CIS-TR-82-6

A COMPARISON OF IN-CLASS AND SELF-STUDY MODES OF INSTRUCTION IN PROGRAMMING

by

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Abstract

During Fall term, 1981, a study was done comparing the effects of two modes of teaching CIS 133: Introduction to Numerical Computation (FORTRAN programming). The study, comparing in-class and self-study modes of instruction, consisted of two parts: analysis of performance by the groups on the final exam and comparison of characteristics typical of those enrolling and succeeding under each of the teaching modes.

Between the two groups, no significant difference was found in the knowledge displayed on the final exam. The overall success rate for the in-class mode was much higher than for the self-study mode. The noticeable difference in characteristics within the groups is that people with no prior experience enroll in self-study much less frequently, and those who do succeed less often.

A COMPARISON OF IN-CLASS AND SELF-STUDY MODES OF INSTRUCTION IN PROGRAMMING

ABSTRACT

During Fall term, 1981, at the University of Oregon, a study was done comparing the effects of two modes of teaching. The in-class model and the self-study model of teaching CIS 133: Introduction to Numerical Computation (FORTRAN programming) were studied from two perspectives.

1) The knowledge the students had at the end of the course was measured on a specially designed final exam.

2) Demographic descriptions of the students who enrolled and who succeeded were compared.

All comparison was done on a group unit, not individual basis.

Findings were:

Between the two groups, no significant difference was found in the knowledge displayed on the final exam.

The overall success rate for the in-class mode (86%) was much higher than for the self-study mode (61%), with success defined as completing the work and receiving a grade of A, B, C or Pass.

The noticeable difference in characteristics within the groups is that people with no prior experience enroll in self-study much less frequently, and those who do succeed less often.

Self-study instruction absorbs fewer teaching resources, but has a lower success rate, especially for beginners at programming.

A COMPARISON OF IN-CLASS AND SELF-STUDY MODES OF INSTRUCTION IN PROGRAMMING

THE COURSE

The Department of Computer and Information Science at the University of Oregon regularly offers a course in programming in FORTRAN. The course, CIS 133: Introduction to Numerical Computation, is designed as a service course for the university community and is not part of the sequence taken by Computer Science majors. It has a formal prerequisite requirement of one course in college algebra, or the equivalent. CIS 133 is usually taught by graduate students under the general supervision of a faculty member.

Programs written by students for assignments in this course are run using batch processing, under a WATFIV compiler system. The computing facility used is an IBM 4341.

The course is taught in two different modes:

1) a standard in-class mode with students attending regular class meetings.

2) a self-study mode with individual assistance available to the students.

IN-CLASS MODE

During a typical term, two in-class sections of CIS 133 are offered. The class meets three times per week for 50 minutes per class, for the ten week term. Enrollment in each section is limited to about 40 students. Students will typically be asked to do four or five programming assignments, each requiring writing programs fifty to one hundred lines long, including documention. They will also take two midterm examinations, during class time, and a final examination of two hour duration. Students in these sections have the option of being graded by letter grade A-F or on a Pass/No-pass basis. The text currently being used in these classes is FORTRAN IV WITH WATFOR AND WATFIV by Paul Cress, Paul Dirksen, and J. Wesley Graham.

SELF-STUDY MODE

Students enrolled in CIS 133 Self-Study are expected to attend one meeting at the beginning of the term, when procedures for the class are explained. They purchase a self-study packet which contains instructions and reading assignments keyed into the text, WATFOR WATFIV FORTRAN PROGRAMMING by Frederic Stuart. Also included are nine programming assignments, each of the same magnitude as those above. These students have no midterm examinations, but must take and pass the same final as the students in the in-class sections. Assistance from the teacher assigned to the self-study section is available on an

individual basis. Because of the structure of teaching assignments, each student is entitled, on average, to about 5 minutes of the teacher's time per week. Enrollment in this self-study section is usually about 40 students. Grading in self-study is Pass/No-pass only. Otherwise, academic credit is the same for the self-study and the in-class models.

Faculty members in the CIS department indicate that several years ago the two courses were more alike. Since then, more instruction in structured programming has been integrated into the curriculum of the in-class mode, causing change in course structure.

THE STUDY

During Fall term, 1981, an informal study was made to compare the effects of these two modes of instruction on the students enrolled in the course. For the purposes of this study, students in the two sections of the in-class model were grouped (totalling 73 students) to compare with the self-study group (35 students). Students' performances on the final examination were compared in an attempt to discern any differences in the learning gained by students under the two instructional modes. The final examination given this term was specifically designed for this purpose. It was somewhat different from the examinations usually given, but was planned to cover the same material as is usually tested in these courses.

Some demographic data on the students along with information on their reasons for enrolling in these classes was gathered. Characteristics of the students who successfully completed these courses were compared with students who did not complete the courses, in an attempt to define the characteristics of students who learn well through these different instructional modes. No attempt was made to correlate individual student performance on the exam with individual demographic characteristics. Examination results were compared on a class unit basis.

ENROLLMENT FALL 1981

Because of the enrollment pressure on all CIS courses, enrollment in CIS 133 during this term may have been somewhat historically atypical. Students who would have preferred to enroll in the beginning courses in the CIS major sequence, but who had late registration times, chose CIS 133 as one of the few classes still open. Similarly, students who would have preferred the in-class sections enrolled in self-study as it was the only option available at the end of the registration period. Current predictions within the CIS department, however, suggest that this enrollment pressure and resulting forced choices will continue over the next several years. Therefore, doing a study under these circumstances remains valid.

THE EXAM

The final exam used in this study was designed to test four knowledge areas in beginning programming. These are:

1. syntax and system use
2. correctness and debugging
3. structure and style
4. program logic and flow of control

The test consisted of forty questions, ten for each of the four knowledge areas. Each question was the objective type; most were multiple choice, a few were true/false, and a few required short, one or two word answers. The style of questions was balanced so that the score one would expect from random guessing was the same (.20) for each of the four sections . A copy of the exam is included in Appendix A. Students were allowed to use their books and notes as references during the exam.

Comparison of performance by the two groups on this final exam showed little difference. The mean scores and deviations for the two groups are given in figure 1. Statistical analysis of the groups' scores revealed no significant difference. (See Appendix A for statistical test results.) Of course, that this study found no difference in the knowledge of the two groups does not mean there is none.

	In-class		Self-study	
	mean	s.d.	mean	s.d.
area 1	8.4	1.1	7.8	1.9
area 2	6.6	1.4	7.0	1.7
area 3	7.4	1.5	7.0	1.7
area 4	8.8	1.0	8.5	0.9
total	31.1	3.6	30.4	4.3

Figure 1. Mean scores and standard deviations for correct responses for two groups over four knowledge areas and in total for the final exam.

A few specific questions resulted in interesting differences between the groups. Appendix A, page 2 is a graph of correct responses by individual test question. Questions 19 and 20 asked the students to list two methods or sources of information useful for debugging a program (excluding help from other people). Every individual in the self-study group could give two correct responses, while nine (14%) of the in-class students gave only one and six (10%) gave no correct responses.

Another question which may point to a difference was question 35, a true/false question.

"Two reasons for using subroutines are that subroutines for one program can be written by different programmers, and that subroutines can be debugged separately."

Self-study students missed this at a rate over four times greater than in-class students (33% vs. 8%). This may indicate that self-study students have less understanding of the reasons for using some programming practices, even though they have learned to use the practices.

If one were to repeat this study, one might refine the exam using the different responses on these questions as indicators of areas for finer examination, where differences in knowledge might be found.

DEMOGRAPHIC DATA

At the beginning of the term, students who registered in CIS 133 were asked to provide some background information about themselves. This included age, class standing, experience in computing and reason for taking CIS 133 (by choice or to fulfill a requirement). Additionally, the self-study students were asked to specify their reason for selecting the self-study model. At the end of the term, data on students who did and did not successfully complete the course were separated so that the characteristics of these two groups could be compared.

The characteristics of students enrolling in the two modes of class were very much the same. Figure 2 shows a summary of the comparisons, while more detailed data is reported in Appendix B. The self-study group had a slightly higher percent of people taking the course because it is required of them, and a slightly lower average class standing. This may be a result of the narrowing of enrollment options during the later registration times.

	In-class		Self-study		
	enrolled	succeeded	enrolled	succeeded	
Age	22.4	22.6	23.5	23.0	(means)
Class standing	3.6	3.7	3.2	3.0	(means)
Prior expereince	2.0	2.1	2.7	2.9	(means)
Course required	10%	all	20%	3 of 7	

Figure 2. Summary of characteristics of students across the two modes of instruction.

The significant difference that should be noted is in the amount of computing experience students had prior to enrollment in CIS 133. The self-study group had a mean rating .65 higher than the in-class group, on a scale from 1 to 5 (13% higher). This is primarily because students with no background did not (and are advised not to) enroll in self-study as frequently as in in-class courses. The self-study group included 18% with no prior experience, while the in-class included 45%.

Figure 2 also indicates the average characteristics of the students who succeeded (received a grade of A, B, C or Pass). Again, there is very little difference in the characteristics. The overall success rate for the two groups, however, is very different: of those enrolled in the in-class mode, 86% succeeded, while in the self-study mode, 61% succeeded.

During this study, all students who completed the assignments and took the final exam passed the course, both in self-study and in-class modes. Of those who did not successfully complete the work, most had formally dropped the course before the final exam. They had usually done part of the work for the class before dropping, but a few (about 15%) of the self-study students did not complete even one assignment from the course.

In both modes, success was fairly uniformly distributed over age and class standing, with people with more background, or of whom this course was required having slightly higher success rates (see Appendix B for more detail). One noticeable fact, however, is that for the students with no prior experience in programming (6) who did enroll in self-study, the success rate was only 33% (2 passed). If the proportion of students with no prior experience were the same in self-study as in in-class, that would drop the overall success rate for self-study to 51%.

In the self-study group, the reason the student gave for enrolling in the self-study mode was a slight indicator of success (see figure 3).

	Enrolled		Succeeded	
	N	% of class	N	success rate
In-class full	19	58%	13	.7
Class schedule	2	6%	1	.5
Personal schedule	7	21%	2	.3
Prefer self-study	5	15%	4	.8

Figure 3. Reason for enrolling in self-study.

CONCLUSIONS

This study, comparing in-class and self-study modes of instruction in programming, consisted of two parts: analysis of performance by the groups on the final exam and comparison of characteristics typical of those enrolling and succeeding under each of the teaching modes.

Between the two groups, no significant difference was found in the knowledge displayed on the final exam. The overall success rate for the in-class mode was much higher than for the self-study mode. The noticeable difference in characteristics within the groups is that people with no prior experience enroll in self-study much less frequently, and those who do succeed less often.

Throughout, the small number of subjects studied and the grouping into two groups of uneven sizes can have affected the information produced by the study. Additionally, a better final exam might have yielded different measurements of the knowledge of the groups. Self-study instruction absorbs fewer teaching resources, but has a lower success rate, especially for beginners at programming.

BIBLIOGRAPHY

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Hinkle, D., W. Wiersma, & S. Jurs. APPLIED STATISTICS FOR THE BEHAVIORA SCIENCES. Chicago: McNally, 1979.

Stuart, F. WATFOR WATFIV FORTRAN PROGRAMMING. New York: John Wiley, 1971

Test for significant differences between groups on four test areas

Variable				
	1	In-class, area 1 errors	vs	5 Self-study, area 1 errors
	2	In-class, area 2 errors	vs	6 Self-study, area 2 errors
	3	In-class, area 3 errors	vs	7 Self-study, area 3 errors
	4	In-class, area 4 errors	vs	8 Self-study, area 4 errots

None of the applicable (underlined) T-values is significant.

***** T TESTS *****

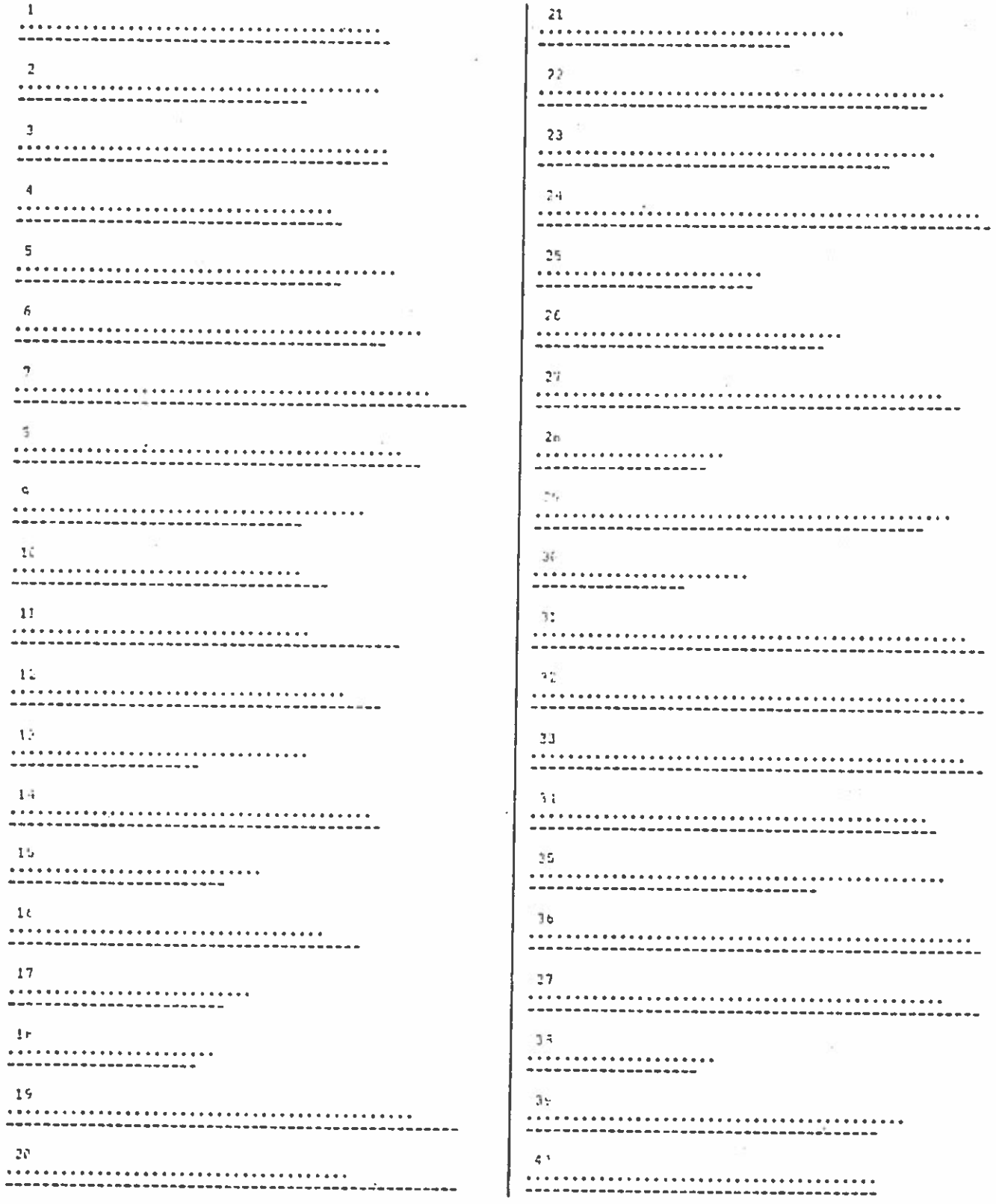
ANALYSIS RUN WITH EACH VARIABLE BEING USED AS A TREATMENT

VAR.	SIZE	MEAN	STD. DEV.
1	21	1.619	1.117
2	21	3.476	1.401
3	21	2.667	1.494
4	21	1.000	1.000
5	21	2.238	1.895
6	21	3.000	1.703
7	21	3.048	1.717
8	21	1.524	0.9284

1	.0000E+00				
2	4.750	.0000E+00			
3	2.573	-1.811	.0000E+00		
4	-1.892	-6.593	-4.247	.0000E+00	
5	1.290	-2.408	-.8138	2.648	.0000E+00
6	3.107 .0000E+00	-.9897	.6742	4.641	1.370
7	3.196 .9024E-01	-.8864 .0000E+00	.7670	4.723	1.451
8	-.3005 -3.488	-5.324 -3.578	-2.977 .0000E+00	1.759	-1.551
	1 6	2 7	3 8	4	5

Percent of correct answers by question

... In-class
--- Self-study



CIS 133 Name_____

Circle your instructor's name: Webb Wair Yu

Circle the letter in front of the best response to each question.

1. The control cards required for a WATFIV job are

   a) END, $ENTRY, $JOB
   b) END, STOP, $ENTRY
   c) END, STOP
   d) $ENTRY, $JOB
   e) END, STOP, $JOB, $ENTRY

2. A FORTRAN compiler

   a) is a program
   b) translates FORTRAN programs into machine language
   c) translates FORTRAN programs into machine language and then executes them
   d) (a), (b) and (c) are correct
   e) Only (a) and (b) are correct

3. An example of a set of valid variable names in FORTRAN is

   a) TYP, PED, 1ST
   b) A?, B?, C?
   c) I567, MEAN, TOTAL
   d) TO-GO, X, Y
   e) AP, IX, F.34

4. An example of an invalid assignment statement in FORTRAN is

   a) A = (A + B)C
   b) VALUE = 41 + 4 * Y
   c) X = 2.3E-05
   d) B = A * A * A
   e) I = INT(X * Y)

5. Given the program fragment below, an appropriate FORMAT statement would be

```
N1= 12
N2= 36
WRITE (3,10) N1,N2
```

   a) 10 FORMAT(2I,2I)
   b) 10 FORMAT(1X,'VALUES',1,I)
   c) 10 FORMAT(1X,F2.0,F2.0)
   d) 10 FORMAT(' VALUES',I2,I4)
   e) 10 FORMAT(1X,2I2.0)

6. An example of an implied do loop is

a)
```
      WRITE(3,10)(I,I=1,12)
   10 FORMAT(1X,'NUMBER',12I5)
```

b)
```
      DO 1 I=1,12
      PRICE(I) = 3.9 / I
    1 CONTINUE
```

c)
```
      WRITE(3,11) PRICE
   11 FORMAT(1X,'PRICE',2X,12F5.2)
```

d) both (a) and (b)
e) both (b) and (c)

7. Which of the following statements is NOT true?

a) A3 = A3 * A3 is a legal FORTRAN statement.
b) If N=3, the statement M=1+N**2 assigns the value -3 to M.
c) (A+B)**.5 and (A+B)**(1./2.) have the same meaning in FORTRAN.
d) Parentheses may be used to override the normal order in which operations are performed by the computer.
e) Every FORMAT statement must have a statement label.

8. The FORTRAN statement A=B*C+W/T**5 is the same as

a) A = (((B*C) + (W/T)) ** 5)
b) A = ((B * (C + W)) / (T ** 5))
c) A = ((B * C) + (W / (T ** 5)))
d) A = ((B * C) + ((W / T) ** 5))
e) none of the above

9. Which of the following statements is true?

a) The programming line 10 FORMAT(1X,'SUM',F7.3) must be punched starting somewhere in columns 7-72.
b) When the assignment statement QTY=X+Y is punched on a card, the letter Q must appear in column 7.
c) When using cards, a C punched in column 1 or in column 6 indica that the card contains a comment.
d) The values read from data cards can be controlled by the use of formatted input statements.
e) If a real value is assigned by a READ statement, the input reco must contain the decimal point.

10. An example of a valid IF statement is

a) IF(N.GT.10) GO TO 5
b) IF((I.GT.0).AND.(J.GT.0)) GO TO 5
c) IF(I.EQ.4.OR.5) GO TO 5
d) all of the above are valid
e) two of the above are valid

11. A programmer receives the error message "SUBSCRIPT NUMBER 1 OF ARRAY A HAS INVALID VALUE 11". This message will appear if

a) The programmer forgot to dimension the array
b) The value of the index variable was out of range
c) The array is supposed to contain integers
d) The index variable is not defined
e) The programmer forgot the $JOB card

12. A programmer received the error message "CONTROL CARD ENCOUNTERED ON UNIT 1 AT EXECUTION." Probable cause for this is

a) a DIMENSION statement was missing
b) a DATA statement was missing
c) there were missing data cards or incorrect format on the cards
d) a subprogram was not included, but was called
e) a GOTO 1 was used when there was no 1 CONTINUE

13. The error message resulting from the program given below will be

```
      DIMENSION A(10)
      DATA A/10*0./
      DO 1 I=1,10
    1 PRINT,A(I)
      STOP
      END
```

a) "FIRST CHARACTER OF STATEMENT WAS NOT ALPHABETIC"
b) "UNREFERENCED STATEMENT FOLLOWS A TRANSFER"
c) "SUBSCRIPT NUMBER 1 OF A IS UNDEFINED"
d) "CONTROL CARD ENCOUNTERED ON UNIT 1 AT EXECUTION"
e) "INVALID TYPE OF ARGUMENT IN REFERENCE TO SUBPROGRAM A"

14. If a run time error stops a program with the message
"Executing line 10 in m/prog when termination occurred"
it means that

a) There is an error in line 10 of the main program
b) There is an error in line 10 of the subroutine being called
c) There is an error before the tenth card in the data
d) There is an error before line 10 in the program
e) Any of the above error locations is possible

15. A cause of infinite loops is

a) failing to modify the test variable within an IF..test..GOTO 1
b) Putting a FORMAT statement within the loop
c) modifying an index variable within a DO-loop
d) two of the above
e) all of the above

16. The program to the right contains

a) a compile-time error
b) a run-time error
c) a programming error the computer will not recognize but which will give incorrect results

```
      S=0
    1 DO 2 N=1,10
        READ(1,10)X
   10   FORMAT(F7.2)
        S=S+X
        WRITE(3,11)S
   11 FORMAT(1X,'SUM IS',F9.2)
      STOP
      END
```

17. The program to the right contains

a) a compile-time error
b) a run-time error
c) a programming error the computer will not recognize but which will give incorrect results

```
C SUM OF FRACTIONS PROGRAM
      SUM=0
      DO 3 K=1,50
        SUM=SUM+FLOAT(1/K)
    3 CONTINUE
      WRITE(3,13)SUM
   13 FORMAT(1X,'SUM IS',F10.5
      STOP
      END
```

18. The program to the right contains

a) a compile-time error
b) a run-time error
c) a programming error the computer will not recognize but which will give incorrect results

```
      SUM=0
      N=10
      DO 4 J=1,10
        N=N-1
    4   SUM=FLOAT(J)+SUM
      AV=SUM/FLOAT(N)
      WRITE(3,14)AV
   14 FORMAT(1X,'AVERAGE IS',F
      STOP
      END
```

List two methods or sources of information useful for debugging a program. Do not include help from other people.

19. _____

20. _____

21. Which of the following statements is NOT true?

a) The GO TO statement is called a conditional transfer statement because it initiates a transfer of control only if it is exec
b) A logical IF statement can be used to instruct the computer to execute a particular statement only if a certain condition, specified by the programmer, is met.
c) The condition in a logical IF must be a logical expression-that is, an expression that is either true or false.
d) IF statements are useful for transferring control around a DO loo whenever the initial parameter is greater than the terminal parameter.
e) A logical variable can be used as a "flag" or "switch".

22. If A=1, B=2, and C=3, which of the following logical expressions is t

a) A+B.LT.C
b) A/C*2.LT.0.5
c) (A.LT.C).AND.(B.GE.C)
d) B**2.EQ.A+C
e) .NOT.((A.GT.B).OR.(C.GT.A))

23. How many lines of output will be printed by the following program fragment?

```
      DO 1 I=1,3
      DO 1 J=2,3
      N=I+J
      WRITE(3,10)I,J,N
    1 CONTINUE
   10 FORMAT(1X,I2,I2,I3)
```

a) 1
b) 2
c) 4
d) 6
e) 9

24. What will be the first line of output printed by the fragment in problem 23 above?

a) 1 2 4
b) 1 2 5
c) 1 3 4
d) 1 3 3
e) 1 2 3

25. How many lines of output will be printed by the following program fragment?

```
      DO 1 I=1,5
      IF(I/2*2.NE.I) GO TO 3
      DO 2 J=1,3
      WRITE(3,10)
    2 CONTINUE
      GO TO 1
    3 WRITE(3,11)
    1 CONTINUE
   10 FORMAT(1X,'  XXX')
   11 FORMAT(1X,'XXXXX')
```

a) 1
b) 3
c) 9
d) 10
e) 12

26. What will be the last line of output printed by the program fragment in problem 25?

a) XXX
b) XX)
c) XXXXX
d) XXXXXXXX
e) XXX XXXXX

27. Which of the following statements is NOT true?

a) The IF statement often provides a convenient way to transfer control out of a DO-loop.
b) If an exit is made from a DO-loop via an IF statement, the current value of the DO-loop index variable is maintained.
c) If an exit is made from a DO-loop because the loop is satisfie the value of the DO-loop index variable is reset to zero.
d) If a loop begins with the statement DO 1 I=1,35 the variable I must occur in some statement before the statement labeled 1 is encountered.
e) The initial, terminal, and increment parameters in a DO-loop cannot be modified in the range of the loop.

28. Which of the following statements is true?

a) The statement GO TO 5 cannot appear in the range of a loop initiated by the statement DO 5 I=1,10.
b) The DO variable of a loop containing a loop may not be used as a parameter of the inner loop.
c) An executable statement in the range of a loop initiated with DO 2 K=5,9,2 will not necessarily be executed three times.
d) The number of iterations of a loop initiated by the statement DO 2 I=1,14,3 is 5.
e) DO-loops cannot be nested more than three levels.

29. Which of the following statements is NOT true?

a) DIMENSION statements may appear anywhere in a program as long as they appear before the arrays being dimensioned are used.
b) Placing an array name, without subscripts, in a WRITE or PRINT statement will cause the whole array to be printed.
c) The statement DIMENSION A(10),B(5,5),C(2,3) is a legal statemen in FORTRAN.
d) If the statement DIMENSION L(5,4) appears in a program, all 20 storage units must be assigned values.
e) If the statement DIMENSION L(5,4) appears in a program, we can use the statement DATA L/20*0/ to set the array L entries to

30. Which of the following statements is NOT true?

a) All variables appearing in a statement function definition are called dummy variables.
b) If FN(X) is defined in a function statement, the expression FN(SQRT(A)) is a valid function reference and so is SQRT(FN(A
c) If a function F with one real argument is defined in a program, we may also define a function G with the statement G(X)=X+F(X
d) IF functions FN1 and FN2 have been defined in a program, the assignment statement Y=FN1(A,FN2(A)) will necessarily result in an error when the program is run.
e) Function statements (definitions) are nonexecutable; they repre instructions to the compiler.

On the following three lines, list three things a programmer can do to make the program he or she has written easier for someone to read

31. _____

32. _____

33. _____

34. In FORTRAN programmers can write their own function for finding the square root of a number and can use their own instead of SQRT.

a) The above statement is TRUE.
b) The above statement is FALSE.

35. Two reasons for using subroutines are that subroutines for one program can be written by different programmers, and that subrouti can be debugged separately.

a) The above statement is TRUE.
b) The above statement is FALSE.

Below are two subprograms and a program segment which calls the subprograms. For questions 36 - 40 indicate the value of the variables specified upon return from the subroutine call.

```
      SUBROUTINE SUB(I,J,K,M,N)
      M=1
      IF(M.LT.J) M=J
      N=J
      IF(N.GT.K) N=K
      RETURN
      END
```

```
      FUNCTION FCN(I,J,K)
      INTEGER FCN
      FCN=0
      DO 1 N=I,J,K
         FCN=FCN+N
    1 CONTINUE
      RETURN
      END
```

```
      I=1
      J=2
      K=3
      CALL SUB(I,J,FCN(1,5,K),N1,N2)
```

36. I=_____

37. J=_____

38. K=_____

39. N1=_____

40. N2=_____

Class standing

	In-class				Self-study			
	enrolled		passed		enrolled		passed	
	N	% of class	N	success rate	N	% of class	N	success rate
Freshman	7	10%	6	.86	3	9%	2	.66
Sophomore	15	21%	10	.66	7	21%	4	.57
Junior	8	11%	6	.75	12	36%	9	.75
Senior	24	33%	20	.84	5	15%	1	.20
2nd Bach.	4	6%	4	1.00	1	3%	0	.00
Masters	4	6%	4	1.00	3	9%	2	.67
Doctoral	6	8%	6	1.00	1	3%	1	1.00
Other	5	7%	5	1.00	1	3%	1	1.00

Prior experience

	In-class				Self-study			
	enrolled		passed		enrolled		passed	
	N	% of class	N	success rate	N	% of class	N	success rate
None	33	45%	26	.79	6	18%	3	.33
Self taught	4	6%	3	.75	2	6%	2	1.00
1-2 classes	32	44%	28	.88	20	60%	13	.65
3- + classes	2	3%	2	1.00	5	15%	3	.60
Other	2	3%	2	1.00	-	-	-	-

Enrollment option

Not required	66	90%	54	.82	26	79%	17	.65
Required	7	10%	7	1.00	7	21%	3	.43

Age

	In-class				Self-study			
	enrolled		passed		enrolled		passed	
	N	% of class	N	success rate	N	% of class	N	success rate
18	6	8%	5	.84	2	6%	2	1.00
19	9	12%	7	.77	6	18%	3	.50
20	10	14%	7	.70	5	15%	3	.60
21	11	15%	8	.72	3	9%	3	1.00
22	10	14%	9	.90	3	9%	0	.00
23	5	7%	4	.80	1	3%	0	.00
24	6	8%	5	.84	2	6%	1	.50
25	5	7%	5	1.00	2	6%	2	1.00
26	1	1%	1	1.00	2	6%	1	.50
27	2	3%	2	1.00	-	-	-	-
28	1	1%	1	1.00	1	3%	1	1.00
29	1	1%	1	1.00	1	3%	1	1.00
30-39	3	4%	3	1.00	2	6%	1	.50
40-49	1	1%	1	1.00	1	3%	0	.00
50-59	1	1%	1	1.00	1	3%	1	1.00

CIS 133 Information Sheet

Name: (names were used only for dividing data on succeeders from othe

Are you taking this course _____ by choice
_____ because it is required of you

Check your class standing
____ Freshman
____ Sophmore
____ Junior
____ Senior
____ Second Bacc.
____ Master's
____ Doctoral
____ Other

Your age? _____

Check the best estimate of your background in CS:

____ no previous work in programming or CS
____ self taught programming
____ one or two classes
____ three or more classes
____ other

Check your reason for enrolling in self-study:

____ the regular class was full
____ course scheduling conflict required it
____ personal life scheduling required it
____ prefer independent study
____ other