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ABSTRACT

An interactive test analysis system was developed which interfaces a 3M DATRONICS system with a XEROX Sigma 9 computer. The computer programs were written in A Programming Language (APL). The current implementation of the program is characterized by its capability to: read responses from a DATRONIC answer sheet; allow the faculty member the option of omitting items from the analysis; check for omitted items; allow the faculty member the option of selecting specific reports; and collect descriptive statistics concerning the system performance and characteristics of the test analyzed. The complete set of reports generated by the test analysis program provide information normally included in an analysis of a norm-referenced test. The fixed costs for the test analysis system are the 3M Datronic System and the Anderson Jacobson terminal. If you assume a lease option for each component of the system then the approximate cost will be $240 per month. This fixed cost can be allocated on the assumption of full utilization of the system with an average cost of $1.50 per hour for a 40 hour week. When the costing formula was applied to the data base of 88 sets of tests, the average and median cost were determined to be $8.37 and $7.83 respectively. (Author/RC)

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Interactive Test Analysis: Development, Implementation, and Evaluation

by

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TM004 832

Interactive Test Analysis:

Development, Implimentation, and Evaluation

The purpose of this paper is to describe the development, implementation, and evaluation of an interactive test analysis system. The primary focus of the paper will be on the operational characteristics of the system and the problems associated with determining the costs of such services in an educational setting.

DEVELOPMENT

The T.C.U. Interactive Test Analysis Program was developed to provide test scoring and test analysis services to the members of the T.C.U. instructional staff. The initial performance standards established for the test analysis services, 95% completed within one working day and 100% completed within two working days, has been achieved by the system.

The three phases of any data analysis program: data entry, data analysis, and report generation are accomplished through the interface of the:

A. 3M DATRONICS Data Analysis System,

B. Anderson Jacobson Selectronic 841 Terminal, and

C. XEROX Sigma 9 computer.

Each of the three components of the system has proved highly reliable and the versatility of the system, in an educational

environment, appears to be very great. Information concerning the components of the system can be obtained from the manufacturer. (See Appendix 1)

The XEROX Sigma 9 computer system provides the option of selecting FORTRAN, BASIC, or APL as the programming language for the test analysis system. A Programming Language (APL) was selected on the basis of its ability to manipulate and perform computations involving matrices of numeric data. APL, as it has been implemented on the XEROX Sigma 9 computer (XEROX APL - Sigma 6/7/9 Computers: Language and Operations Reference Manual) enables the user to copy functions from a library and to erase variables or functions from the active workspace during execution of a function. This feature greatly reduces the size of the workspace required to analyze the test data.

The author served as both the designer and programmer for the T.C.U. Interactive Test Analysis Program. The programs were developed, tested, and modified over a period of three months. Accurate estimates of the time required to develop the programs would have been possible if the author had filed the reports generated by the XEROX operating system. Existing APL functions, from the T.C.U. Computer Center library were utilized when it was feasible to do so. The major portion of the programs were developed in an interactive mode. Each APL function was programed, tested, modified, and integrated into the main control function named START (See Appendix 2). Faculty members, who had previously utilized the test scoring service, were consulted both as to the information they

wanted to receive and the format developed for the final reports. Requests for additional information to be included in the reports and the need to verify the accuracy of the data entered, often required major program modification.

Three factors which make the set of APL programs longer and less efficient than typical APL programs are the:

A. use of comments to internally document the functions,

B. inculsion of the interpretative information in each report generated by the system, and

C. ability of the programmer to maximize the power and efficiency of the APL language.

IMPLEMENTATION

The test analysis programs have been available for only three months, March through May 1975, and during this period of time approximately 100 sets of tests have been analyzed by Instructional Services. Sets of tests were eliminated form the data base if the number of students or items was less than ten of if the performance data was known to be invalid. The invalid data occurred most frequently in the early stages of development when unexpected problems would be discovered in the operation of the system. The resulting data base consisted of complete data for 88 sets of tests papers.

The current implementation of the program is characterized by its capability to:

A. read responses from a DATRONIC answer sheet,

B. allow the faculty member the option of omitting items from the analysis,

C. check for double responses to an item,

D. check for omitted items,

E. allow the faculty member the option of selecting specific reports, and

F. collect descriptive statistics concerning the system performance and characteristics of the test analyzed.

The complete set of reports generated by the test analysis program (See Appendix 3) provide the information normally included in an analysis of a norm referenced test, such as the:

A. descriptive statistics for the test,

B. table of frequency and cummulative frequency,

C. histogram of grouped data,

D. table of raw and converted scores,

E. item difficulty and discrimination indexes, and

F. reports of individual student performance.

Program documentation is currently being prepared and the entire set of programs will be submitted to the XEROX Users' group. The use of imbedded commands to copy or erase functions or variables and the delta PMT function are the only non standard APL features used in the programs.

EVALUATION

The test analysis system has proved to be highly reliable and has met the performance specifications, 95% completed in 1 working day and 100% completed within 2 working days, established by Instructional Services. The objective, in all educational services, is to provide the services as cost effectively as possible. In the analysis of costs, fixed and variable costs will be discussed separately.

The fixed costs for the test analysis system are the 3M Datronic System and the Anderson Jacobson terminal. The options of: purchase, lease - purchase, and rental are available for each component of the system. T.C.U. has purchased the 3M Datronics system ($3,300) and leased the Anderson Jacobson terminal. If you assume a lease option for each component of of the system then the approximate costs will be:

3M Datronic System	-	$118 per month (3 yr.)
Anderson Jacobson terminal	-	$122 per month
Total	-	$240 per month

These fixed cost can be allocated on the assumption of full utilization of the system with and average cost of $1.50 per hour for a 40 hour week or $.75 per hour for an 80 hour week. It is unlikely that institutions with student bodies of less than 10,000 students need to allocate more than 40 hours per week for test analysis services. In subsequent calculation, $1.50 per hour is used for the fixed costs.

The variable costs involved in the test analysis system are:

A. Student Operator - $ .03 minute

B. Terminal Connect Time- .05

C. CPU time - 3.25

D. Answer Sheets - .025

E. Paper Cost - .10 per set.

The formula used to determine the estimated cost of each test analyzed by Instructional Services is:

COST = Connect time x .025
+ Connect time x .03
+ Connect time x .05
+ CPU time x 3.25
+ Answer Sheet @ .025
+ Paper @ .10

When the formula was applied to the total data base, 88 sets of tests, the average and median cost were determined to be $8.37 and $7.83 respectively. As expected, the average and median costs increased as the lenght of the test increased:

		AVERAGE	MEDIAN
10 - 50 item test	=	$6.64	$ 6.66
51 - 101 item test	=	10.11	10.85
101 - 150 item test	=	15.69	17.29

Although the cost of the service is substantial, it is less than the same information could be derived through hand calculation of the same test analysis information.

DISCUSSION

The evaluation of the T.C.U. Interactive Test Analysis Program points out the complexity of developing such a system and the need to develop techniques for reducing the cost of the services provided. Some of the changes which would contribute to delivering comparable test analysis services at reduced cost include:

A. Delete the descriptive information from the APL programs and prepare a user's guide,

B. Development of automatic feed device for the test scoring machine (this is currently under development by 3M Corporation),

C. Development of test scoring machine which would read both sides (100 items) at one pass,

D. Remote printing of APL generated files, and

E. Increase the efficiency of the APL programs.

It has been estimated that implementation of the first suggestion will reduce the average cost of the set of tests analyzed from $8.37 to $6.67. The remaining improvements require the continued cooperation between the manufacturers of the equipment and the developers of test analysis programs and systems.

The developer of test analysis programs must be in constant communication with the faculty members who utilize the program in order to assure that the information provided is being accurately interpreted and that the information needs of the user are be met by the program. Some of the major program developments which will

enhance the current test analysis programs include:

A. capability to analyze and report subtest scores,

B. information management system to store and and accumulate student and item statistics,

C. computer generated tests, and

D. test analysis programs for criterion referenced tests.

The test analysis system has also demonstrated that it can support faculty evaluation and during the summer of 1975 it will be used by the student government in analyzing their election results. Analysis of the cost of using the system to read the 25,000 student evaluations into data files is currently under study.

APPENDIX 1

ERIC

SYSTEM COMPONENTS: SOURCES AND COST ESTIMATES

3M DATRONICS Data Analysis System
5500-RST Data Analysis System

Mr. Jim Womac
3M Center
3M Corporation
Building 209-1
St. Paul, Minn. 55101

Anderson-Jacobson Computer Terminal
AJ SELECTRONIC 841

Mr. George Fish
1065 Morse Avenue
Sunnyvale, CA 94086

XEROX Computer Users° Group
701 South Aviation Boulevard
El Segundo, CA 90245

APPENDIX 2

ERIC

```
      ∇START[⎕]∇
    ∇ START
[1]   ⍝INTERACTIVE TEST ANALYSIS PROGRAM
[2]   ⍝FOR 3-M DATRONICS 550/D TESTSCORER
[3]   ⍝INTERFACED WITH A XEROX SIGMA 9 COMPUTER
[4]   ⍝THROUGH AN A. J. SELECTRONIC 841 TERMINAL
[5]   ⍝
[6]   ⍝AUTHORIZATION TO UTILIZE THIS SET OF
[7]   ⍝PROGRAMS IS GIVEN IF CREDIT IS GIVEN TO
[8]   ⍝THE PROGRAM DEVELOPER - DR. LIPE AND
[9]   ⍝TEXAS CHRISTIAN UNIVERSITY
[10]  ⍝
[11]  ⍝DEVELOPMENTAL PROGRAM - 1ST EDITION
[12]  ⍝DOCUMENTATION DATE MAY 1975
[13]  ⍝FOR PROGRAM ASSISTANCE CONTACT:
[14]  ⍝DR. GARY LIPE, DIRECTOR
[15]  ⍝INSTRUCTIONAL SERVICES
[16]  ⍝TEXAS CHRISTIAN UNIVERSITY
[17]  ⍝FORT WORTH, TEXAS 76129
[18]  ⍝817 926 2461
[19]  ⍝
[20]  ⍝START IS THE CONTROL PROGRAM FOR THE TEST ANALYSIS PROGRAMS
[21]  ⍝COPY START FROM THE APL WORKSPACE AND THEN EXECUTE START
[22]  ⍝
[23]  ⍎')QCOPY L1 SS SYSFN'
[24]  ⍎')QCOPY L1 CPU RT SCPU SIT SM SRT SSD SST SU SDEPT SMDI'
[25]  'TYPE THE DEPARTMENT IDENTIFICATION NUMBER'
[26]  DEPT←⎕
[27]  CPU1←I21
[28]  RT1←I20
[29]  'TYPE NAME OF INSTRUCTOR'
[30]  INST←⍞
[31]  'TYPE NAME OF COURSE'
[32]  COURSE←⍞
[33]  'TYPE NAME OF TEST'
[34]  TITLE←⍞
[35]  ' '
[36]  'TYPE THE MAXIMUM POSSIBLE SCORE FOR THE TOTAL TEST'
[37]  'THIS REPRESENTS THE NUMBER OF ITEMS SCORED LESS THE'
[38]  'NUMBER OF OMITTED ITEMS'
[39]  TOTAL←⎕
[40]  'TYPE NUMBER OF SIDES OF TEST TO BE SCORED'
[41]  NS←⎕
[42]  ' '
[43]  'INDICATE THE NUMBER OF ITEMS ON EACH SIDE OF THE TEST'
[44]  'TYPE NUMBERS AS FOLLOWS:'
[45]  'SIDE 1 (SPACE) SIDE 2 (SPACE) SIDE 3 (SPACE) SIDE 4'
[46]  'FOR ANY SIDE THAT DOES NOT HAVE ANY ITEMS TO BE'
[47]  'SCORED, ENTER ZERO (0)'
[48]  NIT←⎕
[49]  SN←1 51 101 151
[50]  ⍎')QCOPY TESTSC2 CHOICE READ CK CKE DIM C T D GO HD DATE ΔFMT'
```

```
      ∇START[⎕S1]∇
[51]  CHOICE
[52]  CNT←0
[53]  START:CNT←CNT+1
[54]  ' '
[55]  'TYPE THE NUMBER OF ITEMS TO BE SCORED ON SIDE ';CNT
[56]  'NUMBER OF ITEMS MUST BE ≤ 50'
[57]  CMAX←⎕
[58]  ' '
[59]  READ
[60]  CK
[61]  →(ERROR=0)/B2
[62]  CKE
[63]  B2:⍎')QCOPY TESTSC2 SCORE GRADE ORDER DISC ISTAT PO5 DSTAT'
[64]  ⍎')QCOPY TESTSC2 SCORE1 SCORE2 SCORE3 SCORE4 MPDATA'
[65]  ⍎')QCOPY TESTSC2 ISTAT1 ISTAT2 ISTAT3 ISTAT4 MIDATA MANS REL'
[66]  SCORE
[67]  GRADE
[68]  ISTAT
[69]  →(CNT<NS)/START
[70]  MIDATA
[71]  ⍎')ERASE ISTAT1 ISTAT2 ISTAT3 ISTAT4 MIDATA'
[72]  MPDATA
[73]  ⍎')ERASE SCORE1 SCORE2 SCORE3 SCORE4 MPDATA'
[74]  MANS
[75]  SC←SC1+SC2+SC3+SC4
[76]  C SC
[77]  USC←E
[78]  T SC
[79]  ORDER
[80]  DISC
[81]  PO5
[82]  ⍎')ERASE CHOICE READ CK CKE SCORE GRADE ORDER DISC ISTAT'
[83]  ⍎')QCOPY TESTSC2 STDSC PO1 PO2 PO3 PO4 R DSTAT MANS USTDSC'
[84]  D←M
[85]  DSTAT SC
[86]  M←D
[87]  R SC
[88]  ⍎')ERASE E J RN'
[89]  STDSC
[90]  PO1
[91]  ⍎')ERASE PO1'
[92]  PO2
[93]  ⍎')ERASE PO2'
[94]  ⍎')QCOPY TESTSC2 GRP HIST'
[95]  GRP
[96]  ⍎')ERASE GRP'
[97]  PO3
[98]  ⍎')ERASE PO3'
[99]  PO4
[100] ⍎')ERASE PO4'
```

```
      ∇START[⎕101]∇
[101] CPU2←I21
[102] RT2←I20
[103] CPU←CPU2-CPU1
[104] RT←RT2-RT1
[105] SYSFN
[106] GO
[107] ' '
[108] 'SYSTEM OPERATOR+++++++++++++++++++++++++++'
[109] 'FOLLOW THESE DIRECTIONS ONLY IF THIS HAS'
[110] 'BEEN A REAL SET OF TEST PAPERS SCORED'
[111] 'AND YOU ARE IN A CLEAR WS'
[112] ' '
[113] '     1. EXECUTE THE FN ER'
[114] '     2. RENAME WORKSPACE TO L1'
[115] '     3. SAVE WORKSPACE L1'
[116] '     4. CLEAR THE WORKSPACE'
```

APPENDIX 3

```
)APL
APL-B00-005
CLEAR WS
      )COPY TESTSC2 START
TESTSC2     SAVED 09:03 MAY 16,'75
      START
TYPE THE DEPARTMENT IDENTIFICATION NUMBER
⎕:
      100
TYPE NAME OF INSTRUCTOR
DR. GARY LIPE
TYPE NAME OF COURSE
DEMONSTRATION PROGRAM
TYPE NAME OF TEST
FOR 8TH ANNUAL CUETUG CONFERENCE

TYPE THE MAXIMUM POSSIBLE SCORE FOR THE TOTAL TEST
THIS REPRESENTS THE NUMBER OF ITEMS SCORED LESS THE
NUMBER OF OMITTED ITEMS
⎕:
      15
TYPE NUMBER OF SIDES OF TEST TO BE SCORED
⎕:
      1

INDICATE THE NUMBER OF ITEMS ON EACH SIDE OF THE TEST
TYPE NUMBERS AS FOLLOWS:
SIDE 1 (SPACE) SIDE 2 (SPACE) SIDE 3 (SPACE) SIDE 4
FOR ANY SIDE THAT DOES NOT HAVE ANY ITEMS TO BE
SCORED, ENTER ZERO (0)
⎕:
      15 0 0 0
THIS REPORT CONTAINS 5 SECTIONS:
    1.  DESCRIPTIVE STATISTICS
    2.  SUMMARY GROUP PERFORMANCE DATA
    3.  HISTOGRAM
    4.  INDIVIDUAL STUDENT PERFORMANCE DATA
    5.  INDIVIDUAL ITEM PERFORMANCE DATA

TYPE 1 FOR EACH SECTION TO BE PRINTED
TYPE 0 FOR EACH SECTION TO BE OMITTED

SPACE BETWEEN EACH 1 AND/OR 0

⎕:
      1 1 1 1 1

TYPE THE NUMBER OF ITEMS TO BE SCORED ON SIDE 1
NUMBER OF ITEMS MUST BE ≤ 50
⎕:
      15

START FEEDING FORMS. TYPE 'STOP' WHEN FINISHED.
STOP
12 ROWS ENTERED

TYPE 1 IF ITEMS WERE OMMITTED ON THE ANSWER KEY
TYPE 0 IF NO ITEMS WERE OMMITTED ON THE ANSWER KEY
⎕:
      0
```

TEXAS CHRISITIAN UNIVERSITY - INSTRUCTIONAL SERVICES TEST ANALYSIS FOR DR. GARY LIPE
COURSE: DEMONSTRATION PROGRAM -- FOR 8TH ANNUAL CUETUG CONFERENCE WAS SCORED ON JUNE 9,1975
ASSISTANCE IN INTERPRETATION OF TEST RESULTS MAY BE OBTAINED BY CALLING
DR. GARY LIPE, DIRECTOR AT 817 926 2461 EXT. 454

THIS SECTION OF THE TEST REPORT CONTAINS
DESCRIPTIVE STATISTICS FOR THE TOTAL GROUP

NUMBER OF ITEMS SCORED 15

NUMBER OF TEST PAPERS SCORED 11

MEASURES OF VARIABILITY

RANGE REPRESENTS THE DIFFERENCE BETWEEN THE HIGHEST AND LOWEST SCORE IN THE SET OF TEST SCORES

VARIANCE IS A SINGLE REPRESENTATIVE VALUE OF ALL THE DIFFERENCES OF INDIVIDUAL TEST SCORES FROM A COMMON REFERENCE POINT, THE MEAN.

STANDARD DEVIATION IS THE SQUARE ROOT OF THE VARIANCE
THE STANDARD DEVIATION IS USEFUL IN INTERPRETING SCORES WHICH ARE NORMALLY DISTRIBUTED ABOUT THE MEAN AND IN INFERENTIAL STATISTICS .

RANGE	7
VARIANCE	4.02
STANDARD DEVIATION	2

MEASURES OF CENTRAL TENDENCY

MEAN IS THE ARITHMETIC AVERAGE OF THE SET OF TEST SCORES

MEDIAN IS THE POINT, ON THE RAW SCORE SCALE, ABOVE WHICH AND BELOW WHICH ONE-HALF OF THE TEST SCORES FALL.

MODE IS THE SCORE(S) IN THE SET OF TEST SCORES WHICH OCCUR MOST FREQUENTLY.

MEAN	12.27
MEDIAN	13
MODE	13

SPACE TO THE TOP OF A NEW PAGE
STRIKE RETURN TO CONTINUE

TEXAS CRRISITIAN UNIVERSITY - INSTRUCTIONAL SERVICES TEST ANALYSIS FOR DR. GARY LIPE
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THIS SECTION OF THE REPORT PROVIDES
SUMMARY GROUP PERFORMANCE DATA

RAW SCORE DENOTES THE TOTAL NUMBER OF CORRECT ANSWERS

FREQUENCY DENOTES THE NUMBER OF TIMES A SCORE OCCURRED

CUMULATIVE FREQUENCY DENOTES THE TOTAL NUMBER OF SCORES
LESS THAN OR EQUAL TO A GIVEN SCORE

RAW SCORE	FREQUENCY (F)	CUMULATIVE FREQUENCY (CF)
15.00	1.00	11.00
14.00	2.00	10.00
13.00	3.00	8.00
12.00	2.00	5.00
11.00	1.00	3.00
10.00	1.00	2.00
8.00	1.00	1.00

SPACE TO THE TOP OF A NEW PAGE
STRIKE RETURN TO CONTINUE

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FREQUENCY DISTRIBUTION FOR GROUPED DATA

SIX GROUPS HAVE BEEN ESTABLISHED TO INCLUDE THE RANGE OF RAW SCORES FROM 8 TO 15

THE INTERVAL FOR EACH GROUP IS 2

A HISTOGRAM FOR THE GROUPED DATA IS:
EACH UNIT ON THE VERTICAL SCALE REPRESENTS 1
EACH UNIT ON THE HORIZONTAL SCALE REPRESENTS ONE OF THE SIX GROUPS
THE LOWEST GROUP IS ON THE LEFT AND THE HIGHEST GROUP ON THE RIGHT

```
.    T
.    T
.   TT
.   TT
. TTTTT
.......
```

SCALE: T = 1

LIMITS FOR GROUPS

LOWER	UPPER	FREQUENCY
15	16	1
13	14	5
11	12	3
9	10	1
7	8	1
5	6	0

SPACE TO THE TOP OF A NEW PAGE
STRIKE RETURN TO CONTINUE

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THIS SECTION OF THE REPORT PROVIDES
A SUMMARY CONVERSION FOR EACH UNIQUE RAW SCORE

RAW SCORE DENOTES THE TOTAL NUMBER OF CORRECT ANSWERS

PERCENT CORRECT DENOTES [100 × (RAW SCORE ÷ TOTAL POSSIBLE SCORE)]

RANK ORDER DENOTES THE RANK OF EACH SCORE WITHIN THE TOTAL GROUP
THE HIGHEST RANK = NUMBER OF STUDENTS IN GROUP AND LOWEST RANK = 1
RANKS ARE CORRECTED FOR TIED SCORES

T SCORE DENOTES A CONVERSION OF THE RAW SCORE TO A SCALE WITH
MEAN = 50 AND STANDARD DEVIATION = 10

Z SCORE DENOTES A CONVERSION OF THE RAW SCORE TO A SCALE WITH
MEAN = 0 AND STANDARD DEVIATION = 1

RAW SCORE	PERCENT CORRECT	RANK ORDER	T SCORE	Z SCORE
15.00	100.00	11.00	64.00	1.36
14.00	93.00	9.50	59.00	0.86
13.00	87.00	7.00	54.00	0.36
12.00	80.00	4.50	49.00	-0.14
11.00	73.00	3.00	44.00	-0.63
10.00	67.00	2.00	39.00	-1.13
8.00	53.00	1.00	29.00	-2.13

SPACE TO THE TOP OF A NEW PAGE
STRIKE RETURN TO CONTINUE

THE ITEM DIFFICULTIES WHICH PRODUCE THE MOST EFFICIENT MEASURES OF STUDENT PERFORMANCE MAY BE CALCULATED BY A FORMULA METHOD OR FREDRIC LORD SUGGESTED SET OF ITEM DIFFICULTY BASED ON THE TYPE OF TEST ITEM UTILIZED.

BOTH SETS OF ITEM DIFFICULTY INDEXES ARE:

FORMULA DIF	FREDRIC LORD DIF	TYPE OF TEST ITEM
.75	.85	2 CHOICE OR TRUE/FALSE ITEMS
.67	.77	3 CHOICE MULTIPLE CHOICE
.63	.74	4 CHOICE MULTIPLE CHOICE
.60	.69	5 CHOICE MULTIPLE CHOICE

THE MEAN DIFFICULTY OF ITEMS ON THIS TEST = 0.82
THE MEDIAN DIFFICULTY FOR ITEMS ON THIS TEST = 0.91
THE MOST FREQUENT DIFFICULTY INDEX FOR ITEMS ON THIS TEST = 0.91

INDIVIDUAL TEST ITEM FOR TEST SIDE NUMBER 1

TEST ITEM	CORRECT ANSWER	DIF INDEX	DISC INDEX	OMIT	PROPORTION SELECTING EACH ANSWER A	B	C	D	E
1	A	0.91	0.20	0.00	0.91	0.09	0.00	0.00	0.00
2	B	0.64	0.60	0.00	0.36	0.64	0.00	0.00	0.00
3	B	0.91	0.20	0.00	0.09	0.91	0.00	0.00	0.00
4	E	0.64	0.60	0.00	0.09	0.00	0.18	0.09	0.64
5	D	0.73	0.40	0.00	0.09	0.00	0.00	0.73	0.18
6	D	1.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00
7	A	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
8	A	0.91	0.20	0.00	0.91	0.09	0.00	0.00	0.00
9	A	0.55	0.00	0.00	0.55	0.45	0.00	0.00	0.00
10	D	0.27	0.20	0.00	0.00	0.09	0.00	0.27	0.64

TEST ITEM	CORRECT ANSWER	DIF INDEX	DISC INDEX	OMIT	PROPORTION SELECTING EACH ANSWER A	B	C	D	E
11	B	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
12	A	0.91	0.00	0.00	0.91	0.09	0.00	0.00	0.00
13	A	1.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
14	D	0.91	0.00	0.00	0.09	0.00	0.00	0.91	0.00
15	C	0.91	0.20	0.00	0.00	0.00	0.91	0.00	0.09

SPACE TO THE TOP OF A NEW PAGE
STRIKE RETURN TO CONTINUE

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THIS SECTION OF THE REPORT PROVIDES
REPRESENTATION OF THE PERFORMANCE OF EACH INDIVIDUAL
UTILIZING EACH OF THE FOLLOWING FORMATS:

RAW SCORE DENOTES THE TOTAL NUMBER OF CORRECT ANSWERS

PERCENT CORRECT DENOTES [100 × (RAW SCORE ÷ TOTAL POSSIBLE SCORE)]

RANK ORDER DENOTES THE RANK OF EACH SCORE WITH THE TOTAL GROUP
THE HIGHEST RANK = NUMBER OF STUDENTS IN GROUP AND LOWEST RANK = 1
RANKS ARE CORRECTED FOR TIED SCORES

T SCORE DENOTES A CONVERSION OF THE RAW SCORE TO A SCALE WITH
MEAN = 50 AND STANDARD DEVIATION = 10

Z SCORE DENOTES A CONVERSION OF THE RAW SCORE TO A SCALE WITH
MEAN = 0 AND STANDARD DEVIATION = 1

TEST NUMBER	RAW SCORE	PERCENT CORRECT	RANK ORDER	T SCORE	Z SCORE
1.00	13.00	87.00	7.00	54.00	0.36
2.00	11.00	73.00	3.00	44.00	-0.63
3.00	12.00	80.00	4.50	49.00	-0.14
4.00	10.00	67.00	2.00	39.00	-1.13
5.00	12.00	80.00	4.50	49.00	-0.14
6.00	8.00	53.00	1.00	29.00	-2.13
7.00	15.00	100.00	11.00	64.00	1.36
8.00	14.00	93.00	9.50	59.00	0.86
9.00	13.00	87.00	7.00	54.00	0.36
10.00	14.00	93.00	9.50	59.00	0.86

TEST NUMBER	RAW SCORE	PERCENT CORRECT	RANK ORDER	T SCORE	Z SCORE
11.00	13.00	87.00	7.00	54.00	0.36

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STRIKE RETURN TO CONTINUE

TEXAS CRRISITIAN UNIVERSITY - INSTRUCTIONAL SERVICES TEST ANALYSIS FOR DR. GARY LIPE
COURSE: DEMONSTRATION.PROGRAM -- FOR 8TH ANNUAL CUFTUG CONFERENCE WAS SCORED ON JUNE 9,1975
ASSISTANCE IN INTERPRETATION OF TEST RESULTS MAY BE OBTAINED BY CALLING
DR. GARY LIPE, DIRECTOR AT 817 926 2461 EXT. 454

THIS SECTION OF THE REPORT PROVIDES
ITEM STATISTICS FOR EACH TEST ITEM

CORRECT ANSWER DENOTES THE ANSWER MARKED AS CORRECT ON THE ANSWER KEY
O INDICATES THAT THE TEST ITEM WAS OMITTED ON THE ANSWER KEY

DIFFICULTY INDEX (DIF) IS THE PROPORTION ANSWERING THE ITEM CORRECTLY
1.00 REPRESENTS AN ITEM WHICH EACH STUDENT ANSWERED CORRECTLY.
0.00 REPRESENTS AN ITEM WHICH NO STUDENT ANSWERED CORRECTLY.
.50 REPRESENTS AN ITEM WHICH WILL PRODUCE THE MAXIMUM VARIANCE

DISCRIMINATION INDEX (DISC) DENOTES THE DIFFERENCE IN PERFORMANCE
OF THE STUDENTS WHO SCORED THE HIGHEST GRADES ON THE TEST
AND THE STUDENTS WHO SCORED THE LOWEST GRADES ON THE TEST
1.00 DENOTES THAT ALL OF THE HIGH GROUP AND NONE OF THE LOW GROUP
ANSWERED THE QUESTION CORRECTLY
0.00 DENOTES THAT THERE WAS NO DIFFERENCE BETWEEN THE PERFORMANCE OF THE
HIGH GROUP AND THE LOW GROUP.
1.00 DENOTES THAT ALL OF THE LOW GROUP AND NONE OF THE HIGH GROUP
ANSWERED THE ITEM CORRECTLY. ANY ITEM WITH A NEGATIVE DISCRIMINATION
INDEX OUGHT TO BE CAREFULLY EXAMINED.

PROPORTION SELECTING EACH ALTERNATIVE DENOTES THE NUMBER OF
STUDENTS SELECTING EACH ALTERNATIVE DIVIDED BY THE
TOTAL NUMBER IN THE TEST GROUP

THIS SECTION REPORTS A SUMMARY OF ITEM DIFFICULTIES

DISTRIBUTION OF ITEM DIFFICULTIES:

LIMITS FOR GROUPS

LOWER	UPPER	FREQUENCY
0.90	1.00	10.00
0.80	0.89	0.00
0.70	0.79	1.00
0.60	0.69	2.00
0.50	0.59	1.00
0.40	0.49	0.00
0.30	0.39	0.00
0.20	0.29	1.00
0.10	0.19	0.00
0.00	0.09	0.00