A survey analysis program for small computers

GARY NARKAUS and RALPH DIPPNER

*State University of New York
State College of Optometry
100 East 24th Street, New York, New York 10010*

This program (GARY1.BA) was designed for use on all types of surveys requiring tabulation of raw data. The basic function of the program is to count the occurrences of specific pieces of information contained within the records of the data, where each record represents one questionnaire, one patient, etc. For example, suppose one wished to determine the frequency of occurrence of pathology with respect to sex. By inputting needed information, the program prints in a cross-tabulation the number of females with pathology A, the number of females with pathology B, etc., and the number of males with pathology A, the number of males with pathology B, etc.

The program allows for up to two selections to eliminate certain records from the count. (In the above example, one may wish to tabulate pathology by sex for only those individuals over 65 years of age.) The program also allows for grouping some of the data, for example, age of the individuals, say, 0-19 years as Group 1, 20-39 years as Group 2, etc. Besides a record count, the program can output percentages of the counts, including percentages across, down, and of the grand total count.

Sample runs are included in this paper to demonstrate the use of the program.

The Data. All data are created on one file and stored on tape prior to running the program. The data consist of a series of records where each patient questionnaire represents one record. Each record contains a fixed number of fields, where each field represents one piece of information about that individual (e.g., age, sex, etc.). Each field can be encoded using any letters or numbers. No more than four characters are allowed in any one field.

The data may be in one of two forms: One uses a delimiter; the other form does not. With a delimiter, each field is separated by a unique character (e.g., a comma or a space) and up to three lines of data per record are allowed. When no delimiter is used, the data is in one continuous line and only one line per record is allowed. Since there is no separation between fields, the first run of the program requires that the end of each field be specified. (The procedure is explained later under Field Specification File.)

The maximum number of fields allowed per record is limited by the number of lines of data per record (i.e., one or three, depending on the form of the data)

and by BASIC, which restricts a single line of input to 72 characters. If longer fields are used, there will be fewer fields available for use.

With the existing program and one DECtape, and data that may need editing, the reasonable maximum on the data file is 90,000 characters. Thus, for a data file consisting of 45 characters per record, a maximum of 2,000 records may be input.

Files. Under most circumstances, one to several files must be created and stored upon the first run of the program. Subsequent runs require only that the names of the previously created files be input. Possible files include field specification, group specification, and report header files. An automated field input file may be created, but this must be done prior to running the program.

Field Specification File. This file is only necessary when the data has no field separation indicator (delimiter), as in the case for both sample runs shown in Figures 1 and 2. A request for "field specs" is the first statement printed upon running the program. If the fields are separated by an indicator, the character to be used as a delimiter is input, for example, a comma or a space. Of course, the delimiter character must be unique, that is, it cannot be contained in the regular data. If the field specifications were created and stored on a previous run, the name that was given to that file is entered (see Figure 2); otherwise, the carriage return is pressed to proceed to the creation of the field specifications. Figure 1 provides an example of how the field specifications are input.

Group Specification File. If any fields are to be further summarized prior to tabulation, a "group" specification file must be created. Only fields with numeric characters may be grouped, and a maximum of six fields may be grouped in any one run. Creation of a group specification file is demonstrated in Figure 1, where Field 3 (age) has been divided into four groups of ages 0-64, 65-74, 75-84, 85-99 years.

Report Header File. This option was added to the program to clarify the output tables. Without this option, the table count is preceded by a line indicating the two field numbers which were cross-tabulated. Using this option allows field names to be printed in addition to the field numbers. Each field name is limited to nine characters in length; headers are not allowed if there are over 75 fields. Figure 1 provides an example for creation of a report header file.

Automated Field Input File. The automated field and selection input option is an extremely useful feature. Without this option, after each table print the user must input the next two fields to be tabulated and the selections, if any. So frequent user intervention is required. The automated input feature allows the user to input a large number of fields and their correspond-

```

.R TECO
*EWDATA1$
I001ABRA68FA
002ALLE76MB
003BARR83MA
004CARS72FAB
005JONE65MC
006LARS88MB
007MART92FBC
008MORR62FA
009SILV65FC
010WATT80MAB
$$
*EX$$

.R BASIC
NEW OR OLD-OLD GARY1

READY
RUNNH
ENTER NAME OF FIELD SPECS (PRESS RETURN IF NEW SPECS),
OR ENTER DATA SEPARATION INDICATOR
? (Carriage return pressed by user)
ENTER # LINES OF DATA PER RECORD
?1
ENTER ENDING COLUMN #'S FOR EACH FIELD, USE 99 FOR
A VARIABLE LAST FIELD, EXTRA RETURN AT END
?3
?7
?9
?10
?99 [99 is input because the field is variable in length (see sample data). If the
? last field was always two characters in length, a 12 would have been input.]
ENTER NAME FOR FIELD SPEC STORAGE
?HSFS

ENTER NAME OF GROUP SPECIFICATION FILE, PRESS RETURN
IF NEW GROUPINGS, ENTER 0 IF NO GROUPINGS
?
ENTER FIELD # TO BE GROUPED, THEN ENTER UPPER BOUNDARY
OF EACH GROUP, PRESS EXTRA RETURN CARRIAGE FOR LAST GROUP
?3
?64
?74
?84
?99
?
MORE GROUPS? IF SO, ENTER A 1.
?
ENTER NAME FOR GROUP SPEC FILE
?HSGS

ENTER HEADER FILE NAME, PRESS RETURN TO CREATE NEW HEADERS
ENTER ZERO FOR NO HEADERS
?
ENTER # OF FIELDS PER RECORD
?5
ENTER NAME OF FIELD
?PT. NO.
?NAME
?AGE
?SEX
?PATHOLOGY
ENTER NAME FOR HEADER FILE
?HSRH

ENTER NAME OF AUTOMATED FIELD INPUT FILE, PRESS RETURN
IF NO AUTOMATION DESIRED
?

```

```

ENTER DATA FILE NAME                                     ) Data file created above is ob-
?DATA1                                                    ) tained.

WHAT FIELDS AND %'S? USE THE FORM X,Y,P
?3,5,0 (User inputs fields to be tabulated; no %s in this case)
SELECTION IF ANY, PRESS RETURN IF NO SELECTION
? (Carriage return pressed. No selection in this case.)

3 by 5                                                    )
AGE BY PATHOLOGY                                          )
RECORD COUNT                                              )
    AB    A    BC    B    C    TOTAL                    )
1      0    1    0    0    0    1                        ) Small sample Teletype printout.
2      1    1    0    0    2    4                        ) Note output is sorted.
3      1    1    0    1    0    3                        )
4      0    0    1    1    0    2                        )
    2      3    1    2    2    10                       )

WHAT FIELDS AND %'S? USE THE FORM X,Y,P
?3,5,0 (User inputs next fields, but they will not be used since a detail select and printout will be done.)
SELECTION IF ANY, PRESS RETURN IF NO SELECTION
?D05EQC (User tells computer to search through all records in the data file and print all records which contain a "C" in Field 5.)
ANOTHER SELECTION IF ANY, PRESS RETURN IF NO SELECTION?
?
005JONE65MC                                              ) Teletype prints records as re-
009SILV65FC                                              ) quested.
WHAT FIELDS AND %'S? USE THE FORM X,Y,P
? ("CTRL" and "C" buttons pressed simultaneously to terminate program run.)
READY

```

Figure 2. Automated input file creation and a sample run demonstrating its use.

```

.R TECO                                                    )
*EWBATCHS                                                )
I4,5,3                                                    ) Sample automated field and selec-
                                                    ) tion input file is created in TECO.
3,5,0                                                    ) (Normally a very large number
04EQM                                                    ) of fields and selections would
                                                    ) be input.)
$$                                                       )
*EX$$                                                    )

.R BASIC
NEW OR OLD-OLD GARY1

READY
RUNNH
ENTER NAME OF FIELD SPECS (PRESS RETURN IF NEW SPECS),
OR ENTER DATA SEPARATION INDICATOR
?HSFS [Field spec file created in first run (Figure 1) is recalled.]
ENTER # LINES OF DATA PER RECORD
?1
ENTER NAME OF GROUP SPECIFICATION FILE, PRESS RETURN
IF NEW GROUPINGS, ENTER 0 IF NO GROUPINGS
?HSGS (Group spec file created in first run is recalled.)
ENTER HEADER FILE NAME, PRESS RETURN TO CREATE NEW HEADERS,
ENTER ZERO FOR NO HEADERS
?HSRH (Report header file created in first run is recalled.)
ENTER NAME OF AUTOMATED FIELD INPUT FILE, PRESS RETURN
IF NO AUTOMATION DESIRED
?BATCH (Automated field input file is obtained.)
ENTER DATA FILE NAME
?DATA1 (Data file is obtained.)
(Program control is automated beyond this point. No further input by user is performed.)

WHAT FIELDS AND %'S? USE THE FORM X,Y,P
4,5,3
SELECTION IF ANY, PRESS RETURN IF NO SELECTION

```

4 BY 5
SEX BY PATHOLOGY

RECORD COUNT

	AB	A	BC	B	C	TOTAL
F	1	2	1	0	1	5
M	1	1	0	2	1	5
	2	3	1	2	2	10

% ACROSS

	AB	A	BC	B	C	ROW %S
F	20	40	20	0	20	50
M	20	20	0	40	20	50

% DOWN

	AB	A	BC	B	C
F	50	67	100	0	50
M	50	33	0	100	50
COL %S	20	30	10	20	20

WHAT FIELDS AND %'S? USE THE FORM X,Y,P

3,5,0

SELECTION IF ANY, PRESS RETURN IF NO SELECTION

04EQM

ANOTHER SELECTION IF ANY, PRESS RETURN IF NO SELECTION

3 BY 5
AGE BY PATHOLOGY

RECORD COUNT

	AB	A	B	C	TOTAL
2	0	0	0	1	1
3	1	1	1	0	3
4	0	0	1	0	1
	1	1	2	1	5

WHAT FIELDS AND %'S? USE THE FORM X,Y,P

RE AT LINE 00610

RE AT LINE 00610

END OF PRINT

READY

ing selections prior to running the program. Having then been created as a file, the computer is able to read the various fields and selections as needed.

Creation of this file is accomplished by using the TECO utility program¹ and can be done by the inexperienced user with the knowledge of only a few TECO commands (see Figure 2).

Field and Percentage Input. After all field, group, and report header files have been created or read, a request is made to input the two fields which are to be cross-tabulated, along with the percentage tables desired, if any. As shown in Figure 1, this information is input in the form X, Y, P where X and Y represent the two fields to be tabulated and P is the percentage code. When P = 0 no percentages are output and only the record count table is printed. When P = 1 percentages across rows are output in addition to the record count. When P = 2 percentages down columns are printed. When P = 3 both percentages (across and down) are

printed in addition to the record count. Figure 1 shows an input of Fields 3 and 5 for cross-tabulation, with no percentages.

After the record count table and percentage tables, if any, have been printed by the Teletype, control of the program returns to the field input (see Figure 1 or 2), and the next two fields to be cross-tabulated along with the percentage code are entered by the user.

When inputting the fields, the number of codes within each of the requested fields must not exceed the maximum table size of a 34 by 20 matrix. That is, the X field cannot have more than 34 different codes within that field, and the Y field cannot have more than 20 different codes. If either limit is exceeded, the execution of the program terminates at that point. These restraints can be altered by very minor reprogramming. Merely change the dimension statement to 68 by 10, for example, if a large X field is needed.

Selection Option. Immediately following each request

for field and percentage input, a request is made for a "selection," if any. This selection option allows the elimination of certain records from the count. For example, an investigator may want a tabulation of age by pathology for males only.

Selection input must be in the form XXYZZ, where XX is the field to be selected, YY is the selection function [i.e., equal (EQ), not equal (NE), less than (LT), or greater than (GT)], and ZZ is a specific code within that field. The field number selected (XX) must always be two characters in length; for Field 5, for example, 05 must be typed. The specific code within a field (ZZ) may be one to four characters long. Using the above example, if sex is Field 4 and only males are to be counted, input 04EQM, which tells the computer to select only those records in Field 4 which contain an M. If desired, two selections may be made on one tabulation, and a record must pass both conditions to be accepted (selected).

Record Search Features. This special feature allows the user to examine specific records within the data file. For example, suppose in a tabulation of sex by pathology the table printout shows one G in Field 4 which should be either an M or F only. The computer can then be directed to search for that G and print the entire record to permit examination for errors. This can be accomplished by typing a "D" as the first character in the selection option (DXXYYZZ). Using the above example for clarification when the selection is requested, D04EQG is input.

As before, two search selections are allowed if de-

sired. For example, the above record could also have been located by inputting D04NEM and D04NEF. This not only locates the G in Field 4, but also locates any other records with an error in Field 4, that is, not equal to male or female. This works for one or two legitimate fields; other errors are usually selected with "EQ" feature.

Figure 1 provides another example of this detail record select and print feature.

Hardware and Software. This program runs on commonly available Digital Equipment Corporation PDP 8/E computers with one TD8E DECTape. With the use of only one DECTape, program running time is quite slow. For example, on a 1,000-record file with 38 fields, each complete tabulation takes about 15 min. However, this program has been designed to run without user intervention once all information has been input (automated input feature). This permits the user to leave the computer room and spend his time elsewhere, while the runs are being executed and tables printed. The program is currently within about 100 words of core limits.

The PDP 8/E has a 12K core, uses the OS/8 operating system, and uses BASIC as a language. This program is not device dependent and can be run without modification on a floppy disk, at considerably faster rates.

Availability. Program tapes or additional information may be obtained at no charge or cost of materials from Ralph Dippner, State University of New York, State College of Optometry, 100 East 24th Street, New York, New York 10010.

APPENDIX A: PROGRAM LISTING

GARY1 BA 3.0 01-AUG-77

```

20 REM F$=FIELD SPECS,F=STORAGE
30 DIM F(2,20)
31 DIM G(6,10)
32 DIM S1$(2,2)\DIM S2$(2,2)\DIM S3$(2,4)\DIM S4$(4,2)
33 S4$(1)="EQ"\S4$(2)="NE"\S4$(3)="GT"\S4$(4)="LT"
34 DIM N$(75,9)
35 DIM C(34,20),I$(34,4),J$(20,4)          COUNT ROW AND COLUMN ALPHA
38 DIM R$(2,72)
39 K7=0\P6=0\F0=0\L7=1
40 F(K7,0)=0
41 P6=0\REM RESET SPECIAL CHARACTER INDICATOR
50 PRINT "ENTER NAME OF FIELD SPECS (PRESS RETURN IF NEW SPECS),"
51 PRINT "OR ENTER DATA SEPARATION INDICATOR"
55 INPUT F$
57 PRINT "ENTER # LINES OF DATA PER RECORD"\INPUT R
58 IF LEN(F$)=1 GO TO 62\IF F$="" GO TO 100
59 FILE#1:F$\GO TO 67
62 P6=1
63 GO TO 210
67 INPUT#1:R,X,X
68 FOR K7=0 TO R-1
70 I=1
75 INPUT#1:D(K7,I,X,X
76 IF F(K7,I)=0 TO TO 80\I=I+1\GO TO 75
80 NEXT K7\CLOSE #1
81 GO TO 210
100 PRINT "ENTER ENDING COLUMN #'S FOR EACH FIELD, USE 99 FOR"
```

LINES 50-479
ONE PASS SETUP
OF PARAMETERS

```

110 PRINT "A VARIABLE LAST FIELD, EXTRA RETURN AT END"
120 I=I+1
130 INPUT F(K7,J)
140 IF F(K7,J)=0 GO TO 180\GO TO 120
180 PRINT "ENTER NAME FOR FIELD SPEC STORAGE"\INPUT F$
182 IF L7<1 GO TO 200
190 FILEV#L7:F$
194 PRINT#L7:R
195 FOR K7=0 TO R-1
200 FOR J=1 TO I\PRINT#L7:F(K7,J)\NEXT J\next K7
205 IF L7<1 TO TO 210\CLOSE#L7
210 REM G$=GROUPING SPECS,G=STORAGE
220 PRINT "ENTER NAME OF GROUP SPECIFICATION FILE, PRESS RETURN"
225 PRINT "IF NEW GROUPINGS, ENTER 0 IF NO GROUPINGS"
230 INPUT G$\IF G$="" GO TO 260\IF G$="0" GO TO 457\FILE#1:G$
231 REM READ GROUP SPECS
232 INPUT#1:J1,X,X
233 FOR L=1 TO J1
235 FOR M=0 TO 10
240 INPUT#1:G(L,M),X,X
245 IF G(L,M)=0 GO TO 247\next M
247 INPUT#1:K(L),X,X
250 next L
255 CLOSE#1\GO TO 457
260 REM CREATE GROUP FILE
300 FOR J=1 TO 6
305 PRINT "ENTER FIELD #TO BE GROUPED, THEN ENTER UPPER BOUNDARY"
306 PRINT "OF EACH GROUP, PRESS EXTRA RETURN CARRIAGE FOR LAST GROUP"
307 INPUT G(J,0)
310 FOR K=1 TO 10
320 INPUT G(J,K)\IF G(J,K)=0 GO TO 340
330 next K
340 PRINT "MORE GROUPS? IF SO, ENTER A 1."
345 K(J)=K-1
350 INPUT J6
360 IF J6<>1 GO TO 390
370 next J
390 PRINT "ENTER NAME FOR GROUP SPEC FILE"
395 J1=J
400 INPUT G$
402 IF L7<1 GO TO 415
410 FILEV#7:G$
415 PRINT#7:J1\REM STORAGE OF #OF GROUPS
416 REM STORAGE OF GROUP SPECS
420 FOR L=1 TO J1
430 FOR M=0 TO 10
440 PRINT#L7:G(L,M)\IF G(L,M)=0 GO TO 455
450 next M
455 PRINT#L7:K(L)
456 next L\IF L7<1 GO TO 457\CLOSE#L7
457 PRINT "ENTER HEADER FILE NAME, PRESS RETURN TO CREATE NEW HEADERS,"
458 PRINT "ENTER ZERO FOR NO HEADERS"
460 INPUT N$\IF N$="" GO TO 472\IF N$="0" GO TO 464
461 FILE#1:N$\INPUT#1:F1,X
462 FOR I=1 TO F1\INPUT#1:N$(I),X\next I
463 CLOSE#1\GO TO 472
464 PRINT "ENTER #OF FIELDS PER RECORD"
465 INPUT F1
467 PRINT "ENTER NAME OF FIELD"
468 FOR I=1 TO F1\INPUT N$(I)\next I
469 PRINT "ENTER NAME FOR HEADER FILE"
470 INPUT N$\FILEV#1:N$\PRINT#1:F1
471 FOR I=1 TO F1\PRINT#1:N$(I)\next I\CLOSE#1
472 PRINT "ENTER NAME OF AUTOMATED FIELD INPUT FILE, PRESS RETURN"
473 PRINT "IF NO AUTOMATION DESIRED"
474 INPUT Y$\IF LEN(Y$)=0 GO TO 475\F0=2\FILE#2:Y$
475 PRINT "ENTER DATA FILE NAME"
476 INPUT D$
479 FILE#1:D$
480 REM ZERO TABLES
490 FOR I=0 TO 19

```

LINES 480-1000
 SELECT THE RECORD

```

500   FOR J=0 TO J9
510   C(I,J)=0
520   NEXT J
530   NEXT I *
540   I9=0\J9=0
599   F=0\PRINT
600   PRINT "WHAT FIELDS AND %'S? USE THE FORM X,Y,P"
610   INPUT #F0:X,Y,P
620   IF F0=0 GO TO 640\IF END#2 GO TO 9985\INPUT #2:X1
621   PRINT X;"",Y;"",P
640   REM SELECTION
645   R3=0
655   PRINT "SELECTION IF ANY, PRESS RETURN IF NO SELECTION"
660   INPUT #F0:S$
661   IF F0=0 GO TO 663\INPUT #2:X1
662   PRINT S$
663   IF S$="" GO TO 829
665   IF SEG$(S$,1,1)<>"D" GO TO 670
667   S$=SEG$(S$,2,LEN(S$))\F=1
670   S1$(R3)=SEG$(S$,1,2)\S2$(R3)=SEG$(S$,3,4)\S3$(R3)=SEG$(S$,5,LEN(S$))
680   FOR I4=1 TO 4\IF S2$(R3)=S4$(I4) GO TO 690\NEXT I4
690   I5(R3)=I4
700   R3=R3+1
710   IF R3=2 GO TO 829
720   PRINT "ANOTHER";\GO TO 655
829   Z=0\REM READ FIRST RECORD
830   FOR K7=0 TO R-1
837   INPUT #1:R$(K7)\IF END#1 GO TO 1200
838   NEXT K7
840   IF P6=0 GO TO 850
841   IF Z>0 GO TO 850
842   Z=Z+1
843   FOR K7=0 TO R-1\C4(K7)=1
844   FOR C5=1 TO LEN(R$(K7))-1
845   IF SEG$(R$(K7),C5,C5)<>F$ GO TO 847
846   C4(K7)=C4(K7)+1
847   NEXT C5\NEXT K7
848   FOR K7=1 TO R-1\C4(K7)=C4(K7)+C4(K7-1)\NEXT K7
849   REM C4(K7)=#OF FIELDS IN LINE #K7 OF RECORD R$(K7)
850   FOR R4=0 TO R3-1
880   J=VAL(S1$(R4))
881   IF P6=0 GO TO 915
895   FOR K7=0 TO R-1
898   IF J>C4(K7) GO TO 900\GO TO 905
900   NEXT K7\RESTORE #1\GO TO 600
905   F9=J\GOSUB 5000\GO TO 920
915   K7=0
917   H$=SEG$(R$(K7),F(K7,J-1),F(K7,J))
918   X$=H$\F9=J\GOSUB 7000
919   IF D<>1 GO TO 920\H$=STR$(K)\D=0
920   IF I5(R4)>1 GO TO 930
925   IF H$=S3$(R4) GO TO 990\GO TO 830
930   IF I5(R4)>2 GO TO 940
935   IF H$<>S3$(F4) GO TO 990\GO TO 830
940   IF I5(R4)>3 GO TO 950
945   IF H$>S3$(R4) GO TO 990\GO TO 830
950   IF H$<S3$(R4) GO TO 990
960   GO TO 830
990   NEXT R4
991   IF F<>1 GO TO 1002
992   FOR K7=0 TO R-1\PRINT R$(K7)\NEXT K7
994   GO TO 830
1000  REM RECORD IS SELECTED IF WE GET HERE
1002  IF P6=0 GO TO 1020
1004  FOR K7=0 TO R-1\IF X>C4(K7) GO TO 1006\GO TO 1008
1006  NEXT K7\RESTORE #1\GO TO 600
1008  F9=X\GOSUB 5000\I$=H$
1013  FOR K7=0 TO R-1\IF Y>C4(K7) GO TO 1014\GO TO 1015
1014  NEXT K7\RESTORE #1\GO TO 600
1015  F9=Y\GOSUB 5000\J$=H$
1018  GO TO 1040

```

LINES 667 and 991-994
 ALLOW GARBAGE CLEAN OUT
 MAKE YOUR 1ST REPORT A WORST CASE

```

1020  I$=SEG$(R$(K7),F(K7,X-1)+1,F(K7,X))
1024  X$=I$\F9=X\GOSUB 7000
1025  IF D<>1 GO TO 1030\I$=STR$(K)\D=0
1030  J$=SEG$(R$(K7),F(K7,Y-1)+1,F(K7,Y))
1034  X$=J$\F9=Y\GOSUB 7000
1035  IF D<>1 GO TO 1040\J$=STR$(K)\D=0
1040  REM TABLE ADD
1050  FOR I=1 TO I9
1060  IF I$=I$(I) GO TO 1100
1070  NEXT I\I9=I9+1\I=I9
1080  I$(I)=I$
1100  FOR J=1 TO J9
1110  IF J$=J$(J) GO TO 1150
1120  NEXT J
1130  J9=J9+1\J=J9
1140  J$(J)=J$
1150  C(I,J)=C(I,J)+1
1190  GO TO 830
1199  REM SORT COLUMNS                LINES 1199-1310
1200  IF F<>1 GO TO 1205                SORT THE ROWS AND COLUMNS
1202  RESTORE #1\GO TO 599              ALPHA PRIOR TO PRINT
1205  I0=1\S9=0
1210  IF J$(I0+1)>J$(I0) GO TO 1250
1220  G$=J$(I0)\J$(I0)=J$(I0+1)\J$(I0+1)=G$\S9=1
1230  FOR I4=1 TO I9\C0=C(I4,I0)\C(I4,I0)=C(I4,I0+1)
1235  C(I4,I0+1)=C0\NEXT I4
1240  IF I0=1 THEN 1250\I0=I0-1\GO TO 1210
1250  I0=I0+1\IF I0<J9 THEN 1210\IF S9=1 THEN 1200
1259  REM SORT ROWS
1260  I0=1\S9=0
1265  IF I9=1 GO TO 1400
1270  IF I$(I0+1)>I$(I0) GO TO 1310
1280  G$=I$(I0)\I$(I0)=I$(I0+1)\I$(I0+1)=G$\S9=1
1290  FOR I4=1 TO J9\C0=C(I0,I4)\C(I0,I4)=C(I0+1,I4)
1295  C(I0+1,I4)=C0\NEXT I4
1300  IF I0=1 THEN 1310\I0=I0-1\GO TO 1270
1310  I0=I0+1\IF I0<I9 THEN 1270\IF S9=1 THEN 1260
1400  PRINT X;" BY ";Y
1402  IF N$="0" GO TO 1410                LINES 1400-4020
1405  PRINT N$(X);" BY ";N$(Y)            PRINT THE MATRIX
1410  FOR I=1 TO I9
1420  FOR J=1 TO J9
1430  C(0,J)=C(0,J)+C(I,J)
1440  C(I,0)=C(I,0)+C(I,J)\NEXT J
1450  C(0,0)=C(0,0)+C(I,0)\NEXT I
1498  P2=0
1499  PRINT\PRINT "RECORD COUNT"
1500  GOSUB 8000
1530  IF P=0 GO TO 1700
1540  IF P=2 GO TO 1558
1550  REM % ACROSS
1552  PRINT
1555  PRINT "% ACROSS"\GOSUB 8000
1557  IF P=1 GO TO 1700
1558  PRINT
1600  PRINT "% DOWN"\GOSUB 8000
1700  REM END OF PRINT
1800  REM CHI-SQUARE
1850  RESTORE #1
1900  GO TO 480
2000  REM PRINT SUBROUTINE
1005  P2=P2+1
2010  FOR J=1 TO J9
2020  PRINT TAB(7+5*(J-1));J$(J+C);
2030  NEXT J
2032  IF Q=1 GO TO 2045
2033  IF P2>1 GO TO 2035\PRINT " TOTAL"\GO TO 2050
2035  IF P=2 GO TO 2045
2040  IF P2>2 GO TO 2045
2042  PRINT " ROW %S"\GO TO 2050
2045  PRINT

```



```

2050 FOR I=1 TO I9
2060 PRINT I$(I);
2070 FOR J=1 TO J9
2080 PRINT TAB(6+5*(J-1));\GOSUB 4000
2090 NEXT J
2091 IF Q=1 GO TO 3005
2092 IF P2>1 TO TO 3001\PRINT TAB(6+5*J9);C(I,0)
2095 GO TO 3010
3001 IF P2=3 GO TO 3005\IF P=2 GO TO 3005
3002 PRINT TAB(6+5*J9);\INT(C(I,0)/C(0,0)*100+.5);
3005 PRINT
3010 NEXT I
3015 IF P2=3 GO TO 3018
3016 IF P2=1 GO TO 3020
3017 IF P=2 GO TO 3018\GO TO 3050
3018 PRINT "COL %S";
3020 FOR J=1 TO J9
3025 IF P2=1 GO TO 3030
3026 PRINT TAB(6+5*(J-1));\INT(C(0, J+C)/C(0,0)*100+.5);\GO TO 3040
3030 PRINT TAB(6+5*(J-1));C(0,J+C);
3040 NEXT J
3041 IF Q=1 GO TO 3060
3042 IF P2>1 GO TO 3060\PRINT TAB(6+5*J9);C(0,0)
3050 PRINT\RETURN
3060 PRINT\PRINT\RETURN
4000 IF P2>1 GO TO 4005\PRINT C(I,J+C);\RETURN
4005 IF P=2 GO TO 4020
4010 IF P2>2 GO TO 4020
4015 PRINT INT(C(I,J+C)/C(I,0)*100+.5);\RETURN
4020 PRINT INT(C(I,J+C)/C(0,J+C)*100+.5);\RETURN
5000 F8=F9\C6(K7)=C4(K7)
5002 IF K7=0 GO TO 5008
5004 F8=F9-C4(K7-1)
5006 C6(K7)=C4(K7)-C4(K7-1)
5008 P5=0\P4=0
5010 P5=P5+1\IF SEG$(R$(K7),P5,P5)=F$ GO TO 5020\GO TO 5010
5020 P4=P4+1
5025 IF P4=F8 GO TO 6000
5030 IF P4=F8-1 GO TO 5040\GO TO 5010
5040 P4=P5+1
5050 IF F8=C6(K7) GO TO 5090
5060 FOR P5=P4+1 TO LEN(R$(K7))
5070 IF SEG$(R$(K7),P5,P5)=F$ GO TO 6000
5080 NEXT P5
5090 P5=LEN(R$(K7))+1
6000 H$=SEG$(R$(K7),P4,P5-1)
6001 X$=H$\GOSUB 7000
6002 IF D<>1 GO TO 6003\H$=STR$(K)\D=0
6003 RETURN
7000 REM GROUPING SUBROUTINE
7010 FOR J=1 TO J1
7020 IF F9=G(J,0) GO TO 7035
7030 NEXT J\RETURN
7035 D=1
7040 FOR K=1 TO K(J)
7050 IF VAL(X$)<=G(J,K) GO TO 7060\NEXT K
7060 RETURN
8000 C=0
8010 IF J9>10 GO TO 8030
8020 GOSUB 2000\RETURN
8030 J8=J9\J9=10\Q=1\GOSUB 2000
8040 Q=0\C=10\J9=J8-10\P2=P2-1\GOSUB 2000\J9=J8\RETURN
9985 PRINT "END OF PRINT"
9990 STOP
9999 END

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READY

NOTE TO PROGRAM MODIFIERS: THIS PROGRAM IS WITHIN ABOUT 100 LOCATIONS OF FILLING USABLE CORE. DIMENSION STATEMENTS MUST BE CUT OR CODING DELETED IF ANY ADDITIONS TO THE PROGRAM (E.G., CHI-SQUARE) ARE TO BE MADE.

NOTE

1. See TECO, Chapter 2 of OS/8 Handbook, Digital Equipment Corporation, Maynard, Massachusetts, April 1974.

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