3,4,5,1)
(1,4,5).	(2,4,1)	(5,2,1)	(5,4,2)	(3,4,1)	(5,3,1)	(5,4,3)
(2,4,5).	(4,2,1)	(5,4,1)	(2,5,1)	(3,1)(4,2)	(5,3,2,4,1)	(2,4,3,5,1)
(3,4,5).	(2,1)(4,3)	(5,2,3,4,1)	(3,4,2,5,1)	(4,3,1)	(5,4,1)	(3,5,1)
(3,2,1).	(3,2)(5,4)	(4,3,2,5,1)	(5,3,2,4,1)	(2,1)(5,4)	(4,3,5,2,1)	(5,3,4,2,1)
(4,3,2).	(4,5,3,2,1)	(3,2,5,4,1)	(5,1)(3,2)	(2,4,5,3,1)	(3,5,2,4,1)	(5,1)(4,2)
(4,3,1).	(2,4,5,3,1)	(3,1)(5,2)	(5,4,2,3,1)	(4,5,3)	(3,5,1)	(5,4,1)
(4,2,1).	(4,5,2)	(2,5,1)	(5,4,1)	(3,4,5,2,1)	(2,1)(5,3)	(5,4,3,2,1)
(5,2,1).	(5,4,2)	(4,5,1)	(2,4,1)	(3,5,4,2,1)	(4,5,3,2,1)	(2,1)(4,3)
(5,3,1).	(2,5,4,3,1)	(4,5,2,3,1)	(3,1)(4,2)	(5,4,3)	(4,5,1)	(3,4,1)
(5,3,2).	(5,4,3,2,1)	(4,1)(3,2)	(3,2,4,5,1)	(2,5,4,3,1)	(4,1)(5,2)	(3,4,2,5,1)
(5,4,1).	(2,5,1)	(4,5,2)	(4,2,1)	(3,5,1)	(4,5,3)	(4,3,1)
(5,4,2).	(5,2,1)	(2,4,1)	(4,5,1)	(3,1)(5,2)	(2,5,3,4,1)	(4,3,2,5,1'
(5,4,3).	(2,1)(5,3)	(3,5,2,4,1)	(4,2,3,5,1)	(5,3,1)	(3,4,1)	(4,5,1)

	(2,3)(4,5).	(2,4)(3,5).	(2,5)(3,4).
(1,2,3).	(2,1)(5,4)	(2,4,3,5,1)	(2,5,3,4,1)
(2,3,4).	(4,5,2)	(5,4,3)	(5,3,2)
(1,3,4).	(3,2,4,5,1)	(3,5,4,2,1)	(3,1)(5,2)
(1,2,4).	(2,3,4,5,1)	(2,1)(5,3)	(2,5,4,3,1)
(1,2,5).	(2,3,5,4,1)	(2,4,5,3,1)	(2,1)(4,3)
(1,3,5).	(3,2,5,4,1)	(3,1)(4,2)	(3,4,5,2,1)
(2,3,5).	(5,4,2)	(4,3,2)	(4,5,3)
(1,4,5).	(4,1)(3,2)	(4,2,5,3,1)	(4,3,5,2,1)
(2,4,5).	(3,4,2)	(5,3,2)	(5,4,3)
(3,4,5).	(4,3,2)	(5,4,2)	(3,5,2)
(3,2,1).	(3,1)(5,4)	(3,5,2,4,1)	(3,4,2,5,1)
(4,3,2).	(4,5,3)	(3,5,2)	(5,4,2)
(4,3,1).	(4,5,3,2,1)	(4,2,3,5,1)	(4,1)(5,2)
(4,2,1).	(4,5,2,3,1)	(4,1)(5,3)	(4,3,2,5,1)
(5,2,1).	(5,4,2,3,1)	(5,3,2,4,1)	(5,1)(4,3)
(5,3,1).	(5,4,3,2,1)	(5,1)(4,2)	(5,2,3,4,1)
(5,3,2).	(5,4,3)	(4,5,2)	(3,4,2)
(5,4,1).	(5,1)(3,2)	(5,3,4,2,1)	(5,2,4,3,1)
(5,4,2).	(3,5,2)	(4,5,3)	(4,3,2)
(5,4,3).	(5,3,2)	(3,4,2)	(4,5,2)

K5*K2
(1,2,3,4,5)
(1,2,3,4,5).(1,2,5,3,4).(1,4,5,2,3).(1,4,2,3,5).(1,3,5,4,2).(1,3,4,2,5).
(5,4,3,2,1).(5,2,1,4,3).(5,4,1,3,2).(5,3,2,4,1).(5,3,1,2,4).(5,2,4,3,1).

(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

GROUP (1,2,3,4,5)

K5*K2

	(1,2,3,4,5).	(1,2,5,3,4).	(1,4,5,2,3).	(1,4,2,3,5).	(1,3,5,4,2).	(1,3,4,2,5).
(1,2)(3,4).	(4,5,2)	(5,4,2)	(3,2,4,5,1)	(3,5,2,4,1)	(4,1)(5,3)	(4,1)(5,2)
(1,3)(2,4).	(4,5,3,2,1)	(4,3,2,5,1)	(2,1)(5,4)	(2,1)(5,3)	(3,5,2)	(5,3,2)
(1,4)(2,3).	(3,1)(5,4)	(3,1)(5,2)	(4,5,3)	(5,4,3)	(2,4,3,5,1)	(2,5,4,3,1)
(1,2)(3,5).	(5,2)(4,3)	(3,4,2)	(4,3,2,5,1)	(4,1)(5,2)	(5,4,1)	(5,2,3,4,1)
(1,3)(2,5).	(5,3,4,2,1)	(5,1)(4,3)	(4,2,1)	(4,5,3,2,1)	(3,2)(5,4)	(4,5,3)
(1,5)(2,3).	(3,4,1)	(3,4,5,2,1)	(4,1)(5,3)	(4,3,1)	(2,5,4,3,1)	(2,1)(4,3)
(1,2)(4,5).	(3,5,2)	(4,2)(5,3)	(5,1)(3,2)	(5,2,3,4,1)	(3,4,1)	(3,5,2,4,1)
(1,4)(2,5).	(5,4,2,3,1)	(5,3,1)	(3,4,2)	(3,2)(5,4)	(3,2,4,5,1)	(3,1)(5,4)
(1,5)(2,4).	(4,1)(3,2)	(4,5,3,2,1)	(2,3,5,4,1)	(2,3,1)	(3,1)(5,2)	(3,2,1)
(1,3)(4,5).	(2,1)(5,3)	(2,4,3,5,1)	(5,2,1)	(5,3,4,2,1)	(3,4,2)	(4,2)(5,3)
(1,4)(3,5).	(2,5,4,3,1)	(2,3,1)	(5,2)(4,3)	(5,4,2)	(5,1)(4,2)	(5,4,2,3,1)
(1,5)(3,4).	(2,4,1)	(2,1)(5,4)	(3,5,2,4,1)	(3,1)(4,2)	(4,2,5,3,1)	(4,2,1)
(2,3)(4,5).	(3,5,1)	(3,5,2,4,1)	(5,3,1)	(5,1)(4,3)	(2,1)(4,3)	(2,4,3,5,1)
(2,4)(3,5).	(4,3,2,5,1)	(4,1)(3,2)	(2,5,4,3,1)	(2,5,1)	(5,2,1)	(5,1)(3,2)
(2,5)(3,4).	(5,1)(4,2)	(5,4,1)	(3,1)(4,2)	(3,2,4,5,1)	(4,5,3,2,1)	(4,5,1)

	(5,4,3,2,1).	(5,2,1,4,3).	(5,4,1,3,2).	(5,3,2,4,1).	(5,3,1,2,4).	(5,2,4,3,1).
(1,2)(3,4).	(5,3,1)	(3,5,1)	(4,2,5,3,1)	(5,4,2,3,1)	(3,2)(5,4)	(5,1)(3,2)
(1,3)(2,4).	(5,2,3,4,1)	(2,3,5,4,1)	(5,2)(4,3)	(5,1)(4,3)	(4,5,1)	(5,4,1)
(1,4)(2,3).	(5,1)(4,2)	(4,2)(5,3)	(2,5,1)	(5,2,1)	(3,4,5,2,1)	(5,3,4,2,1)
(1,2)(3,5).	(3,1)(5,4)	(4,5,1)	(5,4,2,3,1)	(3,1)(4,2)	(4,3,2)	(3,2,4,5,1)
(1,3)(2,5).	(2,3,5,4,1)	(4,1)(3,2)	(5,4,3)	(2,4,3,5,1)	(5,1)(4,2)	(2,4,1)
(1,5)(2,3).	(5,4,2)	(4,2,5,3,1)	(2,1)(5,4)	(4,5,2)	(3,5,2,4,1)	(4,2)(5,3)
(1,2)(4,5).	(4,3,1)	(5,1)(4,3)	(3,1)(4,2)	(4,2,5,3,1)	(5,3,2)	(4,3,2,5,1)
(1,4)(2,5).	(2,4,3,5,1)	(4,3,2)	(3,5,1)	(2,1)(5,3)	(5,3,4,2,1)	(2,1)(4,3)
(1,5)(2,4).	(5,2)(4,3)	(2,5,4,3,1)	(3,4,5,2,1)	(4,5,3)	(4,1)(5,3)	(5,4,3)
(1,3)(4,5).	(4,1)(3,2)	(5,2,3,4,1)	(4,3,2)	(4,3,2,5,1)	(2,5,1)	(4,1)(5,2)
(1,4)(3,5).	(3,2,4,5,1)	(4,5,2)	(5,1)(3,2)	(3,2,1)	(2,1)(4,3)	(3,4,5,2,1)
(1,5)(3,4).	(5,3,2)	(3,1)(5,2)	(4,5,3,2,1)	(3,2)(5,4)	(2,3,5,4,1)	(3,5,2)
(2,3)(4,5).	(4,2,1)	(5,3,4,2,1)	(2,4,1)	(4,1)(5,2)	(3,1)(5,2)	(4,2,5,3,1)
(2,4)(3,5).	(3,4,5,2,1)	(2,1)(5,4)	(5,2,3,4,1)	(3,4,1)	(4,3,1)	(3,1)(5,4)
(2,5)(3,4).	(2,1)(5,3)	(3,2,1)	(4,1)(5,3)	(2,3,5,4,1)	(5,4,2,3,1)	(2,3,1)

K5*K3
(1,2,3,4,5)
(1,3,5,2,4).(1,5,4,2,3).(1,5,3,4,2).(1,2,5,4,3).(1,5,2,3,4).(1,4,5,3,2).
(5,3,1,4,2).(5,1,3,2,4).(5,1,2,4,3).(5,2,1,3,4).(5,1,4,3,2).(5,4,1,2,3).

(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

GROUP (1,2,3,4,5)

K5*K3

	(1,3,5,2,4).	(1,5,4,2,3).	(1,5,3,4,2).	(1,2,5,4,3).	(1,5,2,3,4).	(1,4,5,3,2).
(1,2)(3,4).	(4,2,3,5,1)	(5,3,2,4,1)	(5,4,1)	(5,3,2)	(5,1)(4,2)	(3,1)(5,4)
(1,3)(2,4).	(5,4,3)	(5,2,1)	(5,1)(3,2)	(4,1)(5,2)	(5,4,3,2,1)	(2,3,4,5,1)
(1,4)(2,3).	(2,1)(5,3)	(5,1)(4,3)	(5,2,4,3,1)	(3,4,2,5,1)	(5,3,1)	(4,5,2)
(1,2)(3,5).	(5,1)(4,2)	(3,2,5,4,1)	(3,4,1)	(3,2)(5,4)	(3,4,2,5,1)	(4,3,1)
(1,3)(2,5).	(4,3,2)	(2,1)(5,4)	(2,3,4,5,1)	(5,4,1)	(2,1)(4,3)	(4,2,3,5,1)
(1,5)(2,3).	(2,4,5,3,1)	(5,4,3)	(5,2)(4,3)	(3,5,4,2,1)	(4,5,3)	(4,1)(5,2)
(1,2)(4,5).	(3,4,2,5,1)	(4,1)(3,2)	(4,1)(5,3)	(4,3,2)	(4,2,3,5,1)	(5,3,1)
(1,4)(2,5).	(3,2,1)	(2,3,4,5,1)	(2,4,5,3,1)	(5,1)(4,3)	(2,3,1)	(4,2)(5,3)
(1,5)(2,4).	(3,1)(5,4)	(3,5,2)	(5,3,2)	(4,3,5,2,1)	(3,2)(5,4)	(2,5,3,4,1)
(1,3)(4,5).	(5,2)(4,3)	(4,2,1)	(4,2,3,5,1)	(2,4,1)	(4,3,5,2,1)	(5,1)(3,2)
(1,4)(3,5).	(5,2,1)	(3,4,2,5,1)	(3,1)(4,2)	(2,3,4,5,1)	(3,1)(5,2)	(4,3,2)
(1,5)(3,4).	(4,5,2,3,1)	(4,2)(5,3)	(5,4,2)	(2,1)(5,3)	(4,5,2)	(3,2,5,4,1)
(2,3)(4,5).	(2,5,3,4,1)	(4,3,1)	(4,3,5,2,1)	(3,1)(4,2)	(4,1)(5,3)	(5,2,1)
(2,4)(3,5).	(5,4,1)	(3,1)(5,2)	(3,2,1)	(4,5,2,3,1)	(3,2,5,4,1)	(2,1)(4,3)
(2,5)(3,4).	(4,1)(3,2)	(2,4,5,3,1)	(2,1)(5,4)	(5,3,1)	(2,4,1)	(3,5,4,2,1)

	(5,3,1,4,2).	(5,1,3,2,4).	(5,1,2,4,3).	(5,2,1,3,4).	(5,1,4,3,2).	(5,4,1,2,3).
(1,2)(3,4).	(3,2,5,4,1)	(4,5,2,3,1)	(3,5,2)	(4,5,1)	(3,1)(5,2)	(4,2)(5,3)
(1,3)(2,4).	(2,5,1)	(4,5,3)	(4,1)(5,3)	(3,2)(5,4)	(2,5,3,4,1)	(4,3,5,2,1)
(1,4)(2,3).	(5,2)(4,3)	(2,1)(5,4)	(3,5,4,2,1)	(2,4,5,3,1)	(5,4,2)	(3,5,1)
(1,2)(3,5).	(4,1)(3,2)	(5,2,4,3,1)	(4,5,2)	(5,1)(4,3)	(4,5,2,3,1)	(5,4,2)
(1,3)(2,5).	(4,5,1)	(4,2)(5,3)	(5,3,2,4,1)	(3,4,2)	(4,1)(5,3)	(5,4,3,2,1)
(1,5)(2,3).	(4,3,5,2,1)	(2,4,1)	(3,1)(4,2)	(2,5,3,4,1)	(4,2,1)	(3,1)(5,4)
(1,2)(4,5).	(5,3,2,4,1)	(3,1)(5,2)	(5,2)(4,3)	(3,5,1)	(5,2,4,3,1)	(3,4,2)
(1,4)(2,5).	(4,5,3)	(3,5,4,2,1)	(5,4,3,2,1)	(3,1)(4,2)	(5,4,3)	(5,1)(3,2)
(1,5)(2,4).	(2,1)(5,3)	(3,4,1)	(4,3,1)	(3,2,5,4,1)	(2,1)(4,3)	(4,5,2,3,1)
(1,3)(4,5).	(5,1)(4,2)	(5,3,2)	(2,5,3,4,1)	(3,5,2)	(5,3,2,4,1)	(2,1)(4,3)
(1,4)(3,5).	(3,4,2)	(5,4,3,2,1)	(2,1)(5,4)	(5,2,4,3,1)	(3,2)(5,4)	(2,5,1)
(1,5)(3,4).	(3,5,4,2,1)	(4,1)(3,2)	(2,3,1)	(4,1)(5,2)	(3,2,1)	(2,4,5,3,1)
(2,3)(4,5).	(5,2,4,3,1)	(2,5,1)	(3,4,2,5,1)	(2,1)(5,3)	(5,1)(4,2)	(3,4,1)
(2,4)(3,5).	(2,3,1)	(5,1)(4,3)	(4,5,1)	(5,4,3,2,1)	(2,3,4,5,1)	(4,1)(5,2)
(2,5)(3,4).	(3,1)(5,4)	(4,2,3,5,1)	(5,1)(3,2)	(4,2,1)	(3,5,1)	(5,3,2,4,1)

K5*K4
(1,2,3,4,5)
(1,2,3).(2,3,4).(1,3,4).(1,2,4).(1,2,5).(1,3,5).(2,3,5).(1,4,5).(2,4,5).(3,4,5).
(3,2,1).(4,3,2).(4,3,1).(4,2,1).(5,2,1).(5,3,1).(5,3,2).(5,4,1).(5,4,2).(5,4,3).

(1,2)(3,4).(1,3)(2,4).(1,4)(2,3).(1,2)(3,5).(1,3)(2,5).(1,5)(2,3).(1,2)(4,5).
(1,4)(2,5).(1,5)(2,4).(1,3)(4,5).(1,4)(3,5).(1,5)(3,4).(2,3)(4,5).(2,4)(3,5).
(2,5)(3,4).

GROUP (1,2,3,4,5)

K5*K4

	(1,2,3).	(2,3,4).	(1,3,4).	(1,2,4).	(1,2,5).	(1,3,5).
(1,2)(3,4).	(4,3,2)	(2,4,1)	(4,2,1)	(3,4,2)	(5,2)(4,3)	(4,3,5,2,1)
(1,3)(2,4).	(4,2,1)	(3,2,1)	(4,3,2)	(4,3,1)	(4,2,5,3,1)	(4,2)(5,3)
(1,4)(2,3).	(3,4,1)	(4,3,1)	(2,3,1)	(3,2,1)	(3,2,5,4,1)	(2,3,5,4,1)
(1,2)(3,5).	(5,3,2)	(2,5,3,4,1)	(5,3,4,2,1)	(4,2)(5,3)	(3,5,2)	(5,2,1)
(1,3)(2,5).	(5,2,1)	(3,4,5,2,1)	(5,2)(4,3)	(5,2,4,3,1)	(5,3,1)	(5,3,2)
(1,5)(2,3).	(3,5,1)	(5,1)(4,3)	(2,3,4,5,1)	(3,2,4,5,1)	(3,2,1)	(2,3,1)
(1,2)(4,5).	(3,2)(5,4)	(2,3,5,4,1)	(3,5,4,2,1)	(5,4,2)	(4,5,2)	(3,4,5,2,1)
(1,4)(2,5).	(5,2,3,4,1)	(4,5,2,3,1)	(3,1)(5,2)	(5,2,1)	(5,4,1)	(3,2,5,4,1)
(1,5)(2,4).	(4,2,3,5,1)	(5,1)(3,2)	(3,2,4,5,1)	(4,5,1)	(4,2,1)	(3,1)(4,2)
(1,3)(4,5).	(2,1)(5,4)	(3,5,4,2,1)	(5,4,3)	(2,5,4,3,1)	(2,4,5,3,1)	(4,5,3)
(1,4)(3,5).	(2,5,3,4,1)	(4,2,5,3,1)	(5,3,1)	(2,1)(5,3)	(2,3,5,4,1)	(5,4,1)
(1,5)(3,4).	(2,4,3,5,1)	(5,1)(4,2)	(4,5,1)	(2,3,4,5,1)	(2,1)(4,3)	(4,3,1)
(2,3)(4,5).	(3,1)(5,4)	(5,4,3)	(2,3,5,4,1)	(3,2,5,4,1)	(3,2,4,5,1)	(2,3,4,5,1)
(2,4)(3,5).	(4,2,5,3,1)	(5,3,2)	(5,3,2,4,1)	(4,1)(5,3)	(4,2,3,5,1)	(5,1)(4,2)
(2,5)(3,4).	(5,2,4,3,1)	(4,5,2)	(4,1)(5,2)	(5,2,3,4,1)	(5,1)(4,3)	(4,3,2,5,1)

	(2,3,5).	(1,4,5).	(2,4,5).	(3,4,5).	(3,2,1).	(4,3,2).
(1,2)(3,4).	(2,4,3,5,1)	(3,4,5,2,1)	(2,3,4,5,1)	(2,1)(5,4)	(4,3,1)	(2,3,1)
(1,3)(2,4).	(3,5,4,2,1)	(2,4,5,3,1)	(3,1)(5,4)	(3,2,4,5,1)	(3,4,2)	(3,4,1)
(1,4)(2,3).	(4,1)(5,3)	(3,2)(5,4)	(4,5,3,2,1)	(4,5,2,3,1)	(2,4,1)	(4,2,1)
(1,2)(3,5).	(2,5,1)	(4,3,5,2,1)	(2,4,3,5,1)	(2,1)(4,3)	(5,3,1)	(2,4,5,3,1)
(1,3)(2,5).	(3,2,1)	(4,2,5,3,1)	(3,1)(4,2)	(3,4,2,5,1)	(3,5,2)	(3,5,2,4,1)
(1,5)(2,3).	(5,3,1)	(4,1)(3,2)	(5,3,2,4,1)	(5,2,3,4,1)	(2,5,1)	(5,1)(4,2)
(1,2)(4,5).	(2,3,4,5,1)	(5,2,1)	(2,5,1)	(2,1)(5,3)	(3,1)(5,4)	(2,5,4,3,1)
(1,4)(2,5).	(4,1)(3,2)	(5,4,2)	(4,2,1)	(4,2,5,3,1)	(3,5,2,4,1)	(4,3,5,2,1)
(1,5)(2,4).	(5,4,2,3,1)	(2,4,1)	(5,4,1)	(5,3,2,4,1)	(3,4,2,5,1)	(5,1)(4,3)
(1,3)(4,5).	(3,4,5,2,1)	(5,3,1)	(3,1)(5,2)	(3,5,1)	(3,2)(5,4)	(3,2,5,4,1)
(1,4)(3,5).	(4,1)(5,2)	(5,4,3)	(4,3,5,2,1)	(4,3,1)	(5,3,2,4,1)	(4,5,3,2,1)
(1,5)(3,4).	(5,2,4,3,1)	(3,4,1)	(5,2,3,4,1)	(5,4,1)	(4,3,2,5,1)	(5,1)(3,2)
(2,3)(4,5).	(4,5,3)	(5,1)(3,2)	(5,3,2)	(3,5,2)	(2,1)(5,4)	(5,4,2)
(2,4)(3,5).	(5,4,2)	(2,4,3,5,1)	(5,4,3)	(4,3,2)	(5,3,4,2,1)	(4,5,3)
(2,5)(3,4).	(4,3,2)	(3,4,2,5,1)	(3,4,2)	(5,4,2)	(4,3,5,2,1)	(3,5,2)

	(4,3,1).	(4,2,1).	(5,2,1).	(5,3,1).	(5,3,2).	(5,4,1).
(1,2)(3,4).	(3,2,1)	(3,4,1)	(5,1)(4,3)	(5,4,3,2,1)	(2,5,4,3,1)	(5,3,4,2,1)
(1,3)(2,4).	(2,4,1)	(2,3,1)	(5,4,2,3,1)	(5,1)(4,2)	(3,4,2,5,1)	(5,2,4,3,1)
(1,4)(2,3).	(3,4,2)	(4,3,2)	(5,3,2,4,1)	(5,2,3,4,1)	(4,1)(5,2)	(5,1)(3,2)
(1,2)(3,5).	(4,5,3,2,1)	(4,1)(5,3)	(3,5,1)	(3,2,1)	(2,3,1)	(3,5,4,2,1)
(1,3)(2,5).	(4,1)(5,2)	(4,5,2,3,1)	(2,3,1)	(2,5,1)	(3,5,1)	(2,5,4,3,1)
(1,5)(2,3).	(4,2,3,5,1)	(4,3,2,5,1)	(5,3,2)	(3,5,2)	(5,2,1)	(3,2)(5,4)
(1,2)(4,5).	(5,4,3,2,1)	(5,4,1)	(4,5,1)	(4,5,3,2,1)	(2,4,5,3,1)	(4,2,1)
(1,4)(2,5).	(5,2)(4,3)	(4,5,2)	(2,4,1)	(2,5,3,4,1)	(4,1)(5,3)	(2,5,1)
(1,5)(2,4).	(2,4,3,5,1)	(2,5,1)	(5,4,2)	(4,2)(5,3)	(5,3,4,2,1)	(4,5,2)
(1,3)(4,5).	(5,4,1)	(5,4,2,3,1)	(4,5,2,3,1)	(4,5,1)	(3,2,4,5,1)	(4,3,1)
(1,4)(3,5).	(4,5,3)	(4,2)(5,3)	(3,5,2,4,1)	(3,4,1)	(4,1)(3,2)	(3,5,1)
(1,5)(3,4).	(3,5,1)	(3,4,2,5,1)	(5,2)(4,3)	(5,4,3)	(5,4,3,2,1)	(4,5,3)
(2,3)(4,5).	(5,4,2,3,1)	(5,4,3,2,1)	(4,5,3,2,1)	(4,5,2,3,1)	(4,5,2)	(4,1)(3,2)
(2,4)(3,5).	(2,4,5,3,1)	(2,1)(5,3)	(3,5,4,2,1)	(3,1)(4,2)	(3,4,2)	(3,5,2,4,1)
(2,5)(3,4).	(3,1)(5,2)	(3,4,5,2,1)	(2,1)(4,3)	(2,5,4,3,1)	(5,4,3)	(2,5,3,4,1)

	(5,4,2).	(5,4,3).
(1,2)(3,4).	(2,5,3,4,1)	(2,1)(5,3)
(1,3)(2,4).	(3,1)(5,2)	(3,5,2,4,1)
(1,4)(2,3).	(4,3,2,5,1)	(4,2,3,5,1)
(1,2)(3,5).	(2,3,5,4,1)	(2,1)(5,4)
(1,3)(2,5).	(3,1)(5,4)	(3,2,5,4,1)
(1,5)(2,3).	(5,4,3,2,1)	(5,4,2,3,1)
(1,2)(4,5).	(2,4,1)	(2,1)(4,3)
(1,4)(2,5).	(4,5,1)	(4,3,2,5,1)
(1,5)(2,4).	(5,2,1)	(5,2,4,3,1)
(1,3)(4,5).	(3,1)(4,2)	(3,4,1)
(1,4)(3,5).	(4,2,3,5,1)	(4,5,1)
(1,5)(3,4).	(5,3,4,2,1)	(5,3,1)
(2,3)(4,5).	(4,3,2)	(3,4,2)
(2,4)(3,5).	(3,5,2)	(4,5,2)
(2,5)(3,4).	(4,5,3)	(5,3,2)

REFERENCES

1. Cannon, John J.: Computers in Group Theory: A Survey. Comm. ACM, vol. 12, no. 1, Jan. 1969, pp. 3-12.

2. Allen, Gabriel; Evans, David D.; and Swigert, Paul: FORTRAN Program for Machine Computation of Group Tables of Finite Groups. NASA TN D-5402, 1969.

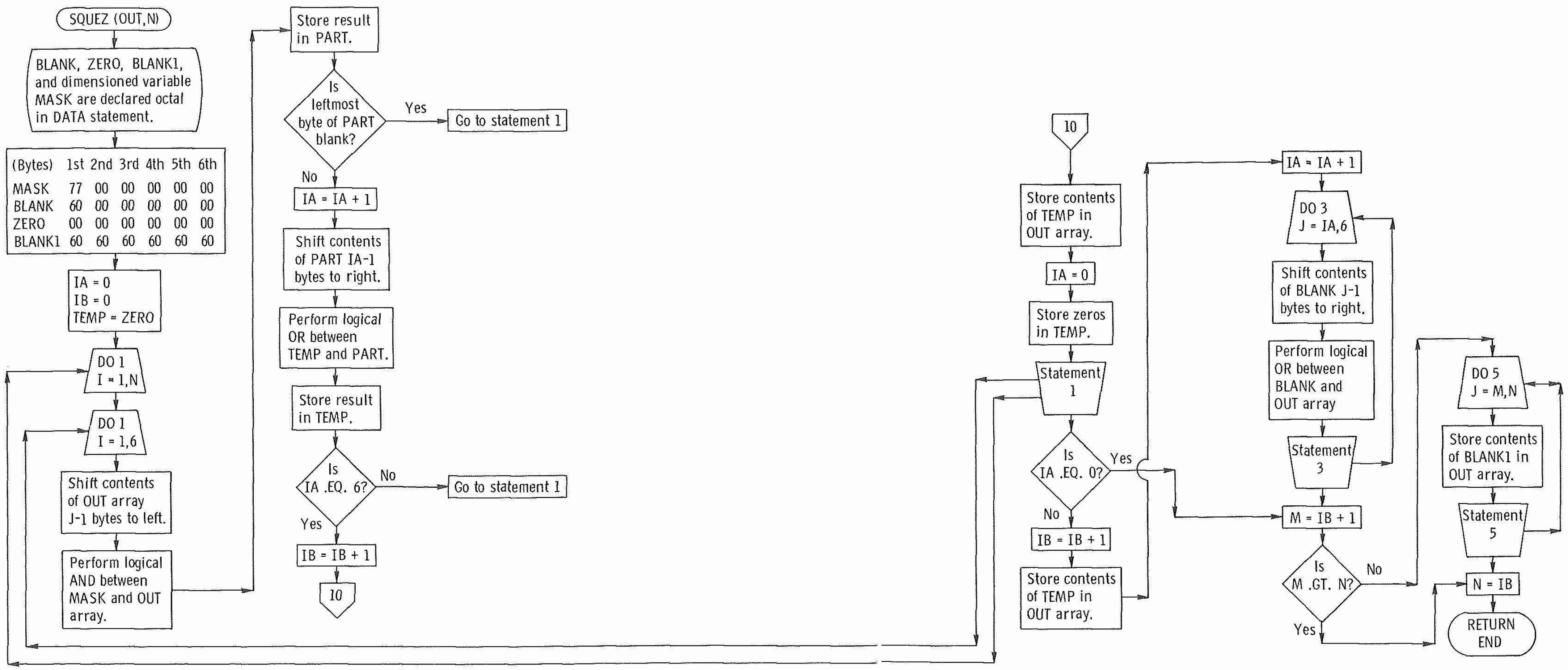

Figure 1. - Flowchart for subroutine SQUEZ.

NASA-Langley, 1970 —— 8 E-5564

National Aeronautics and Space Administration
Washington, D.C. 20546
OFFICIAL BUSINESS

FIRST CLASS MAIL

POSTAGE AND FEES PAID
NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

POSTMASTER: If Undeliverable (Section 158 Postal Manual) Do Not Return

"The aeronautical and space activities of the United States shall be conducted so as to contribute . . . to the expansion of human knowledge of phenomena in the atmosphere and space. The Administration shall provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

— National Aeronautics and Space Act of 1958

NASA SCIENTIFIC AND TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to existing knowledge.

TECHNICAL NOTES: Information less broad in scope but nevertheless of importance as a contribution to existing knowledge.

TECHNICAL MEMORANDUMS: Information receiving limited distribution because of preliminary data, security classification, or other reasons.

CONTRACTOR REPORTS: Scientific and technical information generated under a NASA contract or grant and considered an important contribution to existing knowledge.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit NASA distribution in English.

SPECIAL PUBLICATIONS: Information derived from or of value to NASA activities. Publications include conference proceedings, monographs, data compilations, handbooks, sourcebooks, and special bibliographies.

TECHNOLOGY UTILIZATION PUBLICATIONS: Information on technology used by NASA that may be of particular interest in commercial and other non-aerospace applications. Publications include Tech Briefs, Technology Utilization Reports and Notes, and Technology Surveys.

Details on the availability of these publications may be obtained from:

SCIENTIFIC AND TECHNICAL INFORMATION DIVISION

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Washington, D.C. 20546