1620 GENERAL PROGRAM LIBRARY

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1620 USERS GROUP PROGRAM REVIEW AND EVALUATION

(fill out in typewriter or pencil, do not use ink)

Program No._____ Date_____

Program Name:_____

1. Does the abstract adequately describe what the program is and what it does? Yes___ No___
   Comment_____

2. Does the program do what the abstract says? Yes___ No___
   Comment_____

3. Is the Description clear, understandable, and adequate? Yes___ No___
   Comment_____

4. Are the Operating Instructions understandable and in sufficient detail? Yes___ No___
   Comment_____
   Are the Sense Switch options adequately described (if applicable)? Yes___ No___
   Are the mnemonic labels identified or sufficiently understandable? Yes___ No___
   Comment_____

5. Does the source program compile satisfactorily (if applicable)? Yes___ No___
   Comment_____

6. Does the object program run satisfactorily? Yes___ No___
   Comment_____

7. Number of test cases run_____. Are any restrictions as to data, size, range, etc. covered adequately in description? Yes___ No___
   Comment_____

8. Does the Program Meet the minimal standards of the 1620 Users Group? Yes___ No___
   Comment_____

9. Were all necessary parts of the program received? Yes___ No___
   Comment_____

10. Please list on the back any suggestions to improve the usefulness of the program. These will be passed onto the author for his consideration.

Please return to:

Mr. Richard L. Pratt
Data Corporation
7500 Old Xenia Pike
Dayton, Ohio 45432

Your Name _____

Company _____

Address _____

User Group Code_____

THIS REVIEW FORM IS PART OF THE 1620 USER GROUP ORGANIZATION'S PROGRAM REVIEW AND EVALUATION PROCEDURE. NONMEMBERS ARE CORDIALLY INVITED TO PARTICIPATE IN THIS EVALUATION.

/

11/09/64

FORTRAN TEACH

Direct Inquiries to: Prof. Wendell L. Pope
Computer Center
Utah State University
Logan, Utah

Modifications or revisions to this program, as they occur, will be announced in the appropriate Catalog of Programs for IBM Data Processing Systems. When such an announcement occurs, users should order a complete new program from the Program Information Department.

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1620 USERS GROUP LIBRARY
PROGRAM ABSTRACT

1. **TITLE (If subroutine, state in Title):** FORTRAN TEACH

2. **Author; Organization:** Wendell L. Pope, Utah State University

Date: March, 1964 **Users Group Membership Code:** 5126

3. **Direct Inquiries to Name:** Prof. Wendell L. Pope, Computer Center, Utah State Univ., Logan, Utah 84321 **Phone:** 752-4100 Ex. ~~5~~ 681

4. **Description/Purpose: (5. Method; 6. Restriction/Range; When Applicable)**
FORTRAN TEACH is a set of programs and student problems designed for use during the early part of a course teaching FORTRAN programming. They enable the student to get something on the machine before he can write a complete program, and they assist the instructor in checking the problems.

7. **Specifications (Check or fill in appropriate spaces):**
   a. **Storage used by program:**
   b. **Equipment required by program:**
   Card System ✓ ; **Magnetic Tape System** ____ ; **No. of Tapes** ____ ;
   40K core minimum
   Paper Tape System ____ ; **Disk File System** ____ ; **No. of Packs** ____ ;

   TNS, TNF, MF ___ ; **Auto divide** ___ ; **Indirect addressing** ___ ; **Floating point hardware** ____ ;

   Other (specify) These programs are written in FORTRAN for the FORGO processor. They can be used by any installation using FORGO.
   Can program be used on lesser Machine? _____ . **Specify which requirements can be easily removed**
   c. **Programming type (Check appropriate spaces):**

   Fortran without Format ____ ; **Fortran with Format** ____ ;

   Fortran II ___ ; **Mainline, Complete** ___ ; **Subroutine or function subprogram(S or F)** ____ ;

   Is the program a library (ie, SPS) function to the Fortran system checked? _____ ;

   SPS ____ ; **SPS - 1620/1710** ____ ;

   Mainline, Complete ✓ ; **Macro** ____ ; **Subroutine** ____ ;

   Other programming language: FORGO ; **Give details**
   d. **Language used in the writeup:** English
8. **Additional Remarks:** The programs were introduced at Utah State University by the author in the summer of 1963. They have been adopted for use in other courses and polished to their present form chiefly by Dr. B. C. Watkins and E. C. Olsen of the College of Engineering, U.S.U.

6-63

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DECK KEY

1. Six Sample Problem Decks

   No. 1 101 through 129 in cc 78-80

   No. 2 201 through 229 in cc 78-80

   No. 3 301 through 327 in cc 78-80

   No. 4 401 through 427 in cc 78-80

   No. 5 501 through 526 in cc 78-80

   No. 6 601 through 632 in cc 78-80

The last card of the deck is the "Sample Run Request (Control)Card" pictured on page 3 of the writeup.

Utah State University
Logan, Utah

FORTRAN "TEACH" PROBLEMS

by
Wendell L. Pope

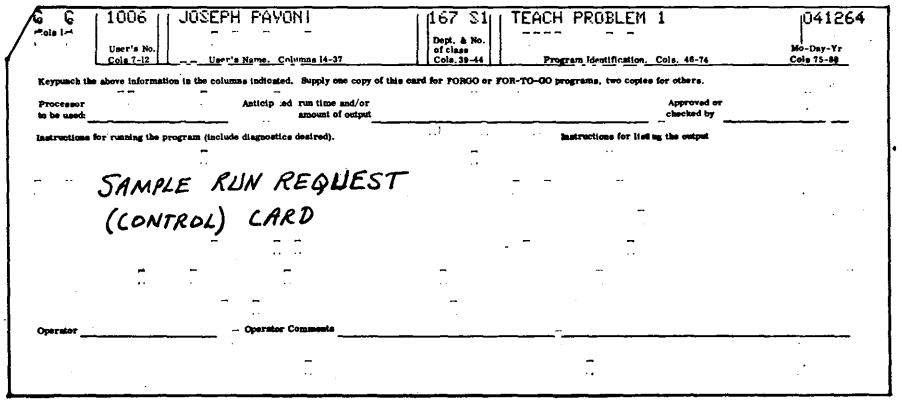
These problems are designed to be of assistance in introducing the neophyte to FORTRAN. Problem sets and programs to check them are provided for arithmetic statements, subscripted variables, fixed and floating point variables, functions and control statements, loops and input-output. The problems do not require that a student be able to write a complete program. They provide a means of acquainting him with the characteristics of FORTRAN in easy stages and help to bridge the gap between the introduction to computing and the writing of a complete program. The student's statements are checked for correctness by imbedding them in the appropriate checking program. They are checked for compilation errors by the FORGO processor, and for accuracy by the checking program itself. This is done by comparing the values computed by the student's statements to a predetermined set of "correct" values. For wrong answers, the number of the problem and the value computed are output, for right answers only the number of the problem is output.

FORTRAN TEACH PROGRAMS

These programs are designed to be used as follows: The instructor introduces a new topic to the class, for example; how to form Arithmetic statements; he then passes out the problem set pertaining to that subject. The student puts into practice what he has been taught by writing FORTRAN Arithmetic statements as the problem set directs. He keypunches them into cards, and submits them to the Computer Center with a properly prepared run request card.

The operator then must insert the student's statements into the appropriate TEACH program (many of them can be batch processed at one time) and run it. The FORGO Processor compiles the TEACH Program including the student's statements; it will duplicate the run request card in the output and follow that with an error message for each error found in compilation. If no errors in compilation are detected, the compiled program is executed. The TEACH Program reads the numbers necessary to assign values to the quantities referred to in the student's statements; it also reads the values of the answers the student should get if his statements are correct. The student's statements are then executed. If errors in compilation or execution are detected, the appropriate messages are output and the next problem is begun. If no errors in execution occur, the TEACH Program compares each quantity computed by the student's statement, and outputs the numbers of the statements that are right and the numbers of the statements that are wrong, together with the student's answer and the correct answer.

The operator then lists the output, and a copy is returned to the student with his input cards. A copy is returned to the student with his input cards. A copy can also be prepared for the instructor if that is desired. The output cards can then be discarded, except this installation preserves the copy of the run request card as a record of the student problems run.



TEACH PROBLEM SET 1

Arithmetic Expressions

Assume that values of A, B, C, D, E, F, G and H are in storage. Write and keypunch correct FORTRAN statements to evaluate each of the following expressions.

1. $X(1) = A + \frac{-B}{C + D}$

2. $X(2) = \frac{A + B}{C - D}$

3. $X(3) = AB + \sqrt{C}\,\frac{D}{E-F} - G$

4. $X(4) = A + \cfrac{B}{C + \cfrac{D}{E + \cfrac{F}{G-H}}}$

5. $X(5) = A + B^{C} - \frac{D}{E}$

6. $X(6) = \left(A + B^{\frac{C-D}{E}}\right)^{F}$

7. $X(7) = A^{(B^2+C)^D} + \frac{\pi}{\left(E - \frac{F}{G}\right)^H}$ $(\pi = 3.141592653\ldots)$

8. $X(8) = \frac{A/B}{C} + \frac{A}{B/C}$

9. If $E > B > A > H > C > F > G > 0$, compute

   $X(9) = A + B + C + E + F + G + H$

   to obtain the most accuracy.

10. $X(10) = A + B^2 + \frac{3}{4+D}$

TEACH PROBLEM SET 2

Subscripted Variables

Assume the arrays $A = \begin{pmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix}$ and $B = \begin{pmatrix} b_1 \\ b_2 \\ b_3 \\ b_4 \end{pmatrix}$

are in storage. Write and keypunch correct FORTRAN statements to evaluate each of the following expressions.

1. $X(1) = \frac{a_{12}}{a_{11}} + \frac{a_{13}}{a_{11}} + \frac{a_{14}}{a_{11}}$

2. $X(2) = \sum_{j=1}^{4} a_{1j}\, b_j$

3. $X(3) = \sum_{j=1}^{4} \frac{b_j}{a_{2j}}$

4. $X(4) = a_{31}X_1 + a_{32}X_1^2 + a_{33}X_1^3 + a_{34}X_1^4$

5. $X(5) = \frac{\lfloor b_1 \rfloor}{b_2}$ where $\lfloor b_1 \rfloor$ denotes the integer portion of b_1.

TEACH PROBLEM SET 3

Fixed point, Floating point, and subscripted variables

Assume that values of k and L and $B = \begin{pmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{pmatrix}$ are in storage.

Write and keypunch correct FORTRAN statements to evaluate each of the following expressions.

1. $X_1 = \sum_{i=1}^{4} b_i^i$

2. $X_2 = b_{k^3-5}$

3. $X_3 = \sum_{i=1}^{4} b_{ik-i}$

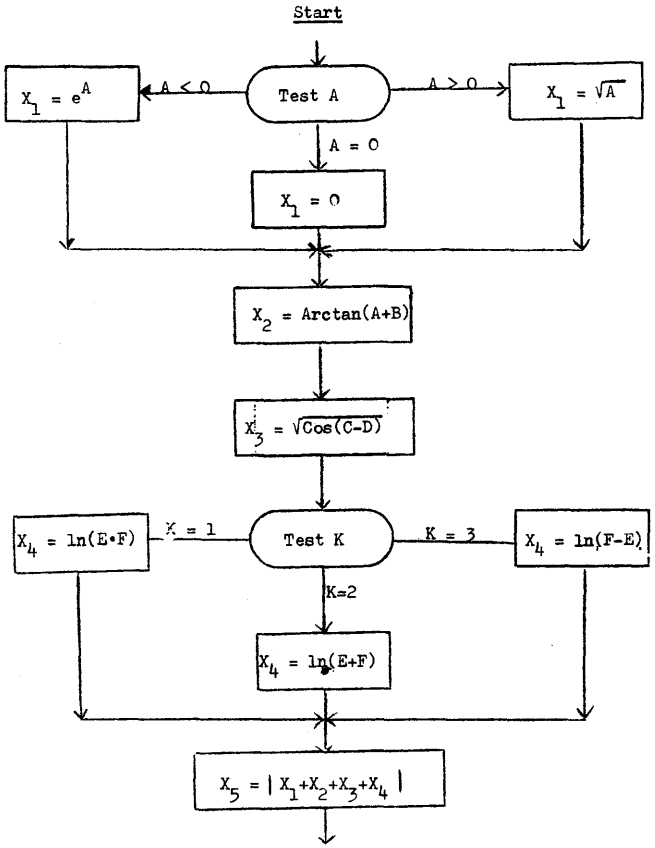
4. $X_4 = \sum_{i=1}^{4} b_i^k$

5. $X_5 = \frac{L}{k} + k^L + k^3 - 2$

TEACH PROBLEM SET 4

Functions and Control Statements

Write (and keypunch) statements to evaluate X_1, X_2, X_4 and X_5 according to the instructions in the flow chart below. Assume A, B, C, D, E, F and K to be defined.



TEACH PROBLEM SET 5

Loops

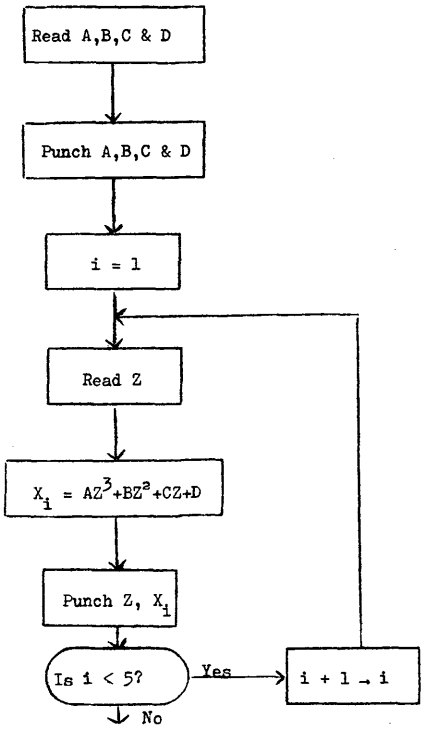
Write (and keypunch) statements to evaluate X_1, X_2, X_3, X_4 and X_5 in the exercises below.

1. $X_1 = 3^3 + 6^3 + 9^3 + 12^3 + \ldots + 99^3$.

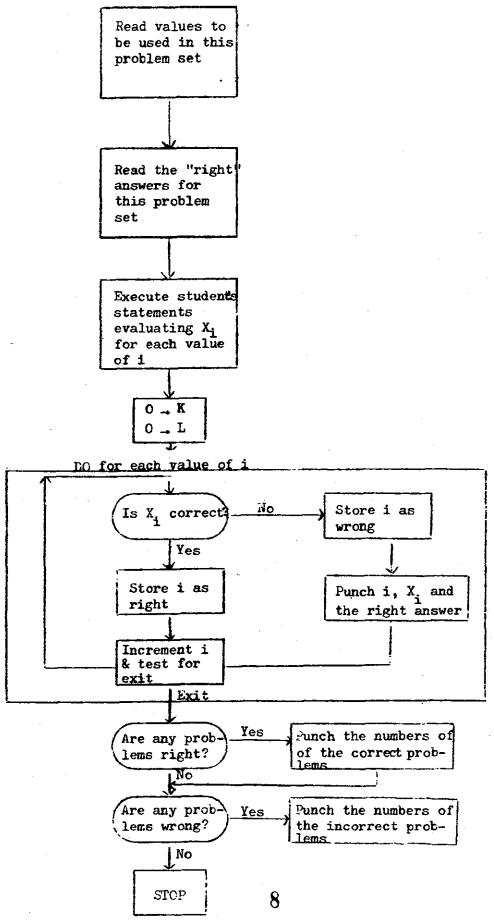
2. $X_i = \frac{A + B^C}{D} \sqrt{E \cdot X_{i-1}}$, $i = 2, 3, 4, 5$.

TEACH PROBLEM SET 6

Input - Output (without formats)



FLOW CHART - TEACH Problem Checking Program




```
C TEACH PROBLEM NO 1        PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD
      DIMENSION NRITE(10),NWRNG(10),RIGHT(10),X(10)
      READ,A,B,C,D,E,F,G,H,(RIGHT(I),I=1,10)
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD
      K=0
      L=0
      DO 9950 I=1,10
      IF(X(I)-RIGHT(I)) 9912,9914,9912
 9912 L=L+1
      NWRNG(L)=I
      PUNCH 9920,I,X(I),RIGHT(I)
      GO TO 9950
 9914 K=K+1
      NRITE(K)=I
 9950 CONTINUE
      IF(K) 9922,9924,9922
 9922 PUNCH 9923,(NRITE(I),I=1,K)
 9923 FORMAT(6H RIGHT,10I5)
 9924 IF(L) 9925,9926,9925
 9925 PUNCH 9927,(NWRNG(I),I=1,L)
 9926 STOP
 9920 FORMAT(9H PROB NO. I3,4X,9HYOUR ANS=E16.8,4X,10HRIGHT ANS= E16.8)
 9927 FORMAT(6H WRONG, 10I5)
      END
10.341296 10.345599 8.6867569 -40.683394 15.683097 .0034784067
 .00034329602 1.1234567
   .10664629E+02  0.41901625      0.84447317E+02  0.12039480E+02
   .65303219E+09  0.10259388E+01  0.14580430E+01  0.87982136E+01
   .46184027E+02  0.11729093E+03
```

```
C TEACH PROBLEM NO 2        PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD
      DIMENSION NRITE( 5),NWRNG( 5),RIGHT( 5),X( 5),B(4),A(4,4)
      READ,K,L,((A(I,J),J=1,4),I=1,4),(B(I),I=1,4), (RIGHT(I),I=1,5)
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD
      K=0
      L=0
      DO 9919 I=1,5
      IF(X(I)-RIGHT(I)) 9912,9914,9912
 9912 L=L+1
      NWRNG(L)=I
      PUNCH 9920,I,X(I),RIGHT(I)
      GO TO 9919
 9914 K=K+1
      NRITE(K)=I
 9919 CONTINUE
      IF(K) 9922,9924,9922
 9922 PUNCH 9923,(NRITE(I),I=1,K)
 9923 FORMAT(5HRIGHT,1015)
 9924 IF(L) 9925,9926,9925
 9925 PUNCH 9927,(NWRNG(I),I=1,L)
 9926 STOP
 9927 FORMAT(5HWRONG,1015)
 9920 FORMAT(8HPROB NO. I3,4X,9HYOUR ANS= E16.8,4X,10HRIGHT ANS= E16.8)
      END
  2  3
2.3964587  3.6241346  4.1357653  5.3422587  3.3524569  4.3687946  5.3124672
6.0247685  4.1024678  5.3751468  6.0347312  7.3107386  5.3420769  6.0467258
7.3214680  8.2469201  9.3704368  10.437695  -1.3579430  -2.5347962
5.4673001  41.125807  4913189.2  7701.4270  .86225934
```

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C TEACH PROBLEM NO 3        PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD
      DIMENSION NRITE(10),NWRNG(10),RIGHT(10),X(10),B(4)
      READ,K,L,(B(I),I=1,4),(RIGHT(I),I=1,5)
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD
      K=0
      L=0
      DO 9919 I=1,5
      IF(X(I)-RIGHT(I)) 9912,9914,9912
 9912 L=L+1
      NWRNG(L)=I
      PUNCH 9920,I,X(I),RIGHT(I)
      GO TO 9919
 9914 K=K+1
      NRITE(K)=I
 9919 CONTINUE
      IF(K) 9922,9924,9922
 9922 PUNCH 9923,(NRITE(I),I=1,K)
 9923 FORMAT(5HRIGHT,1015)
 9924 IF(L) 9925,9926,9925
 9925 PUNCH 9927,(NWRNG(I),I=1,L)
 9926 STOP
 9927 FORMAT(5HWRONG,1015)
 9920 FORMAT(8HPROB NO. I3,4X,9HYOUR ANS= E16.8,4X,10HRIGHT ANS= E16.8)
      END
  2  3
                    9.3704368  10.437695  -1.3579430  -2.5347962
157.09495  -1.3579430  15.915392  205.01975  11.0
```

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C TEACH PROBLEM NO 4       PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD   401
      DIMENSION NRITE(5),NWRNG(5),RIGHT (5),X(5)                             402
      READ,A,B,C,D,E,F,G,H,K,(RIGHT(I),I=1,5)                                403
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD                             404
      K=0                                                                    405
      L=0                                                                    406
      DO 9919 I=1,5                                                          407
      IF (X(I)-RIGHT(I))9912,9914,9912                                       408
 9912 L=L+1                                                                  409
      NWRNG(L)=I                                                             410
      PUNCH 9920,I,X(I),RIGHT(I)                                             411
      GO TO 9919                                                             412
 9914 K=K+1                                                                  413
      NRITE(K)=I                                                             414
 9919 CONTINUE                                                               415
      IF(K)9922,9924,9922                                                    416
 9922 PUNCH 9923,(NRITE(I),I=1,K)                                            417
 9923 FORMAT(5HRIGHT,10I5)                                                   418
 9924 IF(L)9925,9926,9925                                                    419
 9925 PUNCH 9927,(NWRNG(I),I=1,L)                                            420
 9926 STOP                                                                   421
 9927 FORMAT(5HWRONG,10I5)                                                   422
 9920 FORMAT(8HPROB NO. I3,4X,9HYOUR ANS= F16.8,4X,10HRIGHT ANS= F16.8)      423
      END                                                                    424
1.2457369  2.3580123  3.8609756  4.7602541  5.3025768  6.2047536            425
7.0367524  8.3205689  2                                                      426
 1.1161260  1.3001178  .78878076  2.4429843  5.6480088                      427
```

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C TEACH PROBLEM NO 5       PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD   501
      DIMENSION NRITE(5),NWRNG(5),RIGHT(5),X(5)                              502
      READ,A,B,C,D,F,(RIGHT(I),I=1,5)                                        503
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD                             504
      K=0                                                                    505
      L=0                                                                    506
      DO 9919 I=1,5                                                          507
      IF (X(I)-RIGHT(I))9912,9914,9912                                       508
 9912 L=L+1                                                                  509
      NWRNG(L)=I                                                             510
      PUNCH 9920,I,X(I),RIGHT(I)                                             511
      GO TO 9919                                                             512
 9914 K=K+1                                                                  513
      NRITE(K)=I                                                             514
 9919 CONTINUE                                                               515
      IF(K)9922,9924,9922                                                    516
 9922 PUNCH 9923,(NRITE(I),I=1,K)                                            517
 9923 FORMAT(5HRIGHT,10I5)                                                   518
 9924 IF(L)9925,9926,9925                                                    519
 9925 PUNCH 9927,(NWRNG(I),I=1,L)                                            520
 9926 STOP                                                                   521
 9927 FORMAT(5HWRONG,10I5)                                                   522
 9920 FORMAT(8HPROB NO. I3,4X,9HYOUR ANS= F16.8,4X,10HRIGHT ANS= F16.8)      523
      END                                                                    524
2.3964587  3.6241346  4.1357653  5.3422587  3.3524569 112761.0 23922.716    525
11018.845 7478.2325 6160.7034                                               526
```

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```
C TEACH PROBLEM NO 6        PLACE STUDENT HEADER CARD IN FRONT OF THIS CARD
      DIMENSION NRITE(5),NWRNG(5),RIGHT(5),X(5)
      READ,(RIGHT(I),I=1,5)
C     INSERT STUDENT STATEMENTS BEHIND THIS CARD
      K=0
      L=0
      DO 9919 I=1,5
      IF (X(I)-RIGHT(I))9912,9914,9912
 9912 L=L+1
      NWRNG(L)=I
      PUNCH 9920,I,X(I),RIGHT(I)
      GO TO 9919
 9914 K=K+1
      NRITE(K)=I
 9919 CONTINUE
      IF(K)9922,9924,9922
 9922 PUNCH 9923,(NRITE(I),I=1,K)
 9923 FORMAT(5HRIGHT,10I5)
 9924 IF(L)9925,9926,9925
 9925 PUNCH 9927,(NWRNG(I),I=1,L)
 9926 STOP
 9927 FORMAT(5HWRONG,10I5)
 9920 FORMAT(8HPROB NO. I3,4X,9HYOUR ANS= E16.8,4X,10HRIGHT ANS= E16.8)
      END
   .97569023E+04  0.11699576E+04  0.15283722E+05
   .34042183E+03  0.23871681F+04
 14.369025  15.6753869  1.0367521  6.9851203
8.4357205
3.9857423
9.8530247
2.5237586
5.1472536
```