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Programming Details for MDPLOT: A Program for Plotting Multi-Dimensional Data

by

W. L. Nance, B. H. Polmer, and G. C. Keith

Southern Forest Experiment Station
Forest Service
U. S. Department of Agriculture

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We thank J. C. Fortson and Lois S. Shackelford, University of Georgia, for the original versions of subroutines SCHEME and SHUX. Any errors in the subroutines as presented here must be charged to our modifications.

W. L. Nance
B. H. Polmer
G. C. Keith

Southern Forest Experiment Station
Forest Service, USDA
P. O. Box 2008
Evergreen Station
Gulfport, Miss. 39501

PROGRAMMING DETAILS

The program is written in ASA FORTRAN IV and consists of the main program (MAIN) with 14 subroutines. Subroutines SETUP, PLOT, GRID, SCALE, and OIS are microfilm-dependent and therefore must be replaced with the equivalent routines written for the high resolution plotting device available at the user's installation. The calls to these subroutines are flagged by comment cards in the program listings to aid in this conversion. Users may implement the program with page plotting capability only (though this is not recommended) by simply deleting the microfilm dependent subroutines and the calls to the same.

Subroutine CALC is available in two versions. The first version, listed on page 7, directly calculates the elements of the projection vector, $\mathbf{a}_t$, for each observation vector $\mathbf{x}_i$—hence the projection vector is calculated anew for each observation vector. The second version, listed on page 6, uses the pre-calculated values of $\mathbf{a}_t$, stored in the matrix Fstar (listed on pages 18-26). Either version of the subroutine may be used: the first version having the advantage of smaller core requirements, and the second version having the advantage of much faster execution times but larger core requirements (about 5000 36-bit words).

The present version of the program allows up to 250 observation vectors, 50 variables, and computes 99 plotting points per observation vector. This version requires approximately 58K words using the second version of CALC. By reducing the number of observations allowed from 250 to 100, the core requirements are reduced to about 42K words. Note that these core requirements include the microfilm dependent coding, which is about 5K. Reduction of the program to a core requirement of 32K (ideal for many installations) could easily be achieved by reducing the number of observation vectors to 100, using the first version of CALC, and eliminating the microfilm dependent coding.

```
C
C      IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
C      I                             PROGRAM  MDPLOT                                  I
C      I           SOUTHERN FOREST EXPERIMENT STATION FOREST SERVICE USDA             I
C      I               WARREN NANCE, GEORGE KEITH, AND BONNIE POLMER                  I
C      IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
C      ***********
C      * PURPOSE *
C      ***********
C          THIS PROGRAM GRAPHICALLY PRODUCES THE ANDREWS' PLOTTING METHOD
C      **********
C      * METHOD *
C      **********
C          THIS METHOD FOR MULTI-DIMENSIONAL PLOTTING WAS ADAPTED FROM
C      THE FOLLOWING PAPER.
C          1972. ANDREWS, D.F.  PLOTS OF HIGH DIMENSIONAL DATA.  BIOMETRICS
C          28.125 -36.
C      **************
C      * CARD ORDER *
C      **************
C          MICROFILM CARD
C          OIS CARDS  (OPTIONAL)
C          TITLE CARD                                                ****
C          OBSERVATION NAME CARDS (OPTIONAL AFTER 1ST PROBLEM)      *
C          VARIABLE NAME CARDS (OPTIONAL)                           *  REPEATED
C          INPUT FORMAT CARD  (OPTIONAL AFTER 1ST PROBLEM)          *    FOR
C          DATA CARDS  (OPTIONAL AFTER 1ST PROBLEM)                 *    EACH
C          PLOT CARD              * THIS AND LABEL CARD REPEATED *  DATA SET
C          LABEL CARD  (OPTIONAL) *FOR EACH PLOT DESIRED         ****
C          END
C      ******************
C      * MICROFILM CARD *   INSERTED ONCE FOR EACH SET OF PROBLEMS
C      ******************
C          COL. 1  1 IF MICROFILM PLOTTING DESIRED FOR ONE OR MORE
C                    PROBLEMS IN RUN
C                  0 IF NOT
C                    NOTE- THE USE OF MICROFILM IS SC-4020 DEPENDENT.
C          COL. 2  1 IF TABLE OF LINEAR FUNCTIONS DESIRED
C                  0 OR BLANK IF NOT
C      *************
C      * OIS CARDS *   INSERTED ONCE FOR EACH SET OF PROBLEMS
C      *************
C          SHOULD MICROFILM BE DESIRED THIS ENABLES THE CONTROL CLERK TO
C      RETURN THE DEVELOPED OUTPUT TO THE PROGRAMMER.
C          CARD 1 COL.  1- 12  USER'S NAME
C          CARD 2 COL.  1- 12  DESTINATION CODE
C          CARD 3 COL.  1-  6  PHONE NO.
C          CARD 4 COL.  1- 48  SOLID ASTERISKS
C          CARD 5 COL.  1- 54  PROCESSING INFORMATION
C          CARD 6 COL.  1- 66  SOLID ASTERISKS
C      **************
C      * TITLE CARD *    ALWAYS FIRST CARD OF EACH PROBLEM.
C      **************
C          COL.  1-  5  THE WORD 'TITLE'
C          COL.  6- 53  ALPHANUMERIC TITLE OF PROBLEM
C          COL. 54- 56  NO. OF INDIVIDUALS (OR CASES)
C          COL. 57- 59  NO. OF VARIABLES BEFORE TRANSFORMATIONS
C          COL. 60- 62  NO. OF VARIABLES AFTER TRANSFORMATIONS
C          COL. 63- 65  * 1 IF PRINTED PLOTS ONLY DESIRED
C                      *  2 IF MICROFILM PLOTS ONLY DESIRED
C                       * 3 IF PRINTED PLOTS AND MICROFILM ARE BOTH DESIRED
C          COL. 66- 68  1 IF TRANSFORMATIONS NECESSARY
C                       0 IF TRANSFORMATIONS NOT NEEDED
C          COL. 69- 71  1 IF PREVIOUS DATA INPUT TO BE REREAD
C                       0 IF NEW SET OF DATA TO BE INPUT
C          COL. 72- 74  1 IF NEW OBSERVATION NAMES DESIRED AND NO
C                         VARIABLE NAMES DESIRED
C                       0 IF USERS PREVIOUS NAMING SYSTEM FOR CHARACTERS
C                         AND VARIABLES TO BE REREAD
C                       2 IF NEW OBSERVATION NAMES AND VARIABLE NAMES ARE
C                         TO BE ENTERED
C                       3 IF OBSERVATION NAMES ARE TO BE RETAINED BUT
C                         NEW VARIABLE NAMES ARE TO BE ENTERED
C          COL. 75- 77  ALTERNATE UNIT NUMBER FOR DATA SET - A ZERO OR
C                       BLANK DEFAULTS TO SYSTEM STANDARD(UNIT 5)
```

```
C          COL. 78- 80  0 USE THE FOLLOWING STANDARD PLOTTING FUNCTION -
C                         F(T)=SQRT(1/2)X1 + SIN(T)X2 + COS(T)X3 + ...
C                       1 USE FOLLOWING ALTERNATE PLOTTING FUNCTION -
C                         F(T)=SIN(T)X1 + COS(T)X2 + SIN(2T)X3 + ...
C      **************
C      * OBSERVATION*
C      * NAME CARDS *    REQUIRED IF 1 OR 2 PUNCHED IN COLS. 72-74 OF TITLE CARD
C      **************    NUMBER OF NAME CARDS (WHEN REQUIRED) MUST EQUAL NO. OF
C                        INDIVIDUALS (OR CASES)
C          COL.  1- 18  NAME OF INDIVIDUAL (OR CASE)
C          REPEAT FOR EACH INDIVIDUAL. NOTE - NAMES SHOULD BE ASSIGNED TO EACH
C          INDIVIDUAL IN SAME ORDER AS INDIVIDUALS ARE TO BE INPUT IN DATA SET,
C          I.E., 2ND NAME WILL BE ATTACHED TO SECOND INDIVIDUAL IN DATA SET.
C      **************
C      *  VARIABLE  *
C      * NAME CARDS *    REQUIRED IF 2 OR 3 PUNCHED IN COLS. 72-74 OF TITLE CARD
C      **************    NUMBER OF NAME CARDS (WHEN REQUIRED) MUST EQUAL NO. OF
C                        VARIABLES AFTER TRANSFORMATIONS.
C          COL. 1- 18   NAME OF VARIABLE
C          REPEAT FOR EACH VARIABLE. NOTE - NAMES SHOULD BE ASSIGNED TO EACH
C          VARIABLE IN ORDER AFTER TRANSFORMATION.
C      ***************
C      * INPUT FORMAT *  REQUIRED UNLESS 1 PUNCHED IN COLS. 69-71 OF TITLE CARD.
C      ***************
C          SHOULD PROVIDE FOR F OR E SPECIFICATION FOR EACH VARIABLE BEFORE
C      TRASFORMATION.
C      **************
C      * DATA CARDS *    REQUIRED UNLESS 1 PUNCHED IN COLS. 69-71 OF TITLE CARD.
C      **************
C          A MAXIMUM OF 250 INDIVIDUAL CASES, EACH WITH UP TO 50 VARIABLES, MAY
C      BE ENTERED AT ONE TIME.  ALL CARDS FOR EACH INDIVIDUAL SHOULD BE ENTERED
C      IN DATA DECK IN SAME RELATIVE POSITION AS THE CORRESPONDING NAME CARD IN
C      THE NAME CARD SET.
C      **************
C      * PLOT CARDS *
C      **************
C          USER MAY CHOOSE FROM TWO TYPES.
C      TYPE 1  USED FOR PLOTTING UP TO 25 CONSECUTIVE CASES IN ONE PLOT
C          COL.  1-  4  THE WORD 'PLOT'
C          COL.  5-  6  BLANKS
C          COL.  7-  9  INTEGER NO. SPECIFYING THE RELATIVE POSITION (WITH
C                       RESPECT TO DATA DECK) OF THE FIRST INDIVIDUAL IN SUBSET
C                       TO BE PLOTTED
C          COL. 10      COMMA
C          COL. 11- 13  INTEGER NO. SPECIFYING THE RELATIVE POSITION OF THE
C                       LAST INDIVIDUAL IN SUBSET TO BE PLOTTED
C                       EXAMPLE-  PLOT   10, 25
C                       NOTE-  MAXIMUM NO. OF CASES IN EACH SUBSET CANNOT
C                              EXCEED 25
C      TYPE 2  USED FOR PLOTTING UP TO 25 CASES LISTED INDIVIDUALLY
C          COL.  1-  4  THE WORD 'PLOT'
C          COL.  5      BLANK
C          COL.  6-  8  INTEGER NO. OF CASE TO BE PLOTTED
C          COL.  9- 11  INTEGER NO. OF CASE TO BE PLOTTED
C          COL. 12- 14  ETC.
C                       MAXIMUM OF 25 CASES LISTED IN ANY ORDER
C                       EXAMPLE-  PLOT  20  1 14  9 65
C      **************
C      * LABEL CARDS *  OPTIONAL-  IF NO LABEL CARD IS GIVEN, THE TITLE WILL BE
C      ***************              THE SAME AS COLS. 6-53 ON TITLE CARD.
C          COL.  1-  5  THE WORD 'LABEL'
C          COL.  6-53  TITLE FOR THE PLOT PRODUCED BY PRECEEDING PLOT CARD
C      *********************
C      * SUBROUTINES CALLED *
C      *********************
C          OIS
C          READIN
C          CALC
C          ROWF
C
C
C     MAIN
C
      INTEGER TLTC, TLTCK, ANAM, END
      DIMENSION A(80),TITLE(12),FMT(18),ANAM(250,5),X(50),F(250,99),IA(8
     10),IVAR(50,5)
      COMMON R(10),IIU,IOU,IALT,IRR
```

```
      DATA TLTCK,END/4HTITL,4HEND /
      DATA ITEST/4H****/
      IALT=4
      IPROB=0
      IIU=5
      IOU=6
      IRR=9
      READ(IIU,1)MIC,ITAB
    1 FORMAT(2I1)
      IF (MIC .EQ. 0 ) GO TO 4999
C     THE FOLLOWING SUBROUTINE IS MICROFILM DEPENDENT
      CALL OIS
 4999 READ (IIU,10) TLTC,TITLE,NCS,NXVB,NXVA,IPRINT,ITRAN,IREAD,NEWCH,
     1IUNIT,ISIN
   10 FORMAT(A4,1X,12A4,9I3)
      WRITE(IRR,10) TLTC,TITLE,NCS,NXVB,NXVA,IPRINT,ITRAN,IREAD,NEWCH,
     1IUNIT,ISIN
 5000 BACKSPACE  IRR
      READ(IRR,10)  TLTC,TITLE,NCS,NXVB,NXVA,IPRINT,ITRAN,IREAD,NEWCH,
     1IUNIT,ISIN
      IPROB = IPROB + 1
      IF (TLTC .EQ. TLTCK) GO TO 99
      BACKSPACE IRR
      READ(IRR,30) (A(J),J=1,80)                                        1
   30 FORMAT(80A1)
      WRITE(100,40) (A(J),J=1,80)                                       1
   40 FORMAT(78H1THE FOLLOWING CARD IS NOT LABELED 'TITLE'. PROGRAM IS E
     1XPECTING A TITLE CARD. / 1H0, 80A1)
 8000 READ(IIU,42) IA
   42 FORMAT(80A1)
      WRITE(IRR,42) IA
      BACKSPACE IRR
      READ(IRR,43) NXTLE
   43 FORMAT(A4)
      IF(NXTLE.EQ.TLTCK) GO TO 5000
      IF(NXTLE.EQ.END) STOP
      GO TO 8000
   99 IF(NEWCH.EQ.0.OR.NEWCH.EQ.3) GO TO 161
      READ(IIU,60)((ANAM(I,J),J=1,5),I=1,NCS)
   60 FORMAT(5A4)
      IF(NEWCH.EQ.1) GO TO 163
  161 IF(NEWCH.EQ.0) GO TO 65
      READ(IIU,60)((IVAR(I,J),J=1,5),I=1,NXVA)
      GO TO 65
  163 IVAR(1,1) = ITEST
   65 IF (IREAD .EQ. 1) GO TO 90
      READ(IIU,80)(FMT(J),J=1,18)
   80 FORMAT(18A4)
   90 WRITE(100,92) TITLE,NCS,NXVB,NXVA,IPRINT,ITRAN,IREAD,NEWCH,
     1IUNIT,ISIN
   92 FORMAT(1H1,9HJOB TITLE,31X,12A4/10H NO. CASES,30X,I4/
     1 40H NO. DIMENSIONS BEFORE TRANSFORMATIONS  , I4/
     2 40H NO. DIMENSIONS AFTER TRANSFORMATIONS   , I4/
     3 40H PRINT OR MICROFILM OPTION              ,I4 /
     4 22H TRANSFORMATION OPTION,18X,I4/20H RE-READ DATA OPTION,20X,I4/
     5 23H ENTER NEW NAMES OPTION,17X,I4/
     6 40H OPTIONAL UNIT NUMBER FOR DATA SET      , I4 /
     7 40H OPTIONAL SIN FUNCTION                  , I4 )
      IF(IVAR(1,1).EQ.ITEST) GO TO 1400
      WRITE(100,390)
      WRITE(100,100)(I,(IVAR(I,J),J=1,5),I=1,NXVA)
  390 FORMAT(1H0///49H RESPECTIVE VARIABLE LISTING FOR CORRELATION WITH,
     126H TABLE OF LINEAR FUNCTIONS)
  100 FORMAT(4(6X,I3,3H - ,5A4))
 1400 DO 222 IJ = 1,NCS
      CALL READIN (NCS,X,NXVB,NXVA,ITRAN,IREAD,IPROB,FMT,IUNIT)
      CALL CALC(IJ,NXVA,X,F,FMAX,FMIN,ISIN)
  222 CONTINUE
      END FILE IALT
      REWIND IALT
      CALL ROWF($5000,NCS,NXVA,ANAM,F,FMAX,FMIN,TITLE,IPRINT,MIC,ITAB)
      STOP
      END
```

```
NANCE*IPFS.READINSYM
      SUBROUTINE READIN (NCS,X,NXVB,NXVA,ITRAN,IREAD,IPROB,FMT,INUNIT)
C     *PURPOSE*
C         TO READ DATA IN FROM CARDS OR FROM AN ALTERNATE UNIT AND TO SAVE
C     DATA ON AN ALTERNATE UNIT FOR POSSIBLE REREAD OF DATA PREVIOUSLY RECORDED
C     *ARGUMENT DESCRIPTION*
C         NCS - NO. INDIVIDUALS.  EACH INDIVIDUAL IS CAPABLE
C               OF REPRESENTING UP TO 50 OBSERVATIONS.
C           X - MATRIX OF MULTIVARIATE OBSERVATIONS  (SINGLE DIMENSIONED)
C        NXVB - NO. OF VARIABLES BEFORE TRANSFORMATIONS
C        NXVA - NO. OF VARIABLES AFTER TRANSFORMATIONS
C       ITRAN - 1 TRANSFORMATIONS ARE DESIRED
C               0 TRANSFORMATIONS ARE NOT DESIRED
C       IREAD - 1 REREAD OF DATA PREVIOUSLY READ AND RECORDED
C               0 READ NEW DATA
C       IPROB - TITLE PROBLEM NO. OF DATA SET
C         FMT - DATA READIN FORMAT INSTRUCTIONS
C      INUNIT - NO. OF ALTERNATE READIN FOR NEW DATA SET
C               0 IF SYSTEM STANDARD DESIRED
C      *SUBROUTINES CALLED*
C         INTRAN
C
C
      DIMENSION X(50),FMT(18)
      COMMON R(10),IIU,IOU,IALT,IRR
      IF(IREAD.EQ.0) GO TO 500
      READ (IALT) (X(J), J=1, NXVB)
      IF(ITRAN.EQ.1) CALL INTRAN(IPROB,X,NXVB,NXVA,NCS)
      RETURN
  500 INX=IIU
      IF (INUNIT .NE. 0) INX=INUNIT
      READ (INX,FMT) (X(J), J = 1, NXVB)
      WRITE (IALT)   (X(J), J = 1, NXVB)
      IF(ITRAN.EQ.1) CALL INTRAN(IPROB,X,NXVB,NXVA,NCS)
      RETURN
      END
```

```
NANCE*IPFS.INTRANSYM
      SUBROUTINE INTRAN(IPROB,X,NXVB,NXVA,NCS)
C     *PURPOSE*
C         AN OPEN SUBROUTINE FOR USER SUPPLIED FORTRAN TRANSFORMATIONS.
C     *ARGUMENT DESCRIPTION*
C       IPROB - TITLE PROBLEM NO. OF DATA SET
C           X - MATRIX OF MULTIVARIATE OBSERVATIONS (SINGLE DIMENSIONED)
C        NXVB - NO. OF VARIABLES BEFORE TRANSFORMATIONS
C        NXVA - NO. OF VARIABLES AFTER TRANSFORMATIONS
C         NCS - NO. OF CASES
C     *SUBROUTINES CALLED*
C         NONE
C
C
      DIMENSION X(50)
      GO TO (10,10,20,20), IPROB
   10 X(2) = X(3) *(0.9319**2)
      X(3) = X(4) * (0.6979**2)
      X(4) =  X(5) * (1.8240**2)
      X(5) = X(6) * ( 0.2051**2)
      GO TO 1000
   20 X(2) = X(1)
      X(1)=X(5)*(1.8240**2)
      X(5)=X(6)*(0.2051**2)
      X(3)=X(3)*(0.9319**2)
      X(4)=X(4)*(0.6979**2)
 1000 RETURN
      END
```

NANCE*TPF$.CALCS

```
      SUBROUTINE CALC(K,NX,X,F,FMAX,FMIN,ISIN)
C     *PURPOSE*
C         CALCULATES PLOTTING POINTS FOR ANDREWS' PLOTTING METHOD.
C     *ARGUMENT DESCRIPTION*
C           K - INTEGER SEQUENCE NO. OF INDIVIDUAL CASE ENTERED. CASE NOS.
C               RANGE FROM 1 TO TOTAL NO. OF CASES IN DATA SET.
C          NX - NO. OF VARIABLES AFTER TRANSFORMATIONS
C           X - MATRIX OF MULTIVARIATE OBSERVATIONS FOR EACH CASE
C           F - VALUES FOR PLOTTING POINTS FOR EACH INDIVIDUAL. THERE ARE 99
C               PLOTTING POINTS FOR EACH INDIVIDUAL. HENCE, F IS A MATRIX OF
C               NCS X 99 .
C        FMAX - MAXIMUM VALUE IN F
C        FMIN - MINIMUM VALUE IN F
C     *SUBROUTINES CALLED*
C         NONE
      DIMENSION X(50),F(250,99)
      COMMON  /BLKDAT/ FSTAR(51,99), T(99)
      COMMON R(10),I10,I00,IALT,IRR
      NT=99
      IF(K.EQ.1)FMIN=1000.
      IF(K.EQ.1) FMAX=-1000.00
      DO 50 J=1,NT
      F(K,J) = 0.0
      DO 40 L=1,NX
      LL=L
      IF(ISIN.GE.1) LL=L+1
   40 F(K,J) = F(K,J) + X(L) * FSTAR(LL,J)
      IF(F(K,J).GE.FMAX) FMAX=F(K,J)
      IF(F(K,J).LT.FMIN) FMIN=F(K,J)
   50 CONTINUE
      RETURN
      END
```

```
      SUBROUTINE CALC(K,NX,X,F,FMAX,FMIN,ISIN)
C     *PURPOSE*
C         CALCULATES PLOTTING POINTS FOR ANDREWS' PLOTTING METHOD.
C     *ARGUMENT DESCRIPTION*
C           K - INTEGER SEQUENCE NO. OF INDIVIDUAL CASE ENTERED. CASE NOS.
C               RANGE FROM  1 TO TOTAL NO. OF CASES IN DATA SET.
C          NX - NO. OF VARIABLES AFTER TRANSFORMATIONS
C           X - MATRIX OF MULTIVARIATE OBSERVATIONS FOR EACH CASE
C           F - VALUES FOR PLOTTING POINTS FOR EACH INDIVIDUAL.  THERE ARE 99
C               PLOTTING POINTS FOR EACH INDIVIDUAL.  HENCE, F IS A MATRIX OF
C               NCS  X  99 .
C        FMAX - MAXIMUM VALUE IN F
C        FMIN - MINIMUM VALUE IN F
C     *SUBROUTINES CALLED*
C         NONE
      DIMENSION X(50), F(250,99)
      COMMON  /BLKDAT /FSTAR(51,99), T(99)
      COMMON R(10),IIU,IOU,IALT,IRR
      NT=99
      IF (K .EQ. 1) FMIN = 1000.
      IF (K .EQ. 1) FMAX = -1000.
      T(1)=-3.1415926
      T(NT)=-T(1)
      A=NT
      AINC=2.*T(NT)/(A-1.)
      IF(ISIN.GE.1) GO TO 60
      DO 50 J=1,NT
      F(K,J)=0.
      IF(J.EQ.1.OR.J.EQ.NT) GO TO 28
      T(J)=T(J-1)+AINC
   28 DO 40 L=1,NX
      A=L
      IF(L.NE.1) GO TO30
      F(K,J) = X(L) / SQRT(2.)
      RK=1.
      GO TO 40
   30 IF(MOD(L,2).EQ.1) GO TO 35
      F(K,J) = F(K,J) + X(L) * SIN((A-RK)*T(J))
      GO TO 40
   35 RK=RK+1.
      F(K,J) = F(K,J) + X(L) * COS((A-RK)*T(J))
   40 CONTINUE
      IF(F(K,J).GT.FMAX) FMAX=F(K,J)                                        1
      IF(F(K,J).LT.FMIN) FMIN=F(K,J)                                        1
   50 CONTINUE
      GO TO 500
   60 DO 100 J = 1,NT
      F(K,J) = 0.0
      IF(J.EQ.1.OR.J.EQ.NT) GO TO 78
      T(J)=T(J-1)+AINC
      RK=0.0
   78 DO 90 L = 1,NX
      A=L
      IF(MOD(L,2).EQ.0) GO TO 85
      F(K,J)=F(K,J)+X(L)*SIN((A-RK)*T(J))
      GO TO 90
   85 RK=RK+1.0
      F(K,J)=F(K,J)+X(L)*COS((A-RK)*T(J))
   90 CONTINUE
      IF(F(K,J).GT.FMAX)FMAX=F(K,J)
      IF(F(K,J).LT.FMIN)FMIN=F(K,J)
  100 CONTINUE
  500 RETURN
      END
```

```
NANCE*IPF$.ROWFSYM
      SUBROUTINE ROWF($,NCS,NXVA,ANAM,F,FMAX,FMIN,TITLE,IPRINT,MIC,ITAB)
C     *PURPOSE*
C         IDENTIFIES ROWS OF F TO BE PLOTTED.
C     *ARGUMENT DESCRIPTION*
C           $ - EQUIVALENT TO MAIN RETURN STATEMENT
C         NCS - NO. OF CASES
C         NXV - NO. OF VARIABLES AFTER TRANSFORMATIONS
C        ANAM - CASE NAMES
C           F - VALUES FOR PLOTTING POINTS FOR EACH INDIVIDUAL &  99 POINTS/CASE
C        FMAX - MAXIMUM VALUE FOR F
C        FMIN - MINIMUM VALUE FOR F
C       TITLE - TITLE OF PROBLEM STUDY
C      IPRINT - 1  PRINT ONLY DESIRED
C               2  MICROFILM ONLY DESIRED
C               3  BOTH PRINT AND MICROFILM DESIRED
C         MIC - 1  MICROFILM DESIGNATED FOR THIS OR ANOTHER DATA SET WITHIN RUN
C               0  MICROFILM IS NEVER DESIRED
C     *INPUT CARD ORDER*
C         PLOT CARD                 **  REPEATED AS OFTEN
C         LABEL CARD (OPTIONAL)     **  AS DESIRED
C         TITLE OR END CARD       - TITLE IF NEW DATA SET
C                                   END IF NO MORE DATA SETS
C     *SUBROUTINES CALLED*
C         LINF
C         PLTND
C         PLOT1
C         PRIPLT
C         SETUP
C         PLOT
C
C
      INTEGER TLTCK,TLTC,END,COMMAC,COMMA,ANAMW,ANAM,PLOTX
      DIMENSION ANAM(250,5),ANAMW(25,5),F(250,99),FW(25,99),TITLE(12),IM
     1AGE(55,122),IA(80),  OLDTLE(12),IROWF(25)
      COMMON R(10),IIU,IOU,IALT,IRR
      DATA TLTC,END,COMMA,IBLANK/4HTITL,4HEND ,4H,    ,4H    /PLOTX,LABEL
     1/4HPLOT,4HLABE/
      DO 5 I=1,12
      OLDTLE(I)=TITLE(I)
    5 CONTINUE
C   READ PLOT CARD ,CHECK TO SEE IF NEW PROB OR END
 1000 READ(IIU,1101) IA
 1101 FORMAT(80A1)
      WRITE(IRR,1101) IA
      BACKSPACE IRR
   11 READ(IRR,10) TLTCK
      IF(TLTCK.EQ.TLTC)RETURN 1
   10 FORMAT(A4)
      IF(TLTCK .EQ. END) GO TO 25
      IF (TLTCK .EQ. PLOTX) GO TO 28
      IF (TLTCK .EQ. LABEL) GO TO 1000
      WRITE(IOU,24) IA
   24 FORMAT (50H0THE FOLLOWING CARD HAS BEEN INCORRECTLY SUBMITTED  /
     11H0, 80A1)
      IF (TLTCK .NE. END) GO TO 1000
   25 IF(ITAB.GT.0)CALL LINF
      WRITE(IOU,20)
   20 FORMAT (20H1THAT'S ALL FOLKS            )
C     THE FOLLOWING SUBROUTINE IS UNIVAC DEPENDENT
      IF (MIC .NE. 0 .AND. TLTCK .EQ. END) CALL PLTND
      IF (TLTCK .EQ. END) STOP
C  FIND OUT FORMAT OF PLOT CARD AND REREAD
   28 KBEG = 0
      BACKSPACE IRR
      READ(IRR,30) COMMAC
      BACKSPACE IRR
   30 FORMAT(9X,A1)
   50 FORMAT(5X,25I3)
   40 FORMAT(6X,I3,1X,I3)
      IF(COMMAC.EQ.COMMA) READ(IRR,40) KBEG,KEND
      IF (COMMAC .NE. COMMA) READ(IRR,50) (IROWF(K), K= 1,25)
C   TAKE CARE OF FIRST CASE
      IF(KBEG.EQ.0) GO TO 110
      IF(KBEG.LE.NCS.AND.KEND.LE.NCS)GO TO 65
```

```
      IF ((KEND -KBEG) .LE. 25) GO TO 65
   59 WRITE(100,60)
   60 FORMAT(27H ILLEGAL PLOT CARD SKIPPED )
      GO TO 1000
   65 NPS=(KEND-KBEG)+1
      DO 100 I=KBEG,KEND
      ICNT=(I-KBEG)+1
      DO 70 K=1,5
   70 ANAMW(ICNT,K)=ANAM(I,K)
      DO 80 L=1,99
   80 FW(ICNT,L)=F(I,L)
  100 CONTINUE
      READ(IIU,1101) IA
      WRITE(IRR,1101) IA
      BACKSPACE IRR
      READ(IRR,1100) TLTCK
      BACKSPACE IRR
      IF(TLTCK.NE.LABEL) GO TO 1102
      READ(IRR,1100) LABL,TITLE
 1100 FORMAT(A4,1X,12A4)
      GO TO 1128
 1102 DO 2505 IJ=1,12
      TITLE (IJ) = OLDTLE(IJ)
 2505 CONTINUE
 1128 IF (IPRINT .EQ. 2) GO TO 600
      CALL PLOT1(IMAGE, +3.14159, -3.14159, FMAX,FMIN)
      CALL PRIPLT(NPS,ANAMW,FW,TITLE)
      IF (IPRINT .EQ. 1) GO TO 700
C     THE FOLLOWING SUBROUTINE IS MICROFILM DEPENDENT
  600 CALL SETUP(FMAX, FMIN, TITLE)
C     THE FOLLOWING SUBROUTINE IS MICROFILM DEPENDENT
      CALL PLOT(NPS,NXV,ANAMW,FW)
  700 IF (TLTCK .EQ. LABEL) GO TO 1000
       GO TO 11
C TAKE CARE OF SECOND CASE
  110 NPS=0
      DO 300 K = 1, 25
      IF (IROWF(K) .GT. 0) GO TO 150
      NPS=NPS+(K-1)                                                    1
      GO TO 400
  150 II = IROWF(K)
      IF(II.GT.250) GO TO 210
      DO 170 J=1,5
  170 ANAMW(K,J)=ANAM(II,J)                                            1
      DO 180 L = 1, 99
  180 FW(K,L)=F(II,L)                                                  1
      GO TO 300
  210 CONTINUE
      WRITE(100,500) II
  500 FORMAT(20H CASE NUMBER          , I4, 20H     IS TOO LARGE          )
      NPS=NPS-1                                                        1
  300 CONTINUE
      NPS = 25
  400 CONTINUE
      READ(IIU,1101) IA
      WRITE(IRR,1101) IA
      BACKSPACE IRR
      READ(IRR,1100) TLTCK
      BACKSPACE IRR
      IF(TLTCK.NE.LABEL) GO TO 1151
      READ(IRR,1100) LABL,TITLE
 1151 IF(NPS.LE.0.AND.TLTCK.NE.LABEL) GO TO 11
      IF (NPS .LE. 0 .AND. TLTCK .EQ. LABEL) GO TO 59
      IF (NPS .GT. 0) GO TO 1103
      WRITE (100,60)
      GO TO 11
 1103 IF(TLTCK.EQ.LABEL) GO TO 1128
      DO 2560 IJ=1,12
      TITLE (IJ) = OLDTLE (IJ)
 2560 CONTINUE
      GO TO 1128
      END
```

NANCE*TPF$.SETUPSYM

```
      SUBROUTINE SETUP(FMAX,FMIN,TITLE)
C     *PURPOSE*
C         TO GENERATE A MICROFILM GRID FOR EACH PLOT ON MICROFILM.
C     *ARGUMENT DESCRIPTION*
C        FMAX - MAXIMUM VALUE FOR F
C        FMIN - MINIMUM VALUE FOR F
C       TITLE - TITLE OF PROBLEM STUDY
C     *SUBROUTINES CALLED*
C         GRID
C         PRINTV
C         RITE2V
C     *NOTE*
C         THIS SUBROUTINE IS MICROFILM DEPENDENT
C
C
      DIMENSION TITLE (8)
      NT = 99
      DIF = ( FMAX - FMIN) / 10.
      YB = FMIN - DIF
      YT=FMAX+DIF
      AAB=-3.1415926
      AAT=3.1415926
      CALL GRID(AAB,AAT,70,30,YB,YT,140,40)
      CALL SCALE(NT,AAB,AAB,AAT,0,0,0,13,YB,FMIN,FMAX,7,2,3)
      CALL PRINTV(5,5H-3.14,41,121)
      CALL PRINTV(4,4H3.14,978,121)
      CALL RITE2V(76,1004,1023,90,2,48,1,TITLE,NLAST)
      RETURN
      END
```

```
NANCE*TPF$.PLOTSYM
      SUBROUTINE PLOT(NPS, NX,ANAMW,FW)
C     *PURPOSE*
C         TO PRINT NAME LABELS, PLOT CURVES, AND LABEL THE CURVES ON MICROFILM.
C     *ARGUMENT DESCRIPTION*
C         NPS - NO. OF CASES
C          NX - NO. OF VARIABLES AFTER TRANSFORMATIONS
C       ANAMW - NAMES OF INDIVIDUAL CASES DESIRED
C          FW - VALUES FOR PLOTTING POINTS FOR EACH INDIVIDUAL.  99 POINTS/CASE
C     *SUBROUTINES CALLED*
C         PRINTV
C         LINEV
C     *NOTE*
C         THIS SUBROUTINE IS MICROFILM DEPENDENT
C
C
      INTEGER CHW,ANAMW, DUM, B
      DIMENSION DUM(3), CHW(25), ANAMW(25,3),FW(25,99)
      COMMON  /BLKDAT /FSTAR(51,99), T(99)
      COMMON R(10),I1U,IOU,IALT,IRR
      DATA CHW/'A','B','C','D','E','F','G','H','I','J','K','L','M',
     1'N','O','P','Q','R','S','T','U','V','W','X','Y'/
C   WRITE BOTTOM LABELS
      NT=99
      LL=1
      KNT=0
      IF(NPS.LE.0) RETURN
      IF(NPS.LT.4) NN=NPS
      IF(NPS.GE.4) NN=4
      IY=94
   65 IX=63
      DO 80 I=1,NN
      KNT=KNT+1
      B=CHW(KNT)
      CALL PRINTV (1,B,IX,IY)
      IX1=IX+12
      CALL PRINTV (-1,1H-,IX1,IY)
      DO 70 J=1,3
   70 DUM(J)=ANAMW(KNT,J)
      IX1=IX1+12
      CALL PRINTV(18,DUM,IX1,IY)
   80 IX=IX+255
      IF(NPS.LE.(LL*4)) GO TO 100
      LL=LL+1
      IF(NPS.LT.(LL*4)) NN=NPS-((LL-1)*4)                                    1
      IF(NPS.GE.(LL*4)) NN=4                                                 1
      IY=IY-14
      GO TO 65
C
C    PLOT CURVES
C
  100 DO 130 K=1,NPS
      I1=2+K
      I2=33+K
      I3=66+K
      DO 130 I=1,NT
      IX2=R(3)*T(I)+R(5)                                                     1
      IY2=R(4)*FW(K,I)+R(6)                                                  1
      IF(I.EQ.1.OR.I.EQ.I1.OR.I.EQ.I2.OR.I.EQ.I3.OR.I.EQ.99) GO TO 120
      IF(I.EQ.2.OR.I.EQ.(I1-1).OR.I.EQ.(I2-1).OR.I.EQ.(I3-1).OR.I.EQ.98)
     1GO TO 107
      GO TO 110
  107 CALL PRINTV(1,CHW(K),IX2,IY2)
      GO TO 120
  110 CALL LINEV(IX1,IY1,IX2,IY2)
  120 IX1 = IX2
      IY1=IY2
  130 CONTINUE
  163 RETURN
      END
```

```
      SUBROUTINE PRIPLT(NPS,ANAMW,FW,TITLE)
C     *PURPOSE*
C         LOCATES PLOTTED POINTS IN A MATRIX (IMAGE) DIMENSIONED TO
C     SIMULATE A PRINTED PAGE.
C     *ARGUMENT DESCRIPTION*
C         NPS - NO. OF CASES
C       ANAMW - NAMES OF INDIVIDUAL CASES DESIRED
C          FW - ROWS OF F TO BE PLOTTED.    99 POINTS/CASE
C       TITLE - TITLE OF ILLUSTRATION
C     *SUBROUTINES CALLED*
C         PLOT2
C         PLOT3
C
C
      INTEGER ANAMW,CHW
      DIMENSION CHW(25),ANAMW(25,5),FW(25,99),TITLE(12)
      COMMON  /BLKDAT /FSTAR(51,99), T(99)
      COMMON R(10),IIU,IOU,IALT,IRR
      DATA CHW/'A','B','C','D','E','F','G','H','I','J','K','L','M',
     1'N','O','P','Q','R','S','T','U','V','W','X','Y'/
C    PLOT FW INTO IMAGE
      DO 100 I = 1, NPS
      DO 100 J = 1, 99
      CALL PLOT2(T(J), FW(I,J), CHW(I))
  100 CONTINUE
C    PRINT OUT GRAPH
      WRITE (IOU,10) TITLE
   10 FORMAT(1H1,41(1H*),12A4,40(1H*))
      CALL PLOT3
C    PRINT OUT LABELS FOR GRAPH
      WRITE(IOU,15)
      WRITE(IOU,20) (CHW(I),(ANAMW(I,J),J=1,5), I = 1,NPS)
   15 FORMAT(1H1, 'LABELS HAVE BEEN MODIFIED FOR READABILITY')
   20 FORMAT(4(7X,A2,3H - ,5A4))
      RETURN
      END
```

```
      SUBROUTINE SCHEME
C     ENTRY PLOT1(IMAGE,XMAX,XMIN,YMAX,YMIN)
C     ENTRY PLOT2(X,Y,IT)
C     ENTRY PLOT3
C     *PURPOSE*
C         TO PERFORM A 'CORE PLOT' BY LOCATING PLOTTED POINTS IN A MATRIX
C     (IMAGE) DIMENSIONED TO SIMULATE A PRINTED PAGE.
C     *ARGUMENT DESCRIPTION*
C       IMAGE - INTEGER MATRIX FOR PLOTTING
C        XMAX - MAXIMUM VALUES FOR X COORDINATE
C        XMIN - MINIMUM VALUES FOR X COORDINATE
C        YMAX - MAXIMUM VALUES FOR Y COORDINATE
C        YMIN - MINIMUM VALUES FOR Y COORDINATE
C           X - X VALUE FOR A POINT
C           Y - Y VALUE FOR SAME POINT
C          IT - INTEGER LABEL FOR POINT
C     *SUBROUTINES CALLED*
C         SHUX
C
C
      ENTRY PLOT1(IMAGE,XMAX,XMIN,YMAX,YMIN)
      INTEGER DASH,BLANK,EYE
      DIMENSION IMAGE(55,122)
      COMMON  /BLKDAT /FSTAR(51,99), T(99)
      COMMON R(10),IIU,IOU,IALT,IRR
      DATA DASH,BLANK,EYE/1H-,4H    ,1HI/
      DATA M/1H$/
      IMPT=0
      NCOLS=121
      DO 10 I = 1, 55
      DO 10 J = 1, NCOLS
      IMAGE (I,J) = BLANK
      IF (I .NE. 1 .OR. I .NE. 55) GO TO 5
      IMAGE (I,J) = DASH
    5 IF (J .NE. 1 .OR. J .NE. NCOLS) GO TO 10
      IMAGE (I,J) = EYE
   10 CONTINUE
      ISW = 1
      NBAD = 0
      DO 12 I = 1, NCOLS, 10
      DO 12 J = 1,55
   12 IMAGE(J,I) = EYE
      IF(XMAX.LE.XMIN) CALL ER1 (1,XMAX,XMIN,ISW)
      IF(YMAX.LE.YMIN) CALL ER1 (2,YMAX,YMIN,ISW)
      RETURN
      ENTRY PLOT2(X,Y,IT)
      NCOLS=121
      IF(ISW.EQ.2) RETURN
      IPX = 1.49 + FLOAT(NCOLS -1) * (X-XMIN) / (XMAX -XMIN)
      IPY=1.49 +54. * (Y-YMIN)/(YMAX-YMIN)
      ISW1 = 1
      IF (IPX .LT. 1 .OR. IPX .GT. NCOLS) CALL ER2(1,IPX,ISW1,NBAD)
      IF(IPY.LT. 1.OR.IPY.GT.55)  CALL ER2(2,IPY,ISW1,NBAD)
      IF(ISW1.EQ.2) RETURN
      IF(IMAGE(IPY,IPX) .EQ. BLANK .OR.
     1   IMAGE(IPY,IPX) .EQ. EYE .OR.
```

```
      2    IMAGE(IPY,IPX) .EQ. DASH) GO TO 59
       IMAGE(IPY,IPX) = M
       GO TO 60
   59 IMAGE(IPY,IPX) = IT
   60 RETURN
      ENTRY PLOT3
      NCOLS=121
      DIMENSION NAME(55)
      DATA NN/55/
      DATA NAME/55*1H /
      IF(ISW .EQ. 2) RETURN
      IF(NN.GE. 54) GO TO 80
      NM=NN+1
      DO 75 I=NM,55
   75 NAME(I) = BLANK
   80 CONTINUE
      DO 99 I=1,55
      IDX=56-I
      JT=I- ((I/9)*9)
      IF(JT.EQ.1) GO TO 90
      GO TO 95
   90 P=IDX-1
      Z=P*(YMAX-YMIN)/54.+YMIN
      WRITE (100, 87) NAME(I),Z,(IMAGE(IDX,K),K=1,NCOLS)
   87 FORMAT(1H ,A1,1PE09.2,121A1)
      GO TO 96
   95 WRITE(100,88) NAME(I), (IMAGE(IDX,K),K=1, NCOLS)
   88 FORMAT(1H ,A1,09X,121A1)
   96 CONTINUE
   99 CONTINUE
      DIMENSION PUT(13)
      K=0
      DO 100 I = 1, NCOLS, 10
      P=I-1
      Z = P * (XMAX - XMIN) / FLOAT(NCOLS-1) + XMIN
      K=K+1
      PUT(K)=Z
  100 CONTINUE
      IDI = NCOLS/10
      WRITE(100,102) (PUT(I),I=1,IDI)
  102 FORMAT(1H ,6X,12(1PE10.3))
      IF(NBAD.GT. 0) WRITE(6,103) NBAD
  103  FORMAT(1H ,I8,50H POINTS WERE OUTSIDE PLOTTING AREA AND NOT PLOTT
     1ED)
      RETURN
      END
```

NANCE*IPFD.SHOXSYM

```
      SUBROUTINE SHOX
C     ENTRY ER1(I,X,Y,ISW)
C     ENTRY ER2(I,IP,IS,NC)
C     *PURPOSE*
C         A UTILITY ROUTINE TO HANDLE OVERPLOTS FROM SHEME.
C     *ARGUMENT DESCRIPTION*
C         THE ARGUMENT LIST FOR THE TWO ENTRY POINTS ER1 AND ER2
C     ARE INTEGRATED INTO THE LOGIC OF SCHEME.
      ENTRY ER1(I,X,Y,ISW)
      IF(I.EQ.1) WRITE(6,8) X,Y
    8 FORMAT(1H ,26H XMAX  IS  LE   XMIN,XMAX=,E14.7, 9H XMIN   =,E14.7)
    9 FORMAT(1H ,29H YMAX IS LE  YMIN , YMAX IS =,E14.7,10H YMIN IS =,
     1E14.7)
      ISW=2
      RETURN
      ENTRY ER2(I,IP,IS,NC)
      IS=2
      NC=NC+1
      RETURN
      END
```

NANCE*IPFD.GRIDSYM

```
      SUBROUTINE GRID(XL,XR,ML,MR,YB,YT,MB,MT)
C     *PURPOSE*
C         TO PRODUCE A FRAMEWORK AND GRID AREA TAILORED FOR EACH DATA SET.
C     *ARGUMENT DESCRIPTION*
C          XL -  FLOATING POINT LEFTMOST VALUE OF X
C          XR -  FLOATING POINT RIGHTMOST VALUE OF X
C          ML -  MARGIN SPACE LEFT OF SCALED AREA
C          MR -  MARGIN SPACE RIGHT OF SCALED AREA
C          YB -  FLOATING POINT BOTTOM VALUE OF Y
C          YT -  FLOATING POINT TOP VALUE OF Y
C          MB -  MARGIN SPACE BELOW SCALED AREA
C          MT -  MARGIN SPACE ABOVE SCALED AREA
C     *SUBROUTINES CALLED*
C         YSCALV
C         XSCALV
C         SCLSAV
C         FRAMEV
C         LINEV
C
C         THIS SUBROUTINE IS MICROFILM DEPENDENT
      COMMON R(10),I1U,IOU,IALT,IRR
      CALL YSCALV(YB,YT,MB,MT)
      CALL XSCALV(XL,XR,ML,MR)
      CALL SCLSAV(R)
      I1 = R(9)
      I2 = R(7)
      I3 = R(10)
      I4 = R(8)
      CALL FRAMEV(3)
      CALL LINEV(I1,I3,I2,13)
      CALL LINEV(I2,I3,I2,14)
      CALL LINEV(I2,I4,I1,14)
      CALL LINEV(I1,I4,I1,13)
      RETURN
      END
```

```
NANCE*IPF$.SCALESYM
      SUBROUTINE SCALE(NX,XXL,XF,XL,NCHARX,NTX,NDMAXX,NY,YB,YF,YL,NCHARY
     1,NTY,NDMAXY)
C     *PURPOSE*
C          TO PRODUCE SCALING FACTORS BY WHICH THE PLOT MAY BE LABLED AND
C     INCREMENTED ACCORDING TO EACH SPECIFIED DATA SET.
C     *ARGUMENT DESCRIPTION*
C          NX - NO. OF INCREMENTAL VALUES ON X AXIS
C         XXL - FLOATING POINT VALUE OF X FOR LEFT MOST LIMITS OF GRID
C          XF - FLOATING POINT VALUE OF X FOR LEFT MOST LABEL OF GRID
C          XL - FLOATING POINT VALUE OF X FOR RIGHT MOST LABEL OF GRID
C      NCHARX - NO. OF CHARACTERS DISPLAYED IN EACH LABEL ON X AXIS
C         NTX - NO. OF OVERSTRIKES IN PRINTING THE LABELS OF X
C      NDMAXX - MAXIMUM NO. OF PLACES TO LEFT OF DECIMAL IN X-AXIS LABELS
C          NY - NO. OF INCREMENTAL VALUES ON Y AXIS
C          YB - FLOAING POINT VALUE OF BOTTOM LIMITS OF Y
C          YF - FLOATING POINT VALUE OF Y FOR BOTTOM LABEL OF GRID
C          YL - FLOATING POINT VALUE OF Y FOR TOP LABEL OF GRID
C      NCHARY - NO. OF CHARACTERS DISPLAYED IN EACH LABEL ON Y AXIS
C         NTY - NO. OF OVERSTRIKES IN PRINTING THE LABELS OF Y
C      NDMAXY - MAXIMUM NO. OF PLACES TO LEFT OF DECIMAL IN Y-AXIS LABELS
C
C          THIS SUBROUTINE IS MICROFILM DEPENDENT
      COMMON R(10)
    5 A=NX
      B=NY
      G=NCHARX
      H=NCHARY
      AINC=(XL-XF)/(A-1.)
      C=XF
      D=YB
      IY=R(4)*D+R(6)-18.
   10 IX=R(3)*C+R(5)-(6.*G/2.)
      IF(NCHARX.EQ.0) GO TO 12
      CALL LABLV(C,IX,IY,NCHARX,NTX,NDMAXX)
   12 IY1=IY+16
      IY2=IY+25
      IX1=R(3)*C+R(5)
      CALL LINEV(IX1,IY1,IX1,IY2)
      IF(XF.EQ.XL) GO TO 15
      C=C+AINC
      IF(C.LE.XL) GO TO 10
   15 AINC=(YL-YF)/(B-1.)
      C=XXL
      D=YF
      IX=R(3)*C+R(5)-(6.*H+12.)
   20 IY=R(4)*D+R(6)
      IF(NCHARY.EQ.0) GO TO 22
      CALL LABLV(D,IX,IY,NCHARY,NTY,NDMAXY)
   22 IY1=IY
      IX1=R(3)*C+R(5)
      IX2=IX1+6
      IF(YF.EQ.YL) GO TO 25
      CALL LINEV(IX1,IY1,IX2,IY1)
      D=D+AINC
      IF(D.LE.YL) GO TO 20
   25 RETURN
      END
```

NANCE*IPF$.OISSYM

```
      SUBROUTINE OIS
C     *PURPOSE*
C         TO ENABLE THE CONTROL CLERK TO RETURN THE DEVELOPED OUTPUT TO
C     THE RIGHT PROGRAMMER AND TO SET UP THE CAMERA.
C     *CONTROL CARDS*
C     CARD 1 COL.  1- 12  USER'S NAME
C     CARD 2 COL.  1- 12  DESTINATION CODE
C     CARD 3 COL.  1-  6  PHONE NO.
C     CARD 4 COL.  1- 48  SOLID ASTERISKS
C     CARD 5 COL.  1- 54  PROCESSING INFORMATION
C     CARD 6 COL.  1- 66  SOLID ASTERISKS
C     *SUBROUTINES CALLED*
C         IDFRMV
C         CAMRAV
C
C         THIS SUBROUTINE IS MICROFILM DEPENDENT
      DIMENSION NAME(2),DEST(2),INSTR(28)
      READ(5,10) NAME,DEST,PHONE,INSTR
   10 FORMAT(2A6/2A6/A6/8A6/9A6/11A6)
      CALL IDFRMV(NAME,DEST,PHONE,INSTR)
      CALL CAMRAV(35)
      RETURN
      END
```

NANCE*IPF$.LINFSYM

```
      SUBROUTINE LINF
C     *PURPOSE*
C         TO PRODUCE A TABLE OF LINEAR FUNCTIONS FOR THE ANDREWS
C     PLOTTING METHOD.
C     *SUBROUTINES CALLED*
C         NONE
      DIMENSION V(99)
      COMMON  /BLKDAT /FSTAR(51,99), T(99)
      COMMON R(10),IIU,IOU,IALT,IRR
      ISTART = -19
      IEND = 0
      DO 1000 JK = 1,5
      ISTART = ISTART+20
      IEND = IEND+20
      IF(IEND.EQ.100)IEND=99
C     WRITE HEADING FOR TABLE
      WRITE(100,10)
   10 FORMAT(1H1,37X,53HTABLE OF LINEAR FUNCTIONS FOR ANDREWS PLOTTING M
     1ETHOD//59X,11HVALUES OF T/12X,120(1H*))
      WRITE(100,20)  (T(I),I=ISTART,IEND)
   20 FORMAT(1H ,11X,20F6.2)
      DO 60 I = 1, 50
      DO 50 J = ISTART,IEND
   50 V(J) = FSTAR(I,J)
      WRITE(100,55)  I, (V(II),II=ISTART,IEND)
   55 FORMAT(1H ,8X,I3,20F6.2)
   60 CONTINUE
 1000 CONTINUE
      RETURN
      END
```

```
      BLOCK DATA
      COMMON /BLKDAT/FSTAR(51,99), T(99)
      DATA  T  /
     1-3.142,-3.077,-3.013,-2.949,-2.885,-2.821,-2.757,-2.693,-2.629,
     1-2.565,-2.500,-2.436,-2.372,-2.308,-2.244,-2.180,-2.116,-2.052,
     1-1.988,-1.923,-1.859,-1.795,-1.731,-1.667,-1.603,-1.539,-1.475,
     1-1.411,-1.346,-1.282,-1.218,-1.154,-1.090,-1.026, -.962, -.898,
     1 -.833, -.769, -.705, -.641, -.577, -.513, -.449, -.385, -.321,
     1 -.256, -.192, -.128, -.064, -.000,  .064,  .128,  .192,  .256,
     1  .321,  .385,  .449,  .513,  .577,  .641,  .705,  .769,  .833,
     1  .898,  .962, 1.026, 1.090, 1.154, 1.218, 1.282, 1.346, 1.411,
     1 1.475, 1.539, 1.603, 1.667, 1.731, 1.795, 1.859, 1.923, 1.988,
     1 2.052, 2.116, 2.180, 2.244, 2.308, 2.372, 2.436, 2.500, 2.565,
     1 2.629, 2.693, 2.757, 2.821, 2.885, 2.949, 3.013, 3.077, 3.142/
      DATA   (FSTAR( 1,J),J=1,99) /   99*.707/
      DATA   (FSTAR( 2,J),J=1,99) /
     1 -.000, -.064, -.128, -.191, -.254, -.315, -.375, -.434, -.491,
     1 -.546, -.598, -.648, -.696, -.740, -.782, -.820, -.855, -.887,
     1 -.914, -.938, -.959, -.975, -.987, -.995, -.999, -.999, -.995,
     1 -.987, -.975, -.959, -.938, -.914, -.887, -.855, -.820, -.782,
     1 -.740, -.696, -.648, -.598, -.546, -.491, -.434, -.375, -.315,
     1 -.254, -.191, -.128, -.064, -.000,  .064,  .128,  .191,  .254,
     1  .315,  .375,  .434,  .491,  .546,  .598,  .648,  .696,  .740,
     1  .782,  .820,  .855,  .887,  .914,  .938,  .959,  .975,  .987,
     1  .995,  .999,  .999,  .995,  .987,  .975,  .959,  .938,  .914,
     1  .887,  .855,  .820,  .782,  .740,  .696,  .648,  .598,  .546,
     1  .491,  .434,  .375,  .315,  .254,  .191,  .128,  .064,  .000/
      DATA   (FSTAR( 3,J),J=1,99) /
     1-1.000, -.998, -.992, -.982, -.967, -.949, -.927, -.901, -.871,
     1 -.838, -.801, -.761, -.718, -.672, -.623, -.572, -.518, -.463,
     1 -.405, -.345, -.285, -.223, -.160, -.096, -.032,  .032,  .096,
     1  .160,  .223,  .285,  .345,  .405,  .463,  .518,  .572,  .623,
     1  .672,  .718,  .761,  .801,  .838,  .871,  .901,  .927,  .949,
     1  .967,  .982,  .992,  .998, 1.000,  .998,  .992,  .982,  .967,
     1  .949,  .927,  .901,  .871,  .838,  .801,  .761,  .718,  .672,
     1  .623,  .572,  .518,  .463,  .405,  .345,  .285,  .223,  .160,
     1  .096,  .032, -.032, -.096, -.160, -.223, -.285, -.345, -.405,
     1 -.463, -.518, -.572, -.623, -.672, -.718, -.761, -.801, -.838,
     1 -.871, -.901, -.927, -.949, -.967, -.982, -.992, -.998,-1.000/
      DATA   (FSTAR( 4,J),J=1,99) /
     1  .000,  .128,  .254,  .375,  .491,  .598,  .696,  .782,  .855,
     1  .914,  .959,  .987,  .999,  .995,  .975,  .938,  .887,  .820,
     1  .740,  .648,  .546,  .434,  .315,  .191,  .064, -.064, -.191,
     1 -.315, -.434, -.546, -.648, -.740, -.820, -.887, -.938, -.975,
     1 -.995, -.999, -.987, -.959, -.914, -.855, -.782, -.696, -.598,
     1 -.491, -.375, -.254, -.128, -.000,  .128,  .254,  .375,  .491,
     1  .598,  .696,  .782,  .855,  .914,  .959,  .987,  .999,  .995,
     1  .975,  .938,  .887,  .820,  .740,  .648,  .546,  .434,  .315,
     1  .191,  .064, -.064, -.191, -.315, -.434, -.546, -.648, -.740,
     1 -.820, -.887, -.938, -.975, -.995, -.999, -.987, -.959, -.914,
     1 -.855, -.782, -.696, -.598, -.491, -.375, -.254, -.128, -.000/
      DATA   (FSTAR( 5,J),J=1,99) /
     1 1.000,  .992,  .967,  .927,  .871,  .801,  .718,  .623,  .518,
     1  .405,  .285,  .160,  .032, -.096, -.223, -.345, -.463, -.572,
     1 -.672, -.761, -.838, -.901, -.949, -.982, -.998, -.998, -.982,
     1 -.949, -.901, -.838, -.761, -.672, -.572, -.463, -.345, -.223,
     1 -.096,  .032,  .160,  .285,  .405,  .518,  .623,  .718,  .801,
     1  .871,  .927,  .967,  .992, 1.000,  .992,  .967,  .927,  .871,
     1  .801,  .718,  .623,  .518,  .405,  .285,  .160,  .032, -.096,
     1 -.223, -.345, -.463, -.572, -.672, -.761, -.838, -.901, -.949,
     1 -.982, -.998, -.998, -.982, -.949, -.901, -.838, -.761, -.672,
     1 -.572, -.463, -.345, -.223, -.096,  .032,  .160,  .285,  .405,
     1  .518,  .623,  .718,  .801,  .871,  .927,  .967,  .992, 1.000/
      DATA   (FSTAR( 6,J),J=1,99) /
     1 -.000, -.191, -.375, -.546, -.696, -.820, -.914, -.975, -.999,
     1 -.987, -.938, -.855, -.740, -.598, -.434, -.254, -.064,  .128,
     1  .315,  .491,  .648,  .782,  .887,  .959,  .995,  .995,  .959,
     1  .887,  .782,  .648,  .491,  .315,  .128, -.064, -.254, -.434,
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      1 -.598, -.740, -.855, -.938, -.987, -.999, -.975, -.914, -.820,
      1 -.696, -.546, -.375, -.191, -.000,  .191,  .375,  .546,  .696,
      1  .820,  .914,  .975,  .999,  .987,  .938,  .855,  .740,  .598,
      1  .434,  .254,  .064, -.128, -.315, -.491, -.648, -.782, -.887,
      1 -.959, -.995, -.995, -.959, -.887, -.782, -.648, -.491, -.315,
      1 -.128,  .064,  .254,  .434,  .598,  .740,  .855,  .938,  .987,
      1  .999,  .975,  .914,  .820,  .696,  .546,  .375,  .191,  .000/
      DATA    (FSTAR( 7,J),J=1,99) /
      1-1.000, -.982, -.927, -.838, -.718, -.572, -.405, -.223, -.032,
      1  .160,  .345,  .518,  .672,  .801,  .901,  .967,  .998,  .992,
      1  .949,  .871,  .761,  .623,  .463,  .285,  .096, -.096, -.285,
      1 -.463, -.623, -.761, -.871, -.949, -.992, -.998, -.967, -.901,
      1 -.801, -.672, -.518, -.345, -.160,  .032,  .223,  .405,  .572,
      1  .718,  .838,  .927,  .982, 1.000,  .982,  .927,  .838,  .718,
      1  .572,  .405,  .223,  .032, -.160, -.345, -.518, -.672, -.801,
      1 -.901, -.967, -.998, -.992, -.949, -.871, -.761, -.623, -.463,
      1 -.285, -.096,  .096,  .285,  .463,  .623,  .761,  .871,  .949,
      1  .992,  .998,  .967,  .901,  .801,  .672,  .518,  .345,  .160,
      1 -.032, -.223, -.405, -.572, -.718, -.838, -.927, -.982-1.000/
      DATA    (FSTAR( 8,J),J=1,99) /
      1  .000,  .254,  .491,  .696,  .855,  .959,  .999,  .975,  .887,
      1  .740,  .546,  .315,  .064, -.191, -.434, -.648, -.820, -.938,
      1 -.995, -.987, -.914, -.782, -.598, -.375, -.128,  .128,  .375,
      1  .598,  .782,  .914,  .987,  .995,  .938,  .820,  .648,  .434,
      1  .191, -.064, -.315, -.546, -.740, -.887, -.975, -.999, -.959,
      1 -.855, -.696, -.491, -.254, -.000,  .254,  .491,  .696,  .855,
      1  .959,  .999,  .975,  .887,  .740,  .546,  .315,  .064, -.191,
      1 -.434, -.648, -.820, -.938, -.995, -.987, -.914, -.782, -.598,
      1 -.375, -.128,  .128,  .375,  .598,  .782,  .914,  .987,  .995,
      1  .938,  .820,  .648,  .434,  .191, -.064, -.315, -.546, -.740,
      1 -.887, -.975, -.999, -.959, -.855, -.696, -.491, -.254, -.000/
      DATA    (FSTAR( 9,J),J=1,99) /
      1 1.000,  .967,  .871,  .718,  .518,  .285,  .032, -.223, -.463,
      1 -.672, -.838, -.949, -.998, -.982, -.901, -.761, -.572, -.345,
      1 -.096,  .160,  .405,  .623,  .801,  .927,  .992,  .992,  .927,
      1  .801,  .623,  .405,  .160, -.096, -.345, -.572, -.761, -.901,
      1 -.982, -.998, -.949, -.838, -.672, -.463, -.223,  .032,  .285,
      1  .518,  .718,  .871,  .967, 1.000,  .967,  .871,  .718,  .518,
      1  .285,  .032, -.223, -.463, -.672, -.838, -.949, -.998, -.982,
      1 -.901, -.761, -.572, -.345, -.096,  .160,  .405,  .623,  .801,
      1  .927,  .992,  .992,  .927,  .801,  .623,  .405,  .160, -.096,
      1 -.345, -.572, -.761, -.901, -.982, -.998, -.949, -.838, -.672,
      1 -.463, -.223,  .032,  .285,  .518,  .718,  .871,  .967, 1.000/
      DATA    (FSTAR(10,J),J=1,99) /
      1 -.000, -.315, -.598, -.820, -.959, -.999, -.938, -.782, -.546,
      1 -.254,  .064,  .375,  .648,  .855,  .975,  .995,  .914,  .740,
      1  .491,  .191, -.128, -.434, -.696, -.887, -.987, -.987, -.887,
      1 -.696, -.434, -.128,  .191,  .491,  .740,  .914,  .995,  .975,
      1  .855,  .648,  .375,  .064, -.254, -.546, -.782, -.938, -.999,
      1 -.959, -.820, -.598, -.315, -.000,  .315,  .598,  .820,  .959,
      1  .999,  .938,  .782,  .546,  .254, -.064, -.375, -.648, -.855,
      1 -.975, -.995, -.914, -.740, -.491, -.191,  .128,  .434,  .696,
      1  .887,  .987,  .987,  .887,  .696,  .434,  .128, -.191, -.491,
      1 -.740, -.914, -.995, -.975, -.855, -.648, -.375, -.064,  .254,
      1  .546,  .782,  .938,  .999,  .959,  .820,  .598,  .315,  .000/
      DATA    (FSTAR(11,J),J=1,99) /
      1-1.000, -.949, -.801, -.572, -.285,  .032,  .345,  .623,  .838,
      1  .967,  .998,  .927,  .761,  .518,  .223, -.096, -.405, -.672,
      1 -.871, -.982, -.992, -.901, -.718, -.463, -.160,  .160,  .463,
      1  .718,  .901,  .992,  .982,  .871,  .672,  .405,  .096, -.223,
      1 -.518, -.761, -.927, -.998, -.967, -.838, -.623, -.345, -.032,
      1  .285,  .572,  .801,  .949, 1.000,  .949,  .801,  .572,  .285,
      1 -.032, -.345, -.623, -.838, -.967, -.998, -.927, -.761, -.518,
      1 -.223,  .096,  .405,  .672,  .871,  .982,  .992,  .901,  .718,
      1  .463,  .160, -.160, -.463, -.718, -.901, -.992, -.982, -.871,
      1 -.672, -.405, -.096,  .223,  .518,  .761,  .927,  .998,  .967,
      1  .838,  .623,  .345,  .032, -.285, -.572, -.801, -.949,-1.000/
      DATA    (FSTAR(12,J),J=1,99) /
      1  .000,  .375,  .696,  .914,  .999,  .938,  .740,  .434,  .064,
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     1 -.315, -.648, -.887, -.995, -.959, -.782, -.491, -.128,  .254,
     1  .598,  .855,  .987,  .975,  .820,  .546,  .191, -.191, -.546,
     1 -.820, -.975, -.987, -.855, -.598, -.254,  .128,  .491,  .782,
     1  .959,  .995,  .887,  .648,  .315, -.064, -.434, -.740, -.938,
     1 -.999, -.914, -.696, -.375, -.000,  .375,  .696,  .914,  .999,
     1  .938,  .740,  .434,  .064, -.315, -.648, -.887, -.995, -.959,
     1 -.782, -.491, -.128,  .254,  .598,  .855,  .987,  .975,  .820,
     1  .546,  .191, -.191, -.546, -.820, -.975, -.987, -.855, -.598,
     1 -.254,  .128,  .491,  .782,  .959,  .995,  .887,  .648,  .315,
     1 -.064, -.434, -.740, -.938, -.999, -.914, -.696, -.375, -.000/
      DATA   (FSTAR(13,J),J=1,99) /
     1 1.000,  .927,  .718,  .405,  .032, -.345, -.672, -.901, -.998,
     1 -.949, -.761, -.463, -.096,  .285,  .623,  .871,  .992,  .967,
     1  .801,  .518,  .160, -.223, -.572, -.838, -.982, -.982, -.838,
     1 -.572, -.223,  .160,  .518,  .801,  .967,  .992,  .871,  .623,
     1  .285, -.096, -.463, -.761, -.949, -.998, -.901, -.672, -.345,
     1  .032,  .405,  .718,  .927, 1.000,  .927,  .718,  .405,  .032,
     1 -.345, -.672, -.901, -.998, -.949, -.761, -.463, -.096,  .285,
     1  .623,  .871,  .992,  .967,  .801,  .518,  .160, -.223, -.572,
     1 -.838, -.982, -.982, -.838, -.572, -.223,  .160,  .518,  .801,
     1  .967,  .992,  .871,  .623,  .285, -.096, -.463, -.761, -.949,
     1 -.998, -.901, -.672, -.345,  .032,  .405,  .718,  .927, 1.000/
      DATA   (FSTAR(14,J),J=1,99) /
     1 -.000, -.434, -.782, -.975, -.975, -.782, -.434, -.000,  .434,
     1  .782,  .975,  .975,  .782,  .434,  .000, -.434, -.782, -.975,
     1 -.975, -.782, -.434, -.000,  .434,  .782,  .975,  .975,  .782,
     1  .434,  .000, -.434, -.782, -.975, -.975, -.782, -.434, -.000,
     1  .434,  .782,  .975,  .975,  .782,  .434,  .000, -.434, -.782,
     1 -.975, -.975, -.782, -.434, -.000,  .434,  .782,  .975,  .975,
     1  .782,  .434,  .000, -.434, -.782, -.975, -.975, -.782, -.434,
     1 -.000,  .434,  .782,  .975,  .975,  .782,  .434,  .000, -.434,
     1 -.782, -.975, -.975, -.782, -.434, -.000,  .434,  .782,  .975,
     1  .975,  .782,  .434,  .000, -.434, -.782, -.975, -.975, -.782,
     1 -.434, -.000,  .434,  .782,  .975,  .975,  .782,  .434,  .000/
      DATA   (FSTAR(15,J),J=1,99) /
     1-1.000, -.901, -.623, -.223,  .223,  .623,  .901, 1.000,  .901,
     1  .623,  .223, -.223, -.623, -.901,-1.000, -.901, -.623, -.223,
     1  .223,  .623,  .901, 1.000,  .901,  .623,  .223, -.223, -.623,
     1 -.901,-1.000, -.901, -.623, -.223,  .223,  .623,  .901, 1.000,
     1  .901,  .623,  .223, -.223, -.623, -.901,-1.000, -.901, -.623,
     1 -.223,  .223,  .623,  .901, 1.000,  .901,  .623,  .223, -.223,
     1 -.623, -.901,-1.000, -.901, -.623, -.223,  .223,  .623,  .901,
     1 1.000,  .901,  .623,  .223, -.223, -.623, -.901,-1.000, -.901,
     1 -.623, -.223,  .223,  .623,  .901, 1.000,  .901,  .623,  .223,
     1 -.223, -.623, -.901,-1.000, -.901, -.623, -.223,  .223,  .623,
     1  .901, 1.000,  .901,  .623,  .223, -.223, -.623, -.901,-1.000/
      DATA   (FSTAR(16,J),J=1,99) /
     1  .000,  .491,  .855,  .999,  .887,  .546,  .064, -.434, -.820,
     1 -.995, -.914, -.598, -.128,  .375,  .782,  .987,  .938,  .648,
     1  .191, -.315, -.740, -.975, -.959, -.696, -.254,  .254,  .696,
     1  .959,  .975,  .740,  .315, -.191, -.648, -.938, -.987, -.782,
     1 -.375,  .128,  .598,  .914,  .995,  .820,  .434, -.064, -.546,
     1 -.887, -.999, -.855, -.491, -.000,  .491,  .855,  .999,  .887,
     1  .546,  .064, -.434, -.820, -.995, -.914, -.598, -.128,  .375,
     1  .782,  .987,  .938,  .648,  .191, -.315, -.740, -.975, -.959,
     1 -.696, -.254,  .254,  .696,  .959,  .975,  .740,  .315, -.191,
     1 -.648, -.938, -.987, -.782, -.375,  .128,  .598,  .914,  .995,
     1  .820,  .434, -.064, -.546, -.887, -.999, -.855, -.491, -.000/
      DATA   (FSTAR(17,J),J=1,99) /
     1 1.000,  .871,  .518,  .032, -.463, -.838, -.998, -.901, -.572,
     1 -.096,  .405,  .801,  .992,  .927,  .623,  .160, -.345, -.761,
     1 -.982, -.949, -.672, -.223,  .285,  .718,  .967,  .967,  .718,
     1  .285, -.223, -.672, -.949, -.982, -.761, -.345,  .160,  .623,
     1  .927,  .992,  .801,  .405, -.096, -.572, -.901, -.998, -.838,
     1 -.463,  .032,  .518,  .871, 1.000,  .871,  .518,  .032, -.463,
     1 -.838, -.998, -.901, -.572, -.096,  .405,  .801,  .992,  .927,
     1  .623,  .160, -.345, -.761, -.982, -.949, -.672, -.223,  .285,
     1  .718,  .967,  .967,  .718,  .285, -.223, -.672, -.949, -.982,
     1 -.761, -.345,  .160,  .623,  .927,  .992,  .801,  .405, -.096,
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     1 -.572, -.901, -.998, -.838, -.463,  .032,  .518,  .871, 1.000/
      DATA   (FSTAR(18,J),J=1,99) /
     1 -.000, -.546, -.914, -.987, -.740, -.254,  .315,  .782,  .995,
     1  .887,  .491, -.064, -.598, -.938, -.975, -.696, -.191,  .375,
     1  .820,  .999,  .855,  .434, -.128, -.648, -.959, -.959, -.648,
     1 -.128,  .434,  .855,  .999,  .820,  .375, -.191, -.696, -.975,
     1 -.938, -.598, -.064,  .491,  .887,  .995,  .782,  .315, -.254,
     1 -.740, -.987, -.914, -.546, -.000,  .546,  .914,  .987,  .740,
     1  .254, -.315, -.782, -.995, -.887, -.491, -.064,  .598,  .938,
     1  .975,  .696,  .191, -.375, -.820, -.999, -.855, -.434,  .128,
     1  .648,  .959,  .959,  .648,  .128, -.434, -.855, -.999, -.820,
     1 -.375,  .191,  .696,  .975,  .938,  .598,  .064, -.491, -.887,
     1 -.995, -.782, -.315,  .254,  .740,  .987,  .914,  .546,  .000/
      DATA   (FSTAR(19,J),J=1,99) /
     1-1.000, -.838, -.405,  .160,  .672,  .967,  .949,  .623,  .096,
     1 -.463, -.871, -.998, -.801, -.345,  .223,  .718,  .982,  .927,
     1  .572,  .032, -.518, -.901, -.992, -.761, -.285,  .285,  .761,
     1  .992,  .901,  .518, -.032, -.572, -.927, -.982, -.718, -.223,
     1  .345,  .801,  .998,  .871,  .463, -.096, -.623, -.949, -.967,
     1 -.672, -.160,  .405,  .838, 1.000,  .838,  .405, -.160, -.672,
     1 -.967, -.949, -.623, -.096,  .463,  .871,  .998,  .801,  .345,
     1 -.223, -.718, -.982, -.927, -.572, -.032,  .518,  .901,  .992,
     1  .761,  .285, -.285, -.761, -.992, -.901, -.518,  .032,  .572,
     1  .927,  .982,  .718,  .223, -.345, -.801, -.998, -.871, -.463,
     1  .096,  .623,  .949,  .967,  .672,  .160, -.405, -.838,-1.000/
      DATA   (FSTAR(20,J),J=1,99) /
     1  .000,  .598,  .959,  .938,  .546, -.064, -.648, -.975, -.914,
     1 -.491,  .128,  .696,  .987,  .887,  .434, -.191, -.740, -.995,
     1 -.855, -.375,  .254,  .782,  .999,  .820,  .315, -.315, -.820,
     1 -.999, -.782, -.254,  .375,  .855,  .995,  .740,  .191, -.434,
     1 -.887, -.987, -.696, -.128,  .491,  .914,  .975,  .648,  .064,
     1 -.546, -.938, -.959, -.598, -.000,  .598,  .959,  .938,  .546,
     1 -.064, -.648, -.975, -.914, -.491,  .128,  .696,  .987,  .887,
     1  .434, -.191, -.740, -.995, -.855, -.375,  .254,  .782,  .999,
     1  .820,  .315, -.315, -.820, -.999, -.782, -.254,  .375,  .855,
     1  .995,  .740,  .191, -.434, -.887, -.987, -.696, -.128,  .491,
     1  .914,  .975,  .648,  .064, -.546, -.938, -.959, -.598, -.000/
      DATA   (FSTAR(21,J),J=1,99) /
     1 1.000,  .801,  .285, -.345, -.838, -.998, -.761, -.223,  .405,
     1  .871,  .992,  .718,  .160, -.463, -.901, -.982, -.672, -.096,
     1  .518,  .927,  .967,  .623,  .032, -.572, -.949, -.949, -.572,
     1  .032,  .623,  .967,  .927,  .518, -.096, -.672, -.982, -.901,
     1 -.463,  .160,  .718,  .992,  .871,  .405, -.223, -.761, -.998,
     1 -.838, -.345,  .285,  .801, 1.000,  .801,  .285, -.345, -.838,
     1 -.998, -.761, -.223,  .405,  .871,  .992,  .718,  .160, -.463,
     1 -.901, -.982, -.672, -.096,  .518,  .927,  .967,  .623,  .032,
     1 -.572, -.949, -.949, -.572,  .032,  .623,  .967,  .927,  .518,
     1 -.096, -.672, -.982, -.901, -.463,  .160,  .718,  .992,  .871,
     1  .405, -.223, -.761, -.998, -.838, -.345,  .285,  .801, 1.000/
      DATA   (FSTAR(22,J),J=1,99) /
     1 -.000, -.648, -.987, -.855, -.315,  .375,  .887,  .975,  .598,
     1 -.064, -.696, -.995, -.820, -.254,  .434,  .914,  .959,  .546,
     1 -.128, -.740, -.999, -.782, -.191,  .491,  .938,  .938,  .491,
     1 -.191, -.782, -.999, -.740, -.128,  .546,  .959,  .914,  .434,
     1 -.254, -.820, -.995, -.696, -.064,  .598,  .975,  .887,  .375,
     1 -.315, -.855, -.987, -.648, -.000,  .648,  .987,  .855,  .315,
     1 -.375, -.887, -.975, -.598,  .064,  .696,  .995,  .820,  .254,
     1 -.434, -.914, -.959, -.546,  .128,  .740,  .999,  .782,  .191,
     1 -.491, -.938, -.938, -.491,  .191,  .782,  .999,  .740,  .128,
     1 -.546, -.959, -.914, -.434,  .254,  .820,  .995,  .696,  .064,
     1 -.598, -.975, -.887, -.375,  .315,  .855,  .987,  .648,  .000/
      DATA   (FSTAR(23,J),J=1,99) /
     1-1.000, -.761, -.160,  .518,  .949,  .927,  .463, -.223, -.801,
     1 -.998, -.718, -.096,  .572,  .967,  .901,  .405, -.285, -.838,
     1 -.992, -.672, -.032,  .623,  .982,  .871,  .345, -.345, -.871,
     1 -.982, -.623,  .032,  .672,  .992,  .838,  .285, -.405, -.901,
     1 -.967, -.572,  .096,  .718,  .998,  .801,  .223, -.463, -.927,
     1 -.949, -.518,  .160,  .761, 1.000,  .761,  .160, -.518, -.949,
     1 -.927, -.463,  .223,  .801,  .998,  .718,  .096, -.572, -.967,
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     1 -.901, -.405,  .285,  .838,  .992,  .672,  .032, -.623, -.982,
     1 -.871, -.345,  .345,  .871,  .982,  .623, -.032, -.672, -.992,
     1 -.838, -.285,  .405,  .901,  .967,  .572, -.096, -.718, -.998,
     1 -.801, -.223,  .463,  .927,  .949,  .518, -.160, -.761,-1.000/
      DATA   (FSTAR(24,J),J=1,99) /
     1  .000,  .696,  .999,  .740,  .064, -.648, -.995, -.782, -.128,
     1  .598,  .987,  .820,  .191, -.546, -.975, -.855, -.254,  .491,
     1  .959,  .887,  .315, -.434, -.938, -.914, -.375,  .375,  .914,
     1  .938,  .434, -.315, -.887, -.959, -.491,  .254,  .855,  .975,
     1  .546, -.191, -.820, -.987, -.598,  .128,  .782,  .995,  .648,
     1 -.064, -.740, -.999, -.696, -.000,  .696,  .999,  .740,  .064,
     1 -.648, -.995, -.782, -.128,  .598,  .987,  .820,  .191, -.546,
     1 -.975, -.855, -.254,  .491,  .959,  .887,  .315, -.434, -.938,
     1 -.914, -.375,  .375,  .914,  .938,  .434, -.315, -.887, -.959,
     1 -.491,  .254,  .855,  .975,  .546, -.191, -.820, -.987, -.598,
     1  .128,  .782,  .995,  .648, -.064, -.740, -.999, -.696, -.000/
      DATA   (FSTAR(25,J),J=1,99) /
     1 1.000,  .718,  .032, -.672, -.998, -.761, -.096,  .623,  .992,
     1  .801,  .160, -.572, -.982, -.838, -.223,  .518,  .967,  .871,
     1  .285, -.463, -.949, -.901, -.345,  .405,  .927,  .927,  .405,
     1 -.345, -.901, -.949, -.463,  .285,  .871,  .967,  .518, -.223,
     1 -.838, -.982, -.572,  .160,  .801,  .992,  .623, -.096, -.761,
     1 -.998, -.672,  .032,  .718, 1.000,  .718,  .032, -.672, -.998,
     1 -.761, -.096,  .623,  .992,  .801,  .160, -.572, -.982, -.838,
     1 -.223,  .518,  .967,  .871,  .285, -.463, -.949, -.901, -.345,
     1  .405,  .927,  .927,  .405, -.345, -.901, -.949, -.463,  .285,
     1  .871,  .967,  .518, -.223, -.838, -.982, -.572,  .160,  .801,
     1  .992,  .623, -.096, -.761, -.998, -.672,  .032,  .718, 1.000/
      DATA   (FSTAR(26,J),J=1,99) /
     1 -.000, -.740, -.995, -.598,  .191,  .855,  .959,  .434, -.375,
     1 -.938, -.887, -.254,  .546,  .987,  .782,  .064, -.696, -.999,
     1 -.648,  .128,  .820,  .975,  .491, -.315, -.914, -.914, -.315,
     1  .491,  .975,  .820,  .128, -.648, -.999, -.696,  .064,  .782,
     1  .987,  .546, -.254, -.887, -.938, -.375,  .434,  .959,  .855,
     1  .191, -.598, -.995, -.740, -.000,  .740,  .995,  .598, -.191,
     1 -.855, -.959, -.434,  .375,  .938,  .887,  .254, -.546, -.987,
     1 -.782, -.064,  .696,  .999,  .648, -.128, -.820, -.975, -.491,
     1  .315,  .914,  .914,  .315, -.491, -.975, -.820, -.128,  .648,
     1  .999,  .696, -.064, -.782, -.987, -.546,  .254,  .887,  .938,
     1  .375, -.434, -.959, -.855, -.191,  .598,  .995,  .740,  .000/
      DATA   (FSTAR(27,J),J=1,99) /
    1-1.000, -.672,  .096,  .801,  .982,  .518, -.285, -.901, -.927,
     1 -.345,  .463,  .967,  .838,  .160, -.623, -.998, -.718,  .032,
     1  .761,  .992,  .572, -.223, -.871, -.949, -.405,  .405,  .949,
     1  .871,  .223, -.572, -.992, -.761, -.032,  .718,  .998,  .623,
     1 -.160, -.838, -.967, -.463,  .345,  .927,  .901,  .285, -.518,
     1 -.982, -.801, -.096,  .672, 1.000,  .672, -.096, -.801, -.982,
     1 -.518,  .285,  .901,  .927,  .345, -.463, -.967, -.838, -.160,
     1  .623,  .998,  .718, -.032, -.761, -.992, -.572,  .223,  .871,
     1  .949,  .405, -.405, -.949, -.871, -.223,  .572,  .992,  .761,
     1  .032, -.718, -.998, -.623,  .160,  .838,  .967,  .463, -.345,
     1 -.927, -.901, -.285,  .518,  .982,  .801,  .096, -.672,-1.000/
      DATA   (FSTAR(28,J),J=1,99) /
     1  .000,  .782,  .975,  .434, -.434, -.975, -.782, -.000,  .782,
     1  .975,  .434, -.434, -.975, -.782, -.000,  .782,  .975,  .434,
     1 -.434, -.975, -.782, -.000,  .782,  .975,  .434, -.434, -.975,
     1 -.782, -.000,  .782,  .975,  .434, -.434, -.975, -.782, -.000,
     1  .782,  .975,  .434, -.434, -.975, -.782, -.000,  .782,  .975,
     1  .434, -.434, -.975, -.782, -.000,  .782,  .975,  .434, -.434,
     1 -.975, -.782, -.000,  .782,  .975,  .434, -.434, -.975, -.782,
     1 -.000,  .782,  .975,  .434, -.434, -.975, -.782, -.000,  .782,
     1  .975,  .434, -.434, -.975, -.782, -.000,  .782,  .975,  .434,
     1 -.434, -.975, -.782, -.000,  .782,  .975,  .434, -.434, -.975,
     1 -.782, -.000,  .782,  .975,  .434, -.434, -.975, -.782, -.000/
      DATA   (FSTAR(29,J),J=1,99) /
     1 1.000,  .623, -.223, -.901, -.901, -.223,  .623, 1.000,  .623,
     1 -.223, -.901, -.901, -.223,  .623, 1.000,  .623, -.223, -.901,
     1 -.901, -.223,  .623, 1.000,  .623, -.223, -.901, -.901, -.223,
     1  .623, 1.000,  .623, -.223, -.901, -.901, -.223,  .623, 1.000,
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      1  .623, -.223, -.901, -.901, -.223,  .623, 1.000,  .623, -.223,
      1 -.901, -.901, -.223,  .623, 1.000,  .623, -.223, -.901, -.901,
      1 -.223,  .623, 1.000,  .623, -.223, -.901, -.901, -.223,  .623,
      1 1.000,  .623, -.223, -.901, -.901, -.223,  .623, 1.000,  .623,
      1 -.223, -.901, -.901, -.223,  .623, 1.000,  .623, -.223, -.901,
      1 -.901, -.223,  .623, 1.000,  .623, -.223, -.901, -.901, -.223,
      1  .623, 1.000,  .623, -.223, -.901, -.901, -.223,  .623, 1.000/
       DATA   (FSTAR(30,J),J=1,99) /
      1 -.000, -.820, -.938, -.254,  .648,  .995,  .491, -.434, -.987,
      1 -.696,  .191,  .914,  .855,  .064, -.782, -.959, -.315,  .598,
      1  .999,  .546, -.375, -.975, -.740,  .128,  .887,  .887,  .128,
      1 -.740, -.975, -.375,  .546,  .999,  .598, -.315, -.959, -.782,
      1  .064,  .855,  .914,  .191, -.696, -.987, -.434,  .491,  .995,
      1  .648, -.254, -.938, -.820, -.000,  .820,  .938,  .254, -.648,
      1 -.995, -.491,  .434,  .987,  .696, -.191, -.914, -.855, -.064,
      1  .782,  .959,  .315, -.598, -.999, -.546,  .375,  .975,  .740,
      1 -.128, -.887, -.887, -.128,  .740,  .975,  .375, -.546, -.999,
      1 -.598,  .315,  .959,  .782, -.064, -.855, -.914, -.191,  .696,
      1  .987,  .434, -.491, -.995, -.648,  .254,  .938,  .820,  .000/
       DATA   (FSTAR(31,J),J=1,99) /
      1-1.000, -.572,  .345,  .967,  .761, -.096, -.871, -.901, -.160,
      1  .718,  .982,  .405, -.518, -.998, -.623,  .285,  .949,  .801,
      1 -.032, -.838, -.927, -.223,  .672,  .992,  .463, -.463, -.992,
      1 -.672,  .223,  .927,  .838,  .032, -.801, -.949, -.285,  .623,
      1  .998,  .518, -.405, -.982, -.718,  .160,  .901,  .871,  .096,
      1 -.761, -.967, -.345,  .572, 1.000,  .572, -.345, -.967, -.761,
      1  .096,  .871,  .901,  .160, -.718, -.982, -.405,  .518,  .998,
      1  .623, -.285, -.949, -.801,  .032,  .838,  .927,  .223, -.672,
      1 -.992, -.463,  .463,  .992,  .672, -.223, -.927, -.838, -.032,
      1  .801,  .949,  .285, -.623, -.998, -.518,  .405,  .982,  .718,
      1 -.160, -.901, -.871, -.096,  .761,  .967,  .345, -.572,-1.000/
       DATA   (FSTAR(32,J),J=1,99) /
      1  .000,  .855,  .887,  .064, -.820, -.914, -.128,  .782,  .938,
      1  .191, -.740, -.959, -.254,  .696,  .975,  .315, -.648, -.987,
      1 -.375,  .598,  .995,  .434, -.546, -.999, -.491,  .491,  .999,
      1  .546, -.434, -.995, -.598,  .375,  .987,  .648, -.315, -.975,
      1 -.696,  .254,  .959,  .740, -.191, -.938, -.782,  .128,  .914,
      1  .820, -.064, -.887, -.855, -.000,  .855,  .887,  .064, -.820,
      1 -.914, -.128,  .782,  .938,  .191, -.740, -.959, -.254,  .696,
      1  .975,  .315, -.648, -.987, -.375,  .598,  .995,  .434, -.546,
      1 -.999, -.491,  .491,  .999,  .546, -.434, -.995, -.598,  .375,
      1  .987,  .648, -.315, -.975, -.696,  .254,  .959,  .740, -.191,
      1 -.938, -.782,  .128,  .914,  .820, -.064, -.887, -.855, -.000/
       DATA   (FSTAR(33,J),J=1,99) /
      1 1.000,  .518, -.463, -.998, -.572,  .405,  .992,  .623, -.345,
      1 -.982, -.672,  .285,  .967,  .718, -.223, -.949, -.761,  .160,
      1  .927,  .801, -.096, -.901, -.838,  .032,  .871,  .871,  .032,
      1 -.838, -.901, -.096,  .801,  .927,  .160, -.761, -.949, -.223,
      1  .718,  .967,  .285, -.672, -.982, -.345,  .623,  .992,  .405,
      1 -.572, -.998, -.463,  .518, 1.000,  .518, -.463, -.998, -.572,
      1  .405,  .992,  .623, -.345, -.982, -.672,  .285,  .967,  .718,
      1 -.223, -.949, -.761,  .160,  .927,  .801, -.096, -.901, -.838,
      1  .032,  .871,  .871,  .032, -.838, -.901, -.096,  .801,  .927,
      1  .160, -.761, -.949, -.223,  .718,  .967,  .285, -.672, -.982,
      1 -.345,  .623,  .992,  .405, -.572, -.998, -.463,  .518, 1.000/
       DATA   (FSTAR(34,J),J=1,99) /
      1 -.000, -.887, -.820,  .128,  .938,  .740, -.254, -.975, -.648,
      1  .375,  .995,  .546, -.491, -.999, -.434,  .598,  .987,  .315,
      1 -.696, -.959, -.191,  .782,  .914,  .064, -.855, -.855,  .064,
      1  .914,  .782, -.191, -.959, -.696,  .315,  .987,  .598, -.434,
      1 -.999, -.491,  .546,  .995,  .375, -.648, -.975, -.254,  .740,
      1  .938,  .128, -.820, -.887, -.000,  .887,  .820, -.128, -.938,
      1 -.740,  .254,  .975,  .648, -.375, -.995, -.546,  .491,  .999,
      1  .434, -.598, -.987, -.315,  .696,  .959,  .191, -.782, -.914,
      1 -.064,  .855,  .855, -.064, -.914, -.782,  .191,  .959,  .696,
      1 -.315, -.987, -.598,  .434,  .999,  .491, -.546, -.995, -.375,
      1  .648,  .975,  .254, -.740, -.938, -.128,  .820,  .887,  .000/
       DATA   (FSTAR(35,J),J=1,99) /
      1-1.000, -.463,  .572,  .992,  .345, -.672, -.967, -.223,  .761,
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     1  .927,  .096, -.838, -.871,  .032,  .901,  .801, -.160, -.949,
     1 -.718,  .285,  .982,  .623, -.405, -.998, -.518,  .518,  .998,
     1  .405, -.623, -.982, -.285,  .718,  .949,  .160, -.801, -.901,
     1 -.032,  .871,  .838, -.096, -.927, -.761,  .223,  .967,  .672,
     1 -.345, -.992, -.572,  .463, 1.000,  .463, -.572, -.992, -.345,
     1  .672,  .967,  .223, -.761, -.927, -.096,  .838,  .871, -.032,
     1 -.901, -.801,  .160,  .949,  .718, -.285, -.982, -.623,  .405,
     1  .998,  .518, -.518, -.998, -.405,  .623,  .982,  .285, -.718,
     1 -.949, -.160,  .801,  .901,  .032, -.871, -.838,  .096,  .927,
     1  .761, -.223, -.967, -.672,  .345,  .992,  .572, -.463,-1.000/
      DATA   (FSTAR(36,J),J=1,99) /
     1  .000,  .914,  .740, -.315, -.995, -.491,  .598,  .975,  .191,
     1 -.820, -.855,  .128,  .959,  .648, -.434, -.999, -.375,  .696,
     1  .938,  .064, -.887, -.782,  .254,  .987,  .546, -.546, -.987,
     1 -.254,  .782,  .887, -.064, -.938, -.696,  .375,  .999,  .434,
     1 -.648, -.959, -.128,  .855,  .820, -.191, -.975, -.598,  .491,
     1  .995,  .315, -.740, -.914, -.000,  .914,  .740, -.315, -.995,
     1 -.491,  .598,  .975,  .191, -.820, -.855,  .128,  .959,  .648,
     1 -.434, -.999, -.375,  .696,  .938,  .064, -.887, -.782,  .254,
     1  .987,  .546, -.546, -.987, -.254,  .782,  .887, -.064, -.938,
     1 -.696,  .375,  .999,  .434, -.648, -.959, -.128,  .855,  .820,
     1 -.191, -.975, -.598,  .491,  .995,  .315, -.740, -.914, -.000/
      DATA   (FSTAR(37,J),J=1,99) /
     1 1.000,  .405, -.672, -.949, -.096,  .871,  .801, -.223, -.982,
     1 -.572,  .518,  .992,  .285, -.761, -.901,  .032,  .927,  .718,
     1 -.345, -.998, -.463,  .623,  .967,  .160, -.838, -.838,  .160,
     1  .967,  .623, -.463, -.998, -.345,  .718,  .927,  .032, -.901,
     1 -.761,  .285,  .992,  .518, -.572, -.982, -.223,  .801,  .871,
     1 -.096, -.949, -.672,  .405, 1.000,  .405, -.672, -.949, -.096,
     1  .871,  .801, -.223, -.982, -.572,  .518,  .992,  .285, -.761,
     1 -.901,  .032,  .927,  .718, -.345, -.998, -.463,  .623,  .967,
     1  .160, -.838, -.838,  .160,  .967,  .623, -.463, -.998, -.345,
     1  .718,  .927,  .032, -.901, -.761,  .285,  .992,  .518, -.572,
     1 -.982, -.223,  .801,  .871, -.096, -.949, -.672,  .405, 1.000/
      DATA   (FSTAR(38,J),J=1,99) /
     1 -.000, -.938, -.648,  .491,  .987,  .191, -.855, -.782,  .315,
     1  .999,  .375, -.740, -.887,  .128,  .975,  .546, -.598, -.959,
     1 -.064,  .914,  .696, -.434, -.995, -.254,  .820,  .820, -.254,
     1 -.995, -.434,  .696,  .914, -.064, -.959, -.598,  .546,  .975,
     1  .128, -.887, -.740,  .375,  .999,  .315, -.782, -.855,  .191,
     1  .987,  .491, -.648, -.938, -.000,  .938,  .648, -.491, -.987,
     1 -.191,  .855,  .782, -.315, -.999, -.375,  .740,  .887, -.128,
     1 -.975, -.546,  .598,  .959,  .064, -.914, -.696,  .434,  .995,
     1  .254, -.820, -.820,  .254,  .995,  .434, -.696, -.914,  .064,
     1  .959,  .598, -.546, -.975, -.128,  .887,  .740, -.375, -.999,
     1 -.315,  .782,  .855, -.191, -.987, -.491,  .648,  .938,  .000/
      DATA   (FSTAR(39,J),J=1,99) /
     1-1.000, -.345,  .761,  .871, -.160, -.982, -.518,  .623,  .949,
     1  .032, -.927, -.672,  .463,  .992,  .223, -.838, -.801,  .285,
     1  .998,  .405, -.718, -.901,  .096,  .967,  .572, -.572, -.967,
     1 -.096,  .901,  .718, -.405, -.998, -.285,  .801,  .838, -.223,
     1 -.992, -.463,  .672,  .927, -.032, -.949, -.623,  .518,  .982,
     1  .160, -.871, -.761,  .345, 1.000,  .345, -.761, -.871,  .160,
     1  .982,  .518, -.623, -.949, -.032,  .927,  .672, -.463, -.992,
     1 -.223,  .838,  .801, -.285, -.998, -.405,  .718,  .901, -.096,
     1 -.967, -.572,  .572,  .967,  .096, -.901, -.718,  .405,  .998,
     1  .285, -.801, -.838,  .223,  .992,  .463, -.672, -.927,  .032,
     1  .949,  .624, -.518, -.982, -.160,  .871,  .761, -.345,-1.000/
      DATA   (FSTAR(40,J),J=1,99)   /
     1  .000,  .959,  .546, -.648, -.914,  .128,  .987,  .434, -.740,
     1 -.855,  .254,  .999,  .315, -.820, -.782,  .375,  .995,  .191,
     1 -.887, -.696,  .491,  .975,  .064, -.938, -.598,  .598,  .938,
     1 -.064, -.975, -.491,  .696,  .887, -.191, -.995, -.375,  .782,
     1  .820, -.315, -.999, -.254,  .855,  .740, -.434, -.987, -.128,
     1  .914,  .648, -.546, -.959, -.000,  .959,  .546, -.648, -.914,
     1  .128,  .987,  .434, -.740, -.855,  .254,  .999,  .315, -.820,
     1 -.782,  .375,  .995,  .191, -.887, -.696,  .491,  .975,  .064,
     1 -.938, -.598,  .598,  .938, -.064, -.975, -.491,  .696,  .887,
     1 -.191, -.995, -.375,  .782,  .820, -.315, -.999, -.254,  .855,
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     1  .740, -.434, -.987, -.128,  .914,  .648, -.546, -.959, -.000/
      DATA   (FSTAR(41,J),J=1,99)    /
     1 1.000,  .285, -.838, -.761,  .405,  .992,  .160, -.901, -.672,
     1  .518,  .967,  .032, -.949, -.572,  .623,  .927, -.096, -.982,
     1 -.463,  .718,  .871, -.223, -.998, -.345,  .801,  .801, -.345,
     1 -.998, -.223,  .871,  .718, -.463, -.982, -.096,  .927,  .623,
     1 -.572, -.949,  .032,  .967,  .518, -.672, -.901,  .160,  .992,
     1  .405, -.761, -.838,  .285, 1.000,  .285, -.838, -.761,  .405,
     1  .992,  .160, -.901, -.672,  .518,  .967,  .032, -.949, -.572,
     1  .623,  .927, -.096, -.982, -.463,  .718,  .871, -.223, -.998,
     1 -.345,  .801,  .801, -.345, -.998, -.223,  .871,  .718, -.463,
     1 -.982, -.096,  .927,  .624, -.572, -.949,  .032,  .967,  .518,
     1 -.672, -.901,  .160,  .992,  .405, -.761, -.838,  .285, 1.000/
      DATA   (FSTAR(42,J),J=1,99)    /
     1 -.000, -.975, -.434,  .782,  .782, -.434, -.975, -.000,  .975,
     1  .434, -.782, -.782,  .434,  .975,  .000, -.975, -.434,  .782,
     1  .782, -.434, -.975, -.000,  .975,  .434, -.782, -.782,  .434,
     1  .975,  .000, -.975, -.434,  .782,  .782, -.434, -.975, -.000,
     1  .975,  .434, -.782, -.782,  .434,  .975,  .000, -.975, -.434,
     1  .782,  .782, -.434, -.975, -.000,  .975,  .434, -.782, -.782,
     1  .434,  .975,  .000, -.975, -.434,  .782,  .782, -.434, -.975,
     1 -.000,  .975,  .434, -.782, -.782,  .434,  .975,  .000, -.975,
     1 -.434,  .782,  .782, -.434, -.975, -.000,  .975,  .434, -.782,
     1  .782, -.434, -.975, -.000,  .975,  .434, -.782, -.782,  .434,
     1 -.97 ,-.00,.97,.43,-.78,-.78,.43,.97,.00
      DATA   (FSTAR(43,J),J=1,99)    /
     1-1.000,-.223, .901, .623,-.623,-.901, .223, 1.000, .223,
     1-.901,-.623, .623, .901,-.223,-1.000,-.223, .901, .623,
     1 -.623, -.901,  .223, 1.000,  .223, -.901, -.623,  .623,  .901,
     1-.22,-1.00,-.22,.90,.62,-.62,-.90,.22,1.0,
     1  .223, -.901, -.623,  .623,  .901, -.223,-1.000, -.223,  .901,
     1  .623, -.623, -.901,  .223, 1.000,  .223, -.901, -.623,  .623,
     1  .901, -.223,-1.000, -.223,  .901,  .623, -.623, -.901,  .223,
     1 1.000,  .223, -.901, -.623,  .623,  .901, -.223,-1.000, -.223,
     10.90,0.62,-.62,-.90,0.22,1.00,0.22,-.90,-.62,
     10.62,0.90,-.22,-1.0,-.22,0.90,0.62,-.62,-.90,
     1 0.22,1.0,0.22,-.90,-.62,.62,.90,-.22,-1.0
      DATA   (FSTAR(44,J),J=1,99)    /
     1  .000,  .987,  .315, -.887, -.598,  .696,  .820, -.434, -.959,
     1  .128,  .999,  .191, -.938, -.491,  .782,  .740, -.546, -.914,
     1  .254,  .995,  .064, -.975, -.375,  .855,  .648, -.648, -.855,
     1  .375,  .975, -.064, -.995, -.254,  .914,  .546, -.740, -.782,
     1  .491,  .938, -.191, -.999, -.128,  .959,  .434, -.820, -.696,
     1  .598,  .887, -.315, -.987, -.000,  .987,  .315, -.887, -.598,
     1  .696,  .820, -.434, -.959,  .128,  .999,  .191, -.938, -.491,
     1  .782,  .740, -.546, -.914,  .254,  .995,  .064, -.975, -.375,
     1  .855,  .648, -.648, -.855,  .375,  .975, -.064, -.995, -.254,
     1  .914,  .546, -.740, -.782,  .491,  .938, -.191, -.999, -.128,
     1  .959,  .434, -.820, -.696,  .598,  .887, -.315, -.987, -.000/
      DATA   (FSTAR(45,J),J=1,99)    /
     1 1.000,  .160, -.949, -.463,  .801,  .718, -.572, -.901,  .285,
     1  .992,  .032, -.982, -.345,  .871,  .623, -.672, -.838,  .405,
     1  .967, -.096, -.998, -.223,  .927,  .518, -.761, -.761,  .518,
     1  .927, -.223, -.998, -.096,  .967,  .405, -.838, -.672,  .623,
     1  .871, -.345, -.982,  .032,  .992,  .285, -.901, -.572,  .718,
     1  .801, -.463, -.949,  .160, 1.000,  .160, -.949, -.463,  .801,
     1  .718, -.572, -.901,  .285,  .992,  .032, -.982, -.345,  .871,
     1  .623, -.672, -.838,  .405,  .967, -.096, -.998, -.223,  .927,
     1  .518, -.761, -.761,  .518,  .927, -.223, -.998, -.096,  .967,
     1  .405, -.838, -.672,  .623,  .871, -.345, -.982,  .032,  .992,
     1  .285, -.901, -.572,  .718,  .801, -.463, -.949,  .160, 1.000/
      DATA   (FSTAR(46,J),J=1,99)    /
     1 -.000, -.995, -.191,  .959,  .375, -.887, -.546,  .782,  .696,
     1 -.648, -.820,  .491,  .914, -.315, -.975,  .128,  .999,  .064,
     1 -.987, -.254,  .938,  .434, -.855, -.598,  .740,  .740, -.598,
     1 -.855,  .434,  .938, -.254, -.987,  .064,  .999,  .128, -.975,
     1 -.315,  .914,  .491, -.820, -.648,  .696,  .782, -.546, -.887,
     1  .375,  .959, -.191, -.995, -.000,  .995,  .191, -.959, -.375,
     1  .887,  .546, -.782, -.696,  .648,  .820, -.491, -.914,  .315,
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     1  .975, -.128, -.999, -.064,  .987,  .254, -.938, -.434,  .855,
     1  .598, -.740, -.740,  .598,  .855, -.434, -.938,  .254,  .987,
     1 -.064, -.999, -.128,  .975,  .315, -.914, -.491,  .820,  .648,
     1 -.696, -.782,  .546,  .887, -.375, -.959,  .191,  .995,  .000/
      DATA    (FSTAR(47,J),J=1,99)    /
     1-1.000, -.096,  .982,  .285, -.927, -.463,  .838,  .623, -.718,
     1 -.761,  .572,  .871, -.405, -.949,  .223,  .992, -.032, -.998,
     1 -.160,  .967,  .345, -.901, -.518,  .801,  .672, -.672, -.801,
     1  .518,  .901, -.345, -.967,  .160,  .998,  .032, -.992, -.223,
     1  .949,  .405, -.871, -.572,  .761,  .718, -.623, -.838,  .463,
     1  .927, -.285, -.982,  .096, 1.000,  .096, -.982, -.285,  .927,
     1  .463, -.838, -.623,  .718,  .761, -.572, -.871,  .405,  .949,
     1 -.223, -.992,  .032,  .998,  .160, -.967, -.345,  .901,  .518,
     1 -.801, -.672,  .672,  .801, -.518, -.901,  .345,  .967, -.160,
     1 -.998, -.032,  .992,  .223, -.949, -.405,  .871,  .572, -.761,
     1 -.718,  .623,  .838, -.463, -.927,  .285,  .982, -.096,-1.000/
      DATA    (FSTAR(48,J),J=1,99)    /
     1  .000,  .999,  .064, -.995, -.128,  .987,  .191, -.975, -.254,
     1  .959,  .315, -.938, -.375,  .914,  .434, -.887, -.491,  .855,
     1  .546, -.820, -.598,  .782,  .648, -.740, -.696,  .696,  .740,
     1 -.648, -.782,  .598,  .820, -.546, -.855,  .491,  .887, -.434,
     1 -.914,  .375,  .938, -.315, -.959,  .254,  .975, -.191, -.987,
     1  .128,  .995, -.064, -.999, -.000,  .999,  .064, -.995, -.128,
     1  .987,  .191, -.975, -.254,  .959,  .315, -.938, -.375,  .914,
     1  .434, -.887, -.491,  .855,  .546, -.820, -.598,  .782,  .648,
     1 -.740, -.696,  .696,  .740, -.648, -.782,  .598,  .820, -.546,
     1 -.855,  .491,  .887, -.434, -.914,  .375,  .938, -.315, -.959,
     1  .254,  .975, -.191, -.987,  .128,  .995, -.064, -.999, -.000/
      DATA    (FSTAR(49,J),J=1,99)    /
     1 1.000,  .032, -.998, -.096,  .992,  .160, -.982, -.223,  .967,
     1  .285, -.949, -.345,  .927,  .405, -.901, -.463,  .871,  .518,
     1 -.838, -.572,  .801,  .623, -.761, -.672,  .718,  .718, -.672,
     1 -.761,  .623,  .801, -.572, -.838,  .518,  .871, -.463, -.901,
     1  .405,  .927, -.345, -.949,  .285,  .967, -.223, -.982,  .160,
     1  .992, -.096, -.998,  .032, 1.000,  .032, -.998, -.096,  .992,
     1  .160, -.982, -.223,  .967,  .285, -.949, -.345,  .927,  .405,
     1 -.901, -.463,  .871,  .518, -.838, -.572,  .801,  .624, -.761,
     1 -.672,  .718,  .718, -.672, -.761,  .623,  .801, -.572, -.838,
     1  .518,  .871, -.463, -.901,  .405,  .927, -.345, -.949,  .285,
     1  .967, -.223, -.982,  .160,  .992, -.096, -.998,  .032, 1.000/
      DATA    (FSTAR(50,J),J=1,99)    /
     1 -.000, -.999,  .064,  .995, -.128, -.987,  .191,  .975, -.254,
     1 -.959,  .315,  .938, -.375, -.914,  .434,  .887, -.491, -.855,
     1  .546,  .820, -.598, -.782,  .648,  .740, -.696, -.696,  .740,
     1  .648, -.782, -.598,  .820,  .546, -.855, -.491,  .887,  .434,
     1 -.914, -.375,  .938,  .315, -.959, -.254,  .975,  .191, -.987,
     1 -.128,  .995,  .064, -.999, -.000,  .999, -.064, -.995,  .128,
     1  .987, -.191, -.975,  .254,  .959, -.315, -.938,  .375,  .914,
     1 -.434, -.887,  .491,  .855, -.546, -.820,  .598,  .782, -.648,
     1 -.740,  .696,  .696, -.740, -.648,  .782,  .598, -.820, -.546,
     1  .855,  .491, -.887, -.434,  .914,  .375, -.938, -.315,  .959,
     1  .254, -.975, -.191,  .987,  .128, -.995, -.064,  .999,  .000/
      DATA    (FSTAR(51,J),J=1,99)    /
     1-1.000,  .032,  .998, -.096, -.992,  .160,  .982, -.223, -.967,
     1  .285,  .949, -.345, -.927,  .405,  .901, -.463, -.871,  .518,
     1  .838, -.572, -.801,  .623,  .761, -.672, -.718,  .718,  .672,
     1 -.761, -.623,  .801,  .572, -.838,  .518,  .871,  .463, -.901,
     1 -.405,  .927,  .345, -.949, -.285,  .967,  .223, -.982, -.160,
     1  .992,  .096, -.998, -.032, 1.000, -.032, -.998,  .096,  .992,
     1 -.160, -.982,  .223,  .967, -.285, -.949,  .345,  .927, -.405,
     1 -.901,  .463,  .871, -.518, -.838,  .572,  .801, -.623, -.761,
     1  .672,  .718, -.718, -.672,  .761,  .624, -.801, -.572,  .838,
     1  .518, -.871, -.463,  .901,  .405, -.927, -.345,  .949,  .285,
     1 -.967, -.223,  .982,  .160, -.992, -.096,  .998,  .032,-1.000/
      END
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