This project was the third in a proposed 5-phase project for developing vocational education curriculum for junior and senior high school students. Thirteen vocational education teachers participated during the period from July 13 to October 15, 1966. A specific objective for each participant was to develop a 1-semester course in his particular subject area which would be used in establishing a Computer Assisted Instruction (CAI) Curriculum in vocational education. The objective of completing a semester's course appeared to have been too ambitious. From 50 to 150 hours of work was required to produce one 40-minute class lesson. Only one to one and one half class lessons could be prepared since the participants spent 15 hours in preparation each week, outside of the required attendance of 2 hours each evening on Monday through Thursday, in 6 weeks. The most important single impediment of the project was the lack of reliability of the CAI equipment. Recommendations and guidelines for future programs are listed. A sample course section, "Introduction to Data Processing," for CAI instruction is included in the appendix. (PS)

COMPUTER ASSISTED INSTRUCTION

PROVIDENCE COLLEGE COMPUTER CENTER

U. S. OFFICE OF EDUCATION

CONTRACT

OE - 7 - 062811 - 0016

/ Final Report

Project No. 6-2811

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

AUTHOR: Robert R. Reynolds

INVESTIGATOR: G. C. McGregor, O.P.

GRANT NUMBER: OEG1-7-062811-0016
Vocational Education Act of 1963,
P. L. 88-210, Sec 4 (c)

GRANTEE INSTITUTION: Providence College
Providence, Rhode Island

DATE: July 13, 1966--October 15, 1966

SUMMARY OF PROJECT NO. 6-2811

GRANT NUMBER: OEG1-7-062811-0016

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

INVESTIGATOR: G. C. McGregor, O. P.

INSTITUTION: Providence College
Providence, Rhode Island

DURATION: July 13, 1966--October 15, 1966

PURPOSE: The purpose of this project was to allow the participants to revise, rewrite, and evaluate course material in hopes of producing one unit or semester of work in Computer Assisted Instruction mode.

PROCEDURE: Formal instruction in the use of the Coursewriter Language and discussion periods were conducted four evenings per week, for two hours each evening. Each participant was required to attend these sessions. At his convenience, each participant was required to schedule two hours of computer time to be used to test stored materials and revise or enter new course data. Any procedural difficulties encountered during the entry or testing of material were discussed at the evening sessions. Many of the recommendations and guidelines for future programs resulted from these discussion periods.

RESULTS AND CONCLUSIONS:

This project was the third phase in a proposed five phase project which was hoped to result in a vocational education curriculum for junior and senior high school students. The third phase was designed to produce course material which would be used to test student progress, or the lack thereof, when instruction was presented in Computer Assisted Instruction mode. Although we realize that the scope of our objective, to produce one semester of work, was too broad to be wholly achieved, we feel that several participants have made significant progress in realizing the spirit of this objective. (See Appendix 1.)

1. Each participant entered some portion of his program

2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formating of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:

    a. Initializing the system.
    b. Inserting and deleting course material.
    c. Polling the units of the system.
    d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six week workshop period. Several continued through the Labor Day weekend.

The process of learning to write effective programs in Computer Assisted Instruction mode is a very slow process. Continual revision is necessary as an author reaches new plateaus of understanding and proficiency revealing inadequacies of the past. The author must assume an active and self-directing role. His best support is the stimulation provided by the company of others similarily engaged in CAI.

The amount of time and effort expended by the participants in this project attest to the ability of CAI to capture the imagination and to provide a continuing motivating force, despite failures of equipment and frustration of constant revision of materials. It is our belief that the enthusiastic reception by the participants and visitors, who have been able to be engaged in CAI, indicates the future effectiveness of the computer in education.

It is the belief of the participants that the discipline imposed by their individual CAI projects--being com-

pelled to view a curriculum as a detailed, preplanned entity--has produced a heightened appreciation of the learning process and improved their effectiveness as teachers.

TABLE OF CONTENTS

STATEMENT OF PURPOSE

The purpose of this project covering the period of July 13, 1966
to October 15, 1966 was to test and evaluate course sectors leading
to the development of one semester courses which would be used in
establishing a Computer Assisted Instruction Curriculum in vocational
education for junior and senior high school students.

GENERAL OBJECTIVES

1. To test and evaluate course material.

2. To revise and expand previously written material.

3. To develop proficiency in the use of the Computer Assisted Instruction system as a proctor, an author, and as a student.

4. To develop a better appreciation in the problems of developing a curriculum in Computer Assisted Instruction mode.

SPECIFIC OBJECTIVES

1. Each participant was to complete the writing of one unit or semester of material in his particular course area.

2. Each participant was to enter as much of his course material as possible on the disk storage unit.

3. Each participant would select two high school students to test his course material.

4. Each participant would utilize the record of student responses to evaluate his course material.

DESCRIPTION OF PROJECT

The project was directed by the Rev. G. C. McGregor, O.P. and supervised and coordinated by Mr. Paul Bartolomeo. Workshop periods were conducted on Monday through Thursday from 7:00 to 9:00 PM July 5 to August 12, 1966. These evening sessions were conducted in the workshop style, except that two hours was reserved for formal instruction in the Coursewriter language. Due to the fact that only two terminals were available, participants were required to schedule two hours of computer time outside of the normal class hours to enter and test their course material.

One hour of each evening session was devoted to the accomplishment of our general objectives of developing proficiency in role of the author, proctor and student on the system. The remaining hour was used for discussion, conferences with the instructor, working alone, or observation of other participants utilizing the system.

About August 1, 1966, a new method of entering course material into storage was made available by the University of Texas. This method enabled the participants to write their course material on coding sheets and to have this material punched into cards. However, our equipment would not accept this method and IBM technicians had to be called upon to make necessary adjustments. Unfortunately, this work could not be completed before the end of the workshop period. We did begin formal instruction in the use of the coding sheets so that as soon as the system was adjusted, course material could be entered by this media.

Each participant was evaluated by the director and coordinator of the project. Quality of written material, degree of professional improvement, proficiency in use of the equipment, and demonstration of interest as evidenced by independent pursuit of learning, extra hours of work, superior degree of workshop participation, and attitude were considered in obtaining the participant's final grade.

STUDENT SELECTION

The thirteen vocational education teachers who participated in this project are the same participants who took part in earlier phases of this project under U. S. Office of Education contracts OE-5-85-105 and OE-6-85-093. All members of this group were selected on the basis of their scores on the IBM Programmers Aptitude Test. The names of the participants will be found in Appendix V.

PROJECT EVALUATION

The project was not free from technical difficulties inherent in experimental situations. Repeated equipment failure shut down the system many days and snarled input. Some logic difficulties in the Coursewriter language were encountered. Disks damaged in transit required re-entering. As a result, the entering and testing of course sectors fell well behind schedule. This caused problems in motivation for the authors. A more detailed explanation of the technical difficulties may be found in Appendix 8.

The stated objective of completing a semester's course appears to have been too ambitious. As the work progresses, there is an increasing realization that a great deal of time is required to produce a CAI course approaching professional quality. Anywhere from 50 to 150 hours is required to produce a forty minute lesson. Much of this time is taken up in revising, rewriting, and re-entering data in addition to writing and entering new material. Many of the participants worked well beyond the grant period, several right through Labor Day weekend.

The manner in which classes were conducted seems to have achieved the kind of atmosphere that was desired. Teachers were able to pursue that which was of immediate concern to them. They shared their experience by giving others their perspectives and opinions. Programming problems were solved with individual guidance from the instructor. Extemporaneous group or class discussions delved into matters of common concern. It is felt that more formal methods tend to discourage individual involvement, discovery, and creativity, and to distort specialized subject matter into stereotyped and inappropriate patterns.

We feel that the following results have been achieved:

1. Each participant entered some portion of his program.

2. Most participants wrote and planned material in excess of the amount he was able to enter.

3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.

4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.

5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)

6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.

7. Each participant developed a high degree of proficiency in the following CAI skills:

    a. Initializing the system.
    b. Inserting and deleting course material.
    c. Polling the units of the system.
    d. Functioning in the role of the author, student, and the proctor.

8. Many participants continued working on their programs well beyond the six-week workshop period. Several continued through the Labor Day weekend.

9. Each participant has become familiar with the new punch card method of inputing course material.

We definitely believe that the batch-load method, punch card method, of inputing course material offers tremendous advantages over the entering of material through the 1050 Communications Terminal. As stated in our report, under U. S. Office of Education Contract OE-6-85-093, the 1050 Communications Terminal is not an efficient method of input unless the author has the ability to type. No consideration was given to the participants' typing ability as a prerequisite to admission to the project. Although the necessary adjustments needed to adapt our equipment to accept the batch-load method were not completed before the end of the grant period, many participants had begun to write course material for entry by this method.

CONCLUSIONS

The project has satisfied most of the general and specific objectives stated in this report. We do feel that the objectives of producing a full smeester of work and a vocational education curriculum are much too ambitious for a project of this nature. 50 to 150 hours of work are required to produce one 40-minute class lesson. Considering the participants spent 15 hours in preparation each week, outside of the required attendance, in six weeks, only one to one and one half class lessons could have been prepared. This would be far less than that required for one semester let alone a full curriculum.

The most important single impediment in preventing this project from progressing at a higher rate of efficiency was the lack of reliability of our CAI equipment. Most participants wrote far more material than could be entered. Yet, even the data which was entered was, in several instances, destroyed by equipment malfunction. The idea of presenting demonstrations for high ranking school administrators was approached cautiously for fear of adverse reaction due to the unreliability of the equipment. Several authors experienced so much difficulty, they would not bring their students to test material. Finally, we experienced a severe problem in morale among the participants themselves.

One difficulty which we have mentioned in previous reports seems to have been overcome. The development of the batch-load method of entering course material should enable the authors to enter data at a higher rate. In addition, plans have been made to store data on punched cards at periodic intervals, and on magnetic tape before each author work period. After the work period, the updated course will be entered on magnetic tape by the technical personnel to provide a back-up system. These procedures should prevent the destruction of previously entered materials, and an efficient re-entry method will be established in the event of equipment malfunction.

In spite of the problems, which are not unusual in an experimental situation, we are confident that Computer Assisted Instruction provides the most versatile teaching aid to be yet devised. The teacher is freed from the dual task of information transmission and drill. His creative talents can now be utilized to provide instruction for the gifted or exceptional students. The student is required to assume an active role at all times, and the program is tailored to allow him to progress at his own pace. This continual involvment and the immediate knowledge of success or failure should prove to be a positive motivational force.

RECOMMENDATIONS

1. A technical bulletin should be instituted as soon as possible.

2. A users group should be started among the various colleges and universities in Rhode Island which have CAI compatible equipment.

3. More realistic objectives should be established.

4. A review of present equipment should be made, especially the student terminals.

5. There should be coordination, through the U.S. Office of Education, to keep participants in various CAI projects abreast of the newest developments in the field.

6. Individual initiative should be encouraged in entering and testing materials.

7. One session a month should be utilized to document difficulties experienced by the participants with either Coursewriter or the terminal equipment.

8. Visitors should be encouraged to test CAI as soon as equipment is proven reliable.

9. An inservice program for teachers in other fields should be instituted. This could be done with or without equipment.

GUIDELINES

1. Formal instruction in the use of Coursewriter should be continued with special emphasis on the use of functions.

2. The workshop approach should be utilized.

3. All course material should be written prior to formal workshop or class sessions.

4. Authors should be required to utilize the batch-load method of entry. The 1050 terminal use should be limited to testing and minor corrections of format or logic.

5. Author logs for both time spent in preparing material and problems encountered in entering or testing data should be maintained weekly.

6. New participants should be solicited, utilizing the previous participants as instructors.

7. Outside evaluation of course material should be obtained.

8. The objective of producing a single semester of work should be maintained, but the objective of producing a vocational education curriculum in Computer Assisted Instruction mode should be dropped.

9. Future programs should make provision for typists or require the participants to be able to type.

10. Participants should be appraised as to the number of hours of commitment that will be required.

APPENDIX I

Sample course sections completed during the July to August, 1966,
phase of the project in Computer Assisted Instruction.

demo1,s1100
your name is R. R. Reynolds   ds1
                 Introduction to Data Processing

                        Prepared by

                 Mr. Robert R. Reynolds

                            for

           Computer Assisted Instruction

                    Providence College

                 Providence, Rhode Island

                      1965--1966

     You are about to begin a course designed to introduce you to some of

the automated devices used to process data. The course is divided into

three basic sections:

                    1. Simple devices

                    2. Unit Record Equipment

                    3. Electronic Computer

     Please depress the response key [Altn coding and 5].

          The objective of this section is to acquaint you with some
of the simple automated devices used in the modern business world.
Carbon paper is the simplest automated device. The im-
pression of the original is transferred to a copy by the carbon
automatically.
          Sensitized paper, developed by the National Cash Register
Company, is our next simple device. This paper is treated
with chemicals. Original impressions are transferred automa-
tically to the copies without the smudging or mess of carbon paper.
          Our next device is familiar to most people. Credit cards, charge
account plates, name and address plates, etc., are forms of the
embossed plate. Embossed plates are made of plastic or metal.
Data on the plate is raised or embossed. Carbon paper or an
inked ribbon is placed between the document and the plate.
Pressure is applied by a roller, and the data is transferred.
          Please key an eob [altn coding and 5].

Indicate your answers by using the LETTER ONLY.
Which of the following is the simplest form of automated device used in to-
day's business office?
                    [a] Embossed plate
                    [b] Sensitized paper
                    [c] Punched card
                    [d] Carbon paper
b
b - not accepted
Incorrect. Try again.

- not accepted
Incorrect. Did you follow the directions carefully? Try again.

d
Very good. Let's go on.
Paper that has been treated wish chemicals and is used to make copies of
an original document is called:

                        [a]   Carbon paper
                        [b]   Inked paper
                        [c]   Sensitized paper
                        [d]   Copy paper
c
Very good.
The impression of an ------ ------ is made by means of a pressure roller
and carbon paper or inked ribbon.

                        [a]   Embossed plate
                        [b]   Identification cards
                        [c]   Invoice
                        [d]   Order
a
Fine. Now you are ready to go on to the next assignment.
        Another simple automated device is the pegboard. A peg-
board is a flat writing surface with numbered pegs or posts along
one side. Forms are punched with holes to match the pegs for
alignment.
        Look at the first illustration.   When you are ready to go
on, key an eob [altn coding and 5].

        Data is transferred from one form to another by carbon or
sensitized paper. The master list is placed on the pegboard
first. Then the carbon paper is placed on top.   Each addi-
tional form is then placed on top.   The original is the last to
be set on the pegboard. All forms to be used must be coordi-
nated.
        Each original is aligned to the pegs in descending order.
As our illustration demonstrates, each check would be placed on
the pegboard a bit lower than the one before it. When we are
finished, we will have a master list or listing without having to
copy the data from the original several times.
        Please key an eob.

//ss002x//
Indicate your answer by typing the word or words that identify
your selection.
A flat writing surface with numbered pegs along one edge is
known as a --------.
pegboard
Data on the original is transferred to a copy or master list
by means of -------.
carbon paper
Forms are aligned or lined up by using the numbered ----- along
the edge of the board.
pegs ,
That's it, You are doing well. Keep it up.
The advantage of using a pegboard is that we may have a copy or
a ----- without having to rewrite the data on the original document.
mastr list
Forms used with the pegboard are aligned with the pegs on the board by means
of------on the edge of the form.
holes
Fine. Your answer is correct. Let's try the next section.
        Our final simple device is a bit more complex than the
others. The Keysort Process uses a card with holes punched on
the edges of the card.
        Please turn to the second illustration.

Information is recorded on the card by notching the holes.
These holes may be grouped together to represent data. Holes
grouped in this manner are called code fields. The number of
holes in each group may vary to meet the needs of the user. A
code known as the binary code is used to represent data. Only
numeric data may be recorded.
       when you are ready to go on, please key an eob.

       Inorder to sort or select data from the cards, we pass a
steel rod or needle through the holes in the edge of a deck of
cards. The cards that have been notched will fall from the
needle, and the unnotched cards will remain on the needle. This
procedure will be followed for each position in the code field.
Once data has been recorded manually into the cards, the sort-
ing or selection of data is automatic.
       Please key an eob.

Supply only the LETTER that indicates your answer.
       The fields on a keysort card are:
                 [a] on the top
                 [b] on the edge
                 [c] in the middle
                 [d] all over the card
c
sorry, but that's not it. Try once more.
b
Very good. Let's go on to the next question.
//ss009 //Note that the picture of the Keysort card shows that the school
code has been notched.
what is the school number that has been notched into the card?
help
24
24
If the keysort needle is passed through a deck of cards, and this card
was in the deck, would it fall into the tray or remain on the needle if
you wanted schools 10-19?
remain on the needle
If we want to identify the cards used to register boys from those used to
register girls, only one position or code field would be necessary. The
cards used for boys could be notched, and the ones used for girls would not
be notched.//ss010x//
       Therefore, boys' cards would fall to the tray and the girls' cards would
-----.
remain
       The keysort process is the first of our simple automated devices for
processing data that resembles the equipment used in card processing systems
of today. Our next section will be on unit record systems of processing
data. Before we can go on to our new work, we will have a short quiz on
the material we have already covered.
       If you wish to take the quiz, please type yes. If you do not wish to
take the quiz at this time, please type no.
yes
1. The simplest form of automated device is -------.
help
No help given.

carbon paper
Try the next one.
2. Name one other simple automated device.
embossed plate
 :s go on.

3. A credit card is a form of the ------.
embossed plate
Try the next question.
4. The ------ uses numbered pegs to align forms.
peg board
Each answer is being recorded. You may obtain your score at
the end of the test from your instructor.
5. The holes around the edge of the ----- card are notched to
record data.
keysort
Go on.
6. Although data is recorded manually on the keysort card, the
selection or sorting of cards is -----.
automatic
Next question.
7. The unnotched holes on the keysort card cause the cards to
----- on the needle.
stay
You have completed the quiz.
Would you like to know your score? Type yes or no.
yes
You received an A. Let:s go on to the next section. Please
depress the a key.
a
                    Section 2
     We can conclude from the previous section on simple devices that automation
is not a machine. Rather it is a process. The chief aim of automation is to
reduce human effort and handling to obtain less error. The secondary aim is to
increase the processing speed. We shall now attempt to apply the principles of
automation to Data Processing.
     Data processing is the processing of information. The huge volumes of data
that must be handled every day by business, science and government staggers the
imagination. It is physically impossible to process, catalogue and store all the
vast quantities of information accumulated by all sources without the help of machines.
Automated equipment enables us to gather data, manipulate it, draw conclusions
from it, and store it for future use. Routine handling can be performed at high
speeds, freeing men and women for more important tasks. These machines can do many
of the tasks that humans find boring without becoming bored. Because our machines
do not become bored or tired, they make very few mistakes. Most errors that do
occur are the result of human error or machine malfunction.
     All information handling, or data processing, goes through a cycle. First,
the data to be processed must be assembled. Then it must be recorded in a convenient
form. Next, it must be manipulated. The results must be reported. Finally,
it must be stored. The next slide shows the data processing cycle in sequence.
Please depress the response key.
//ss010 //
end of course.
you have been signed off.

```
demo1,a0001
your name is       R. R. Reynolds
type control word
type reyn//finish
reyn
begin
    1        rd              Introduction to Data Processing
    2
    3                              Prepared by
    4
    5                        Mr. Robert R. Reynolds
    6
    7                                  for
    8
    9                    Computer Assisted Instruction
   10
   11                          Providence College
   12
   13                      Providence, Rhode Island
   14
   15                             1965--1966


   16
   17              You are about to begin a course designed to introduce you to some of
   18
   19         the automated devices used to process data. The course is divided into

   20
   21    .     three basic sections:
   22
   23                            1. Simple devices
   24
   25                            2. Unit Record Equipment
   26
   27                            3. Electronic Computer
   28
   29         Please depress the response key [Altn coding and 5].
secla
    1        rd       The objective of this section is to acquaint you with some
    2                of the simple automated devices used in the modern business world.
    3                Carbon paper is the simplest automated device.  The im-
    4                pression of the original is transferred to a copy by the carbon
    5                automatically.
    6                    Sensitized paper, developed by the National Cash Register
    7                Company, is our next simple device.  This paper is treated
    8                with chemicals.  Original impressions are transferred automa-
    9                tically to the copies without the smudging or mess of carbon paper.
   10                    Our next device is familiar to most people.  Credit cards, charge
   11                account plates, name and address plates, etc., are forms of the
   12                embossed plate.  Embossed plates are made of plastic or metal.
   13                Data on the plate is raised or embossed.  Carbon paper or an
   14                inked ribbon is placed between the document and the plate.
   15                Pressure is applied by a roller, and the data is transferred.
   16                    Please key an eob [altn coding and 5].
seclaql
    1        qu Indicate your answers by using the LETTER ONLY.

    2         Which of the following is the simplest form of automated device used in to-

    3         day's business office?
    4                            [a]   Embossed plate
    5                            [b]   Sensitized paper
    6                            [c]   Punched card
    7                            [d]   Carbon paper
```

```
  8          ca d
  9          cb D
 10          ty Very good. Let's go on.                                    ♪
 11          wa carbon paper
 12          wb Carbon paper
 13          wa cbn ppr
 14          fn k1          //2nt//Typing error.
 15          ty Incorrect. You did not follow directions. You were asked to use the LETTER
 16             only to indicate your answer. Please follow directions and try again.
 17          un Incorrect. Try again.
 18          un Incorrect. Did you follow the directions carefully? Try again.
 19          un Incorrect. The correct answer is d, carbon paper. Let's be a bit more

 20             careful when reading and make sure you follow the directions. Go on to
 21             the next question.
 22          br sec1aq2
sec1aq2
  1          qu Paper that has been treated with chemicals and is used to make copies of
  2             an original document is called:                -
  3                              [a]   Carbon paper
  4                              [b]   Inked paper
  5                              [c]   Sensitized paper
  6                              [d]   Copy paper
  7          ca c
  8          cb C
  9          ty Very good.
 10          wa sensitized paper
 11          wb Sensitized paper
 12          wa sens ppr
 13          fn k1          //2nt//Typing error.
 14          ty You did not follow directions. Use the LETTER ONLY! Try again.
 15          un Sorry. Try again.
 16          un The correct answer is c, sensitized paper. Go on to the next question.
 17          br sec1aq3
sec1aq3
  1          qu The impression of an ------  ------ is made by means of a pressure roller
  2             and carbon paper or inked ribbon.
  3                              [a]   Embossed plate
  4                              [b]   Identification cards    ⁻
  5                              [c]   Invoice
  6                              [d]   Order
  7          ca a
  8          cb A
  9          ty Fine. Now you are ready to go on to the next assignment.
 10          wa embossed plate
 11          wb Embossed plate
 12          wa embsd plt
 13          fn k1          //2nt//Typing error.
 14          ty You did not follow directions. Use only the LETTER. Try
 15             again.
 16          un Afraid not. Try again.
 17          un What happened!! That's not right either. Try once more.
 18          un Nope.  You should have answered a, embossed plate.  Let:s
 19             try the next assignment.
 20          br sec1b
sec1b
  1          rd
  2                 Another simple automated device is the pegboard.  A peg-
  3             board is a flat writing surface with numbered pegs or posts along
  4             one side.  Forms are punched with holes to match the pegs for
  5             alignment.
  6                 Look at the first illustration.  When you are ready to go
```

```
 7              on, key an eob [altn coding and 5].
 8          rd      Data is transferred from one form to another by carbon or
 9              sensitized paper. The master list is placed on the pegboard
10              first.  Then the carbon paper is placed on top.  Each addi-
11              tional form is then placed on top.  The original is the last to
12              be set on the pegboard.  All forms to be used must be coordi-
13              nated.
14                  Each original is aligned to the pegs in descending order.
15              As our illustration demonstrates, each check would be placed on
16              the pegboard a bit lower than the one before it.  When we are
17              finished, we will have a master list or listing without having to
18       .      copy the data from the original several times.
19                  Please key an eob.
20          ty //ss002x//
seclbql
 1          qu Indicate your answer by typing the word or words that identify
 2              your selection.
 3              A flat writing surface with numbered pegs along one edge is
 4              known as a --------.
 5          ca no help given.

 6          ca pegboard
 7          cb Pegboard
 8          ca pgbd
 9          fn kl         //1nt//Watch your typing.
10          ty You are correct.
11          wa peg board
12          wb Peg board
13          wa pg bd
14          fn kl         //2nt//Typing error.
15       _  ty Okay, but pegboard is one word.
16          br seclbq2
17          un This answer is not correct. Remember that typing errors are

18              considered as incorrect answers. Try again.
19          un I'm afraid not. LET⌂S GO BACK AND READ AGAIN.
20          br seclb
seclbq2
 1          qu Data on the original is transferred to a copy or master list

 2              by means of -------.
 3          ca no help given.

 4          ca carbon
 5          cb carbon paper
 6          ca cbn pr
 7          fn kl         //2nt//Be careful of typing errors.
 8          cb sensitized paper
 9          cb sens pr
10          fn kl         //2nt//Watch your typing errors.
11          cb carbon or sensitized paper
12          cb sensitized or carbon paper
13          cb cbn or sens pr
14          fn kl         //4nt//Typing error.
15          fn editls     //sh//c/r
16          ty Your answer is correct. Let's go on.
17          un Wrong. LET⌂S TRY AGAIN.
18          un Check your typing and try again.
19          un Sign off and get help from your instructor.
seclb q3
 1          qu Forms are aligned or lined up by using the numbered ----- along
 2              the edge of the board.
 3          ca no help given.
```

```
    4        ca posts
    5        cb pegs
    6        cb pegs or posts
    7        cb posts or pegs
    8        fn editls     //sh//c/r
    9        ty That's it, You are doing well. Keep it up.
   10        un That's not it. Try once more.
   11        un what's the matter?  That is not the correct answer.  Let's go on anyway and see if you cannot do better
   12        hr seclb q4
seclb q4
    1        qu The advantage of using a pegboard is that we may have a copy or
    2           a ----- without having to rewrite the data on the original document.
    3        ca no help given.

    4        ca master list
    5        cb master
    6        ca mstr lst
    7        fn k1          //2rt//Be careful of typing errors.
    8        ca listing
    9        ca lstg
   10        fn k1          //1nt//watch typing errors.
   11        fn editls      //sh//c/r
   12        ua duplicate
   13        fn editls      //sh//c/r
   14        ty This is a good try, but I was looking for a term mentioned in the text.
   15           Try again.
   16        un This answer is not correct. Try again.
   17        un we still can:t seem to get together. Try once more.
   18        un The correct answer is master list. Let's go on.
   19        hr seclb q5
seclb q5
    1        qu Forms used with the pegboard are aligned with the pegs on the board by means
    2           of------on the edge of the form.
    3        ca no help given.

    4        ca punched holes
    5        fn editls      //sh//sp//c/r
    6        ca holes
    7        fn editls      //sh//c/r
    8        ty Fine.  Your answer is correct.  Let's try the next section.
    9        un Sorry, try again.
   10        un Sign off and see your instructor.
seclc
    .        rd      Our final simple device is a bit more complex than the
    2        others.  The Keysort Process uses a card with holes punched on
    3        the edges of the card.
    4              Please turn to the second illustration.
    5        rd      Information is recorded on the card by notching the holes.
    6        These holes may be grouped together to represent data.  Holes
    7        grouped in this manner are called code fields.  The number of
    8        holes in each group may vary to meet the needs of the user.  A
    9        code known as the binary code is used to represent data.  Only
   10        numeric data may be recorded.
   11              when you are ready to go on, please key an eob.
   12        rd      Inorder to sort or select data from the cards, we pass a
   13        steel rod or needle through the holes in the edge of a deck of
   14        cards.  The cards that have been notched will fall from the
   15        needle, and the unnotched cards will remain on the needle.  This
   16        procedure will be followed for each position in the code field.
   17        Once data has been recorded manually into the cards, the sort-
   18        ing or selection of data is automatic.
   19              Please key an eob.
```

```
    19              Please key an eob.
seclc ql
    1           qu Supply only the LETTER that indicates your answer.
       The fields on a keysort card  are:
    2                             [a] on the top
    3                             [b] on the edge
    4                             [c] in the middle
    5                             [d] all over the card
    6           ca b
    7           fn editls    //sh//c/r
    8           ty Very good.  Let's go on to the next question.
    9           wa d
   10           ty This is not quite correct, but why don't you try again.
   11           un sorry, but that's not it.  Try once more.
   12           un The correct answer is b, on the edge.  Go on to the next
   13              question.
   14           br seclc q2
seclc q2
    1           qu //ss009 //
    2              Note that the picture of the Keysort card shows that the school
    3              code has been notched.
    4              What is the school number that has been notched into the card?
    5           ca 24
    6           ca twentyfour
    7           fn editls    //sh//sp//c/r
    8           un Did you look at the school code?  Try again.
    9           un Try 24.
seclc q3
    1           qu If the keysort needle is passed through a deck of cards, and this card
    2              was in the deck, would it fall into the tray or remain on the needle if
    3              you wanted schools 10-19?
    4           ca remainontheneedle
    5           fn editls     //all
    6           ca remain
    7           fn editls    //sh//c/r
    8           ty We can also conclude from your answer that this card must contain data
    9              concerning some other school.  So it is possible to obtain two types
   10              of data from the keysort card--positive or negative.
   11           un Unnotched cards would remain on the needle.  Notched cards would fall
   12              to the tray.
   13           br seclc q4
seclc q4
    1           qu If we want to identify the cards used to register boys from those used to
    2              register girls, only one position or code field would be necessary.  The
    3              cards used for boys could be notched, and the ones used for girls would not
    4              be notched.//ss010x//
    5                  Therefore, boys' cards would fall to the tray and the girls' cards would
    6              -----.
    7           ca remainontheneedle
    8           fn editls    //all
    9           ca remain
   10           fn editls    //sh//c/r
   11           un remain on the needle.
   12           br seclc q5
seclc q5
    1           qu     The keysort process is the first of our simple automated devices for
    2              processing data that resembles the equipment used in card processing systems
    3              of today.  Our next section will be on unit record systems of processing
    4              data.  Before we can go on to our new work, we will have a short quiz on
    5              the material we have already covered.
    6                  If you wish to take the quiz, please type yes.  If you do not wish to
    7              take the quiz at this time, please type no.
    8           ca yes
    9           fn editls    //sh//c/r
```

```
10          wa no
11          fn editls     //sh//c/r
12          ty When you are ready to take the quiz, please use the following format.  Use
13             the control words--go to--and the label secltest.  You should copy this
14             format before signing off.  Please sign off.
15          un Please type yes or no!
secltest
1          qu 1.  The simplest form of automated device is -------.
2          ca No help given.
3          ca carbonpaper
4          fn editls     //all
5          ad 1//c1
6          ty Try the next one.
7          un Try the next one.
8          ad 1//c1
9          br test1q2
test1q2
1          qu 2.  Name one other simple automated device.
2          ca No help given.
3          ca embossedplate
4          cb sensitizedpaper
5          cb pegboard
6          cb keysort
7          cb keysortprocess
8          fn editls     //all
9          ad 1//c1
10         ty Let:s go on.
11         un Let:s go on.
12         ad 1//c2
13         br test1q3
test1q3
1          qu 3.  A credit card is a form of the ------.
2          ca No help given.
3          ca embossedplate
4          fn editls     //all
5          ad 1//c1
6          ty Try the next question.
7          un Try the next question.
8          ad 1//c2
9          br test1q4
test1q4
1          qu 4.  The ------ uses numbered pegs to align forms.
2          ca No help given.
3          ca pegboard
4          fn editls     //all
5          ad 1//c1
6          ty Each answer is being recorded.  You may obtain your score at
7          ty the end of the test from your instructor.
8          un Each response is being recorded.  You may obtain your score at
9             the end of the test from your instructor.
10         ad 1//c2
11         br test1q5
test1q5
1          qu 5.  The holes around the edge of the ----- card are notched to
2             record data.
3          ca No help given.
4          ca keysort
5          fn editls     //all
6          ad 1//c1
7          ty Go on.
8          un Go on.
9          ad 1//c2
10         br test1q6
```

```
testlqb
    1           qu 6.   Although data is recorded manually on the keysort card, the
    2              selection or sorting of cards is -----.
    3           ca No help given.
    4           ca automatic
    5           fn editls    //all
    6           ad 1//cl
    7           ty Next question.
    8           un Next question.
    9           ad 1//c2
   10           br testlq7
testlq7
    1           qu 7.   The unnotched holes on the keysort card cause the cards to
    2         .    ----- on the needle.
    3           ca No help given.
    4           ca remain
    5           cb stay
    6           fn editls    //all
    7           ad 1//cl
    8           ty You have completed the quiz.
    9           un You have completed the quiz.
   10           ad 1//c2
   11           br testlend
testlend
    1           qu Would you like to know your score?  Type yes or no.
    2           ca yes
    3           br scrtld    //-4//cl
    4           br scrtlc    //-5//cl
    5           br scrtlb    //-6//cl
    6           br scrtla    //-7//cl
    7           ca no
    8           ty You may obtain your score from your instructor at a later time.
    9           rd Please depress the eob [altn coding and 5].
   10           br sec2
scrtla
    1           qu You received an A.   Let:s go on to the next section.   Please
    2              depress the a key.
    3           ca a
    4           br sec2
    5           un Please depress the a key!
scrtlb
    1           qu You received a B.   Proceed to the next section.   Please
    2              depress the a key.
    3           ca a
    4           br sec2
    5           un Please depress the a key!
scrtlc
    1           qu You received a C.   Proceed to the next section.   Please
    2              depress the a key.
    3           ca a
    4           br sec2
    5           un Please depress the a key!
scrtld
    1           qu You did not do too well.   Your grade is a D.   This means
    2              you had 3 or more incorrect answers.  Let:s see if you can do a
    3              better job on the next section.  Please strike the a key.
    4           ca a
    5           br sec2
    6           un Please strike the a key!
```

```
sec2
   1      rd                    Section 2
   2                  We can conclude from the previous section on simple devices that automation

   3           is not a machine.  Rather it is a process.  The chief aim of automation is to

   4           reduce human effort and handling to obtain less error.  The secondary aim is to

   5           increase the processing speed.  We shall now attempt to apply the principles of
   6           automation to Data Processing.
   7                  Data processing is the processing of information.  The huge volumes of data

   8           that must be handled every day by business, science and government staggers the

   9           imagination.  It is physically impossible to process, catalogue and store all the

  10           vast quantities of information accumulated by all sources without the help of machines.
  11           Automated equipment enables us to gather data, manipulate it, draw conclusions

  12           from it, and store it for future use.  Routine handling can be performed at high

  13           speeds, freeing men and women for more important tasks. These machines can do many

  14           of the tasks that humans find boring without becoming bored.  Because our machines

  15           do not become bored or tired, they make very few mistakes.  Most errors that do

  16           occur are the result of human error or machine malfunction.
  17                  All information handling, or data processing, goes through a cycle.  First,
  18           the data to be processed must be assembled.  Then it must be recorded in a convenient
  19           form.  Next, it must be manipulated.  The results must be reported.  Finally,

  20           it must be stored.  The next slide shows the data processing cycle in sequence.

  21           Please depress the response key.
  22      ty //ss010 //
finish
type control word
sign off
you have been signed off.
```

```
REYN      ‡                                                                        0203451
BEGIN     ‡                                                                        0203502
   1    RD              I NTRODUCTION TO   D ATA   P ROCESSING ‡                    0203553
   2        ‡                                                                      0203616
   3                         P REPARED BY ‡                                        0203630
   4        ‡                                                                      0203677
   5                    M R.   R OBERT   R. R EYNOLDS ‡                            0203691
   6        ‡                                                                      0203748
   7                            FOR ‡                                              0203762
   8        ‡                                                                      0203803
   9                 C OMPUTER   A SSISTED   I NSTRUCTION ‡                         0203817
  10        ‡                                                                      0203876
  11                     P ROVIDENCE ·C OLLEGE ‡                                   0203890
  12        ‡                                                                      0203941
  13                 P ROVIDENCE,   R HODE   I SLAND ‡                             0203955
  14        ‡                                                                      0204011
  15                         1965--1966        ‡                                   0204025
  16        ‡                                                                      0204076
  17        Y OU ARE ABOUT TO BEGIN A COURSE DESIGNED TO INTRODUCE YOU TO SOME OF ‡ 0204090
  18        ‡                                                                      0204179
  19    THE AUTOMATED DEVICES USED TO PROCESS DATA.  T HE COURSE IS DIVIDED INTO   ‡ 0204193
  20        ‡                                                                      0204281
  21    THREE BASIC SECTIONS 6  ‡                                                  0204295
  22        ‡                                                                      0204332
  23                    1.   S IMPLE DEVICES ‡                                     0204346
  24        ,‡                                                                     0204395
  25                    2.   U NIT   R ECORD   E QUIPMENT ‡                        0204409
  26        ‡                                                                      0204469
  27                    3.   E LECTRONIC   C OMPUTER ‡                             0204483
  28        ‡                                                                      0204539
  29            P LEASE DEPRESS THE RESPONSE KEY   9A LTN CODING AND 5 O . ‡       0204553
SEC1A     ‡                                                                        0204630
   1    RD         T HE OBJECTIVE OF THIS SECTION IS TO ACQUAINT YOU WITH SOME ‡   0264602
   2    OF THE SIMPLE AUTOMATED DEVICES USED IN THE MODERN BUSINESS WORLD. ‡       0264681
   3    C ARBON PAPER IS THE SIMPLEST AUTOMATED DEVICE.   T HE IM- ‡              0264761
   4    PRESSION OF THE ORIGINAL IS TRANSFERRED TO A COPY BY THE CARBON ‡          0264834
   5    AUTOMATICALLY. ‡                                                           0264911
   6         S ENSITIZED PAPER, DEVELOPED BY THE   N ATIONAL   C ASH   R EGISTER ‡ 0264939
   7    C OMPANY, IS OUR NEXT SIMPLE DEVICE.    T HIS PAPER IS TREATED ‡           0265023
   8    WITH CHEMICALS.   O RIGINAL IMPRESSIONS ARE TRANSFERRED AUTOMA- ‡          0265099
   9    TICALLY TO THE COPIES WITHOUT THE SMUDGING OR MESS OF CARBON PAPER. ‡      0265176
  10         O UR NEXT DEVICE IS FAMILIAR TO MOST PEOPLE.   C REDIT CARDS, CHARGE ‡ 0265257
  11    ACCOUNT PLATES, NAME AND ADDRESS PLATES, ETC., ARE FORMS OF THE ‡         0265345
  12    EMBOSSED PLATE.   E MBOSSED PLATES ARE MADE OF PLASTIC OR METAL. ‡         0264171
  13    D ATA ON THE PLATE IS RAISED OR EMBOSSED.   C ARBON PAPER OR AN ‡         0264249
  14    INKED RIBBON IS PLACED BETWEEN THE DOCUMENT AND THE PLATE. ‡              0264327
  15    P RESSURE IS APPLIED BY A ROLLER, AND THE DATA IS TRANSFERRED. ‡           0264399
  16         P LEASE KEY AN EOB  9 ALTN CODING AND 5 O . ‡                         0264539
SEC1AQ1   ‡                                                                        0205936
   1    QU   I NDICATE YOUR ANSWERS BY USING THE   LETTER ONLY .   ‡               0205987
   2         W HICH OF THE FOLLOWING IS THE SIMPLEST FORM OF AUTOMATED DEVICE USED IN TO-  ‡ 0206054
   3    DAYS BUSINESS OFFICE /  ‡                                                  0206147
   4                         9 A O   E MBOSSED PLATE ‡                             0206185
   5                         9 B O   S ENSITIZED PAPER ‡                           0206236
   6                   .     9 C O   P UNCHED CARD ‡                              0206293
   7                         9 D O   C ARBON PAPER ‡                              0206344
```

```
  8    CA O‡                                                                    0206395
  9    CB  D ‡                                                                  0206409
 10    TY  V ERY GOOD.  L ET@S GO ON. ‡                                        0206425
 11    WA CARBON PAPER‡                                                         0206466
 12    WB  C ARBON PAPER‡                                                       0206491
 13    WA CBN PPR‡                                                             0265422
 14    FN KL        //2NT// T YPING ERROR. ‡                                   0265442
 15    TY  I NCORRECT.  Y OU DID NOT FOLLOW DIRECTIONS.  Y OU WERE ASKED TO USE THE  LETTER  ‡   0206518
 16    ONLY TO INDICATE YOUR ANSWER.  P LEASE FOLLOW DIRECTIONS AND TRY AGAIN. ‡   0206614
 17    UN  I NCORRECT.  % RY AGAIN. ‡                                          0206699
 18    UN  I NCURRECT.  D ID YOU FOLLOW THE DIRECTIONS CAREFULLY / T RY AGAIN. ‡   0206738
 19    UN  I NCORRECT.  T HE CORRECT ANSWER IS O, CARBON PAPER.  L ET@S BE A BIT MORE   ‡   0206820
 20    CAREFUL WHEN READING AND MAKE SURE YOU FOLLOW THE DIRECTIONS.  G O ON TO ‡   0206911
 21    THE NEXT QUESTION. ‡                                                    0206997
 22    BR SEC1AQ2    ‡                                                         0207029
SEC1AQ2    ‡                                                                   0207080
  1    QU  P APER THAT HAS BEEN TREATED WITH CHEMICALS AND IS USED TO MAKE COPIES OF ‡   0207131
  2    AN ORIGINAL DOCUMENT IS CALLED 6 ‡                                      0207219
  3                        9 A 0   C ARBON PAPER ‡                             0207266
  4                        9 B 0   I NKED PAPER ‡                              0207317
  5                        9 C 0   S ENSITIZED PAPER ‡                         0207367
  6                        9 D 0   C OPY PAPER ‡                               0207422
  7    CA C‡                                                                   0207471
  8    CB  C ‡                                                                 0207485
  9    TY  V ERY GOOD. ‡                                                       0207501
 10    WA SENSITIZED PAPER‡                                                    0207527
 11    WB  S ENSITIZED PAPER‡                                                  0207556
 12    WA SENS PPR‡                                                            0265488
 13    FN KL        //2NT// T YPING ERROR. ‡                                   0265509
 14    TY  Y OU DID NOT FOLLOW DIRECTIONS.  U SE THE  LETTER ONLY$ T RY AGAIN. +   0207587
 15    UN  S ORRY.  T RY AGAIN. ‡                                              0207669
 16    UN  T HE CORRECT ANSWER IS C, SENSITIZED PAPER.  G O ON TO THE NEXT QUESTION. ‡   0207704
 17    BR SEC1AQ3  ‡                                                           0207792
SEC1AQ3    ‡                                                                   0207843
  1    QU  T HE IMPRESSION OF AN ------  ------ IS MADE BY MEANS OF A PRESSURE ROLLER ‡   0207894
  2    AND CARBON PAPER OR INKED RIBBON. ‡                                     0207983
  3                        9 A 0   E MBOSSED PLATE ‡                           0208030
  4                        9 B 0   I DENTIFICATION CARDS ‡                     0208083
  5                        9 C 0   I NVOICE ‡                                  0208142
  6                        9 D 0   O RDER ‡                                    0208188
  7    CA A‡                                                                   0208232
  8    CB  A ‡                                                                 0208246
  9    TY  F INE.  N OW YOU ARE READY TO GO ON TO THE NEXT ASSIGNMENT. ‡       0208262
 10    WA EMBOSSED PLATE‡                                                      0208336
 11    WB  E MBOSSED PLATE‡                                                    0208363
 12    WA EMBSO PLT‡                                                           0265555
 13    FN KL        //2NT// T YPING ERROR. ‡                                   0265577
 14    TY  Y OU DID NOT FOLLOW DIRECTIONS.  U SE ONLY THE  LETTER . T RY ‡     0208392
 15    AGAIN. ‡                                                                0208469
 16    UN  A FRAID NOT.  T RY AGAIN. ‡                                         0208489
 17    UN  W HAT HAPPENED $$ T HAT@S NOT RIGHT EITHER.  T RY ONCE MORE. ‡      0208529
 18    UN  N OPE.   Y OU SHOULD HAVE ANSWERED A, EMBOSSED PLATE.   L ET 6 S ‡  0208604
 19    TRY THE NEXT ASSIGNMENT. ‡                                             0208663
 20    BR SEC1B       ‡                                                        0208721
SEC1B       ‡                                                                  0208772
  1    RO ‡                                                                    0266858
```
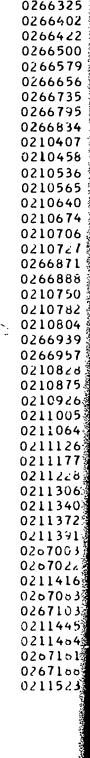
```
 2            A NOTHER SIMPLE AUTOMATED DEVICE IS THE PEGBOARD.    A  PEG- ‡        0265623
 3       BOARD IS A FLAT WRITING SURFACE WITH NUMBERED PEGS OR POSTS ALONG ‡        0265702
 4       ONE SIDE.    F ORMS ARE PUNCHED WITH HOLES TO MATCH THE PEGS FOR ‡         0265781
 5       ALIGNMENT. ‡                                                               0265858
 6            L OOK AT THE FIRST ILLUSTRATION.    W HEN YOU ARE READY TO GO ‡       0265882
 7       ON, KEY AN EOB  9 ALTN CODING AND 5 0 . ‡                                  0265962
 8    RO       D ATA IS TRANSFERRED FROM ONE FORM TO ANOTHER BY CARBON OR ‡         0266015
 9       SENSITIZED PAPER.    T HE MASTER LIST IS PLACED ON THE PEGBOARD ‡          0266093
10       FIRST.    T HEN THE CARBON PAPER IS PLACED ON TOP.    E ACH ADDI- ‡        0266169
11       TIONAL FORM IS THEN PLACED ON TOP.    T HE ORIGINAL IS THE LAST TO ‡       0266246
12       BE SET ON THE PEGBOARD.    A LL FORMS TO BE USED MUST BE COORDI- ‡         0266325
13       NATED. ‡                                                                   0266402
14            E ACH ORIGINAL IS ALIGNED TO THE PEGS IN DESCENDING ORDER. ‡          0266422
15       A S OUR ILLUSTRATION DEMONSTRATES, EACH CHECK WOULD BE PLACED ON ‡         0266500
16       THE PEGBOARD A BIT LOWER THAN THE ONE BEFORE IT.    W HEN WE ARE ‡         0266579
17       FINISHED, WE WILL HAVE A MASTER LIST OR LISTING WITHOUT HAVING TO ‡        0266656
18       COPY THE DATA FROM THE ORIGINAL SEVERAL TIMES. ‡                           0266735
19            P LEASE KEY AN EOB. ‡                                                 0266795
20    TY //SS002X// ‡                                                               0266834
SEC1BQ1    ‡                                                                        0210407
 1    QU  I NDICATE YOUR ANSWER BY TYPING THE WORD OR WORDS THAT IDENTIFY ‡         0210458
 2       YOUR SELECTION. ‡                                                          0210536
 3       A  FLAT WRITING SURFACE WITH NUMBERED PEGS ALONG ONE EDGE IS ‡            0210565
 4       KNOWN AS A --------. ‡                                                     0210640
 5    CA NO HELP GIVEN.         ‡                                                   0210674
 6    CA PEGBOARD‡                                                                  0210706
 7    CB  P EGBOARD‡                                                               0210727
 8    CA PGBO‡                                                                      0266871
 9    FN KL         //INT// W ATCH YOUR TYPING. ‡                                   0266888
10    TY  Y OU ARE CORRECT. ‡                                                       0210750
11    WA PEG BOARD‡                                                                 0210782
12    WB  P EG BOARD‡                                                              0210804
13    WA PG BO‡                                                                     0266939
14    FN KL         //2NT// T YPING ERROR. ‡                                        0266957
15    TY  O KAY, BUT PEGBOARD IS ONE WORD. ‡                                        0210828
16    BR SEC1BQ2    ‡                                                               0210875
17    UN  T HIS ANSWER IS NOT CORRECT.  R EMEMBER THAT TYPING ERRORS ARE   ‡        0210926
18       CONSIDERED AS INCORRECT ANSWERS.    T RY AGAIN. ‡                          0211005
19    UN  I AM AFRAID NOT.  LET@S GO BACK AND READ AGAIN. ‡                         0211064
20    BR SEC1B       ‡                                                             0211126
SEC1BQ2    ‡                                                                        0211177
 1    QU  D ATA ON THE ORIGINAL IS TRANSFERRED TO A COPY OR MASTER LIST   ‡         0211228
 2       BY MEANS OF --------. ‡                                                    0211306
 3    CA NO HELP GIVEN.        ‡                                                    0211340
 4    CA CARBON‡                                                                    0211372
 5    CB CARBON PAPER‡                                                              0211391
 6    CA CBN PR‡                                                                    0207003
 7    FN KL         //2NT// B E CAREFUL OF TYPING ERRORS. ‡                         0207022
 8    CB SENSITIZED PAPER‡                                                          0211416
 9    CB SENS PR‡                                                                   0207003
10    FN KL         //2NT// W ATCH YOUR TYPING ERRORS. ‡                            0267103
11    CB CARBON OR SENSITIZED PAPER‡                                                0211445
12    CB SENSITIZED OR CARBON PAPER‡                                                0211464
13    CB CBN OR SENS PR‡                                                            0207151
14    FN KL         //4NT// T YPING ERROR. ‡                                        0267166
15    FN EDITIS     //SH//C/R‡                                                      0211523
```

```
16    TY   Y OUR ANSWER IS CORRECT.  L ET@S GO ON.  ‡                              021155
17    UN   W RONG.  LET@S TRY AGAIN. ‡                                            021160
18    UN   C HECK YOUR TYPING AND TRY AGAIN. ‡                                    021164
19    UN   S IGN OFF AND GET HELP FROM YOUR INSTRUCTOR. ‡                         021169
SEC1B Q3  ‡                                                                        021175
 1    QU   F ORMS ARE ALIGNED OR LINED UP BY USING THE NUMBERED ---- ALONG ‡      021180
 2         THE EDGE OF THE BOARD. ‡                                               021188
 3    CA   NO HELP GIVEN.       ‡                                                 021192
 4    CA   POSTS‡                                                                 021195
 5    CB   PEGS‡                                                                  021197
 6    CB   PEGS OR POSTS‡                                                         021198
 7    CB   POSTS OR PEGS‡                                                         021201
 8    FN   EDIT1S    //SH//C/R‡                                                   021204
 9    TY   T HAT@S IT,  Y OU ARE DOING WELL.   K EEP IT UP. ‡                     021207
10    UN   T HAT@S NOT IT.   T RY ONCE MORE. ‡                                    021213
11    UN   W HAT@S THE MATTER /  T HAT IS NOT THE CORRECT ANSWER.   L ET@S GO ON ANYWAY AND SEE IF   021218
           YOU CANNOT DO BETTER. ‡                                               021230
12    BR   SEC1B Q4  ‡                                                            021236
SEC1B Q4  ‡                                                                        021241
 1    QU   T HE ADVANTAGE OF USING A PEGBOARD IS THAT WE MAY HAVE A COPY OR ‡     021241
 2         A ----- WITHOUT HAVING TO REWRITE THE DATA ON THE ORIGINAL DOCUMENT. ‡ 021249
 3    CA   NO HELP GIVEN.       ‡                                                 021257
 4    CA   MASTER LIST‡                                                           021260
 5    CB   MASTER‡                                                                021262
 6    CA   MSTR LST‡                                                              026723
 7    FN   KL        //2NT// B E CAREFUL OF TYPING ERRORS. ‡                      026725
 8    CA   LISTING‡                                                               026731
 9    CA   LSTG‡                                                                  026733
10    FN   KL        //1NT// W ATCH TYPING ERRORS. ‡                             026735
11    FN   EDIT1S    //SH//C/R‡                                                   021264
12    WA   DUPLICATE‡                                                             021267
13    FN   EDIT1S    //SH//C/R‡                                                   021270
14    TY   T HIS IS A GOOD TRY, BUT  I  WAS LOOKING FOR A TERM MENTIONED IN THE TEXT. ‡   021273
15         T RY AGAIN. ‡                                                          021282
16    UN   T HIS ANSWER IS NOT CORRECT.   T RY AGAIN. ‡                           021284
17    UN   W E STILL CAN 6 T SEEM TO GET TOGETHER.   T RY ONCE MORE. ‡           021290
18    UN   T HE CORRECT ANSWER IS MASTER LIST.   L ET@S GO ON.   ‡               021297
19    BR   SEC1B Q5  ‡                                                            021304
SEC1B Q5  ‡                                                                        021309
 1    QU   F ORMS USED WITH THE PEGBOARD ARE ALIGNED WITH THE PEGS ON THE BOARD BY MEANS ‡   021314
 2         OF------ON THE EDGE OF THE FORM. ‡                                     021323
 3    CA   NO HELP GIVEN.       ‡                                                 021326
 4    CA   PUNCHED HOLES‡                                                         021331
 5    FN   EDIT1S    //SH//SP//C/R‡                                               021334
 6    CA   HOLES‡                                                                 021337
 7    FN   EDIT1S    //SH//C/R‡                                                   021339
 8    TY   F INE.   Y OUR ANSWER IS CORRECT.   L ET@S TRY THE NEXT SECTION. ‡    021342
 9    UN   S ORRY, TRY AGAIN. ‡                                                   021350
10    UN   S IGN OFF AND SEE YOUR INSTRUCTOR.‡                                    021354
SEC1C     ‡                                                                        021358
 1    RD        O UR FINAL SIMPLE DEVICE IS A BIT MORE COMPLEX THAN THE ‡         026740
 2         OTHERS.   T HE  K EYSORT  P ROCESS USES A CARD WITH HOLES PUNCHED ON ‡ 026871.
 3         THE EDGES OF THE CARD. ‡                                               026756
 4             P LEASE TURN TO THE SECOND ILLUSTRATION. ‡                        026879
 5    RD       I NFORMATION IS RECORDED ON THE CARD BY NOTCHING THE HOLES. ‡     026766
 6         T HESE HOLES MAY BE GROUPED TOGETHER TO REPRESENT DATA.   H OLES ‡    026773
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   7         GRGUPED IN THIS MANNER ARE CALLED CUDE FIELDS.    T HE NUMBER UF ‡      0267819
   8         HOLES IN EACH GROUP MAY VARY TO MEET THE NEEDS OF THE USER.    A  ‡      0267895
   9         CUDE KNOWN AS THE BINARY CODE IS USED TO REPRESENT DATA.    O NLY ‡     0267973
  10         NUMERIC DATA MAY BE RECORDED. ‡                                         0268094
  11              W HEN YOU ARE READY TO GD ON, PLEASE KEY AN EO8. ‡                 0268162
  12     RD     I NORDER TO SORT OR SELECT DATA FROM THE CARDS, WE PASS A ‡          0268239
  13         STEEL ROD OR NEEDLE THROUGH THE HOLES IN THE EDGE OF A DECK OF ‡        0268315
  14         CARDS.    T HE CARDS THAT HAVE BEEN NOTCHED WILL FALL FROM THE  ‡       0268391
  15         NEEDLE, AND THE UNNOTCHED CARDS WILL REMAIN ON THE NEEDLE.    T HIS ‡   0268471
  16         PROCEDURE WILL BE FOLLOWED FOR EACH POSITION IN THE CODE FIELD. ‡       0268546
  17          O NCE DATA HAS BEEN RECORDED MANUALLY INTO THE CARDS, THE SORT- ‡      0268626
  18         ING OR SELECTION OF DATA IS AUTOMATIC. ‡                                0268676
  19              P LEASE KEY AN EO8. ‡                                              0214772
SEC1C Q1  ‡
   1     QU  S UPPLY ONLY THE  LETTER  THAT INDICATES YOUR ANSWER.          T HE FIELDS ON A KEYS   0214823
             ORT CARD  ARE 6  ‡
   2                          9 A 0   ON THE TOP ‡                                   0214942
   3                          9 B 0   ON THE EDGE ‡                                  0214990
   4                          9 C 0   IN THE MIDDLE ‡                                0215039
   5                          9 D 0   ALL OVER THE CARD ‡                            0215090
   6     CA B‡                                                                       0215145
   7     FN EDITIS    //SH//C/R‡                                                     0215159
   8     TY  V ERY GOOD.   L ET'S GO ON TO THE NEXT QUESTION. ‡                      0215191
   9     WA D‡                                                                       0215254
  10     TY  T HIS IS NOT QUITE CURRECT, BUT WHY DON'T YOU TRY AGAIN. ‡             0215268
  11     UN SORRY, BUT THAT'S NOT IT.   T RY ONCE MORE. ‡                            0215339
  12     UN  T HE CORRECT ANSWER IS B, ON THE EDGE.   G O ON TO THE NEXT‡           0215396
  13         QUESTION.  ‡                                                            0215469
  14     BR SEC1C Q2  ‡                                                             0215496
SEC1C Q2  ‡                                                                         0215547
   1     QU //SS009 //‡                                                             0215598
   2      N OTE THAT THE PICTURE CF THE  K EYSORT CARD SHOWS THAT THE SCHOOL ‡      0215621
   3         CCDE HAS BEEN NOTCHED. ‡                                               0215702
   4          W HAT IS THE SCHOOL NUMBER THAT HAS BEEN NOTCHED INTO THE CARD /  ‡   0215738
   5     CA 24‡                                                                     0215818
   6     CA TWENTYFOUR‡                                                             0215833
   7     FN EDITIS     //SH//SP//C/R‡                                              0215856
   8     UN  D ID YOU LOOK AT THE SCHOOL CODE /    T RY AGAIN. ‡                    0215892
   9     UN  T RY 24. ‡                                                             0215956
SEC1C Q3  ‡                                                                        0215979
   1     QU  I F THE KEYSORT NEEDLE IS PASSED THROUGH A DECK OF CARDS, AND THIS CARD ‡  0216030
   2          WAS IN THE DECK, WOULD IT FALL INTO THE TRAY OR REMAIN ON THE NEEDLE IF ‡  0216116
   3         YOU WANTED SCHOOLS 10-19 /  ‡                                         0216203
   4     CA REMAINONTHENEEDLE‡                                                      0216246
   5     FN EDITIS     //ALL‡                                                       0216276
   6     CA REMAIN‡                                                                 0216304
   7     FN EDITIS     //SH//C/R‡                                                  0216323
   8     TY  W E CAN ALSO CONCLUDE FROM YOUR ANSWER THAT THIS CARD MUST CONTAIN DATA ‡  0216355
   9         CONCERNING SOME OTHER SCHOOL.   S O IT IS POSSIBLE TO OBTAIN TWO TYPES ‡  0216441
  10         OF DATA FROM THE KEYSORT CARD--POSITIVE OR NEGATIVE. ‡                 0216527
  11     UN  U NNOTCHED CARDS WOULD REMAIN ON THE NEEDLE.   N OTCHED CARDS WOULD FALL ‡  0216595
  12         TO THE TRAY. ‡                                                         0216682
  13     BR SEC1C Q4  ‡                                                            0216708
SEC1C Q4  ‡                                                                        0216759
   1     QU  I F WE WANT TO IDENTIFY THE CARDS USED TO REGISTER BOYS FROM THOSE USED TO ‡  0216810
   2         REGISTER GIRLS, ONLY ONE POSITION OR CODE FIELD WOULD BE NECESSARY.   T HE ‡  0216899
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  3      CARDS USED FOR BOYS COULD BE NOTCHED, AND THE ONES USED FOR GIRLS WOULD NOT ‡        0216989
  4        BE NOTCHED.//SS010X// ‡                                                            0217078
  5           ' T HEREFURE, BOYS⍪ CARDS WOULD FALL TO THE TRAY AND THE GIRLS⍪ CARUS WOULD ‡   0217115
  6      -----. ‡                                                                             0217208
  7   CA REMAINONTHENEEDLE‡                                                                    0217228
  8   FN EDITIS     //ALL‡                                                                     0217258
  9   CA REMAIN‡                                                                               0217286
 10   FN EDITIS     //SH//C/R‡                                                                 0217305
 11   UN REMAIN ON THE NEEDLE.‡                                                                0217337
 12   BR SEC1C Q5  ‡                                                                           0217371
SEC1C Q5  ‡                                                                                    0217422
  1   QU      T HE KEYSORT PROCESS IS THE FIRST OF OUR SIMPLE AUTOMATED DEVICES FOR ‡         0217473
  2      PROCESSING DATA THAT RESEMBLES THE EQUIPMENT USED IN CARD PROCESSING SYSTEMS ‡       0217562
  3      OF TODAY.    O UR NEXT SECTION WILL BE ON UNIT RECORD SYSTEMS OF PROCESSING ‡        0217654
  4      DATA.    B EFCRE WE CAN GO ON TO OUR NEW WORK, WE WILL HAVE A SHORT QUIZ ON ‡        0217744
  5      THE MATERIAL WE HAVE ALREADY COVERED. ‡                                              0217834
  6          I F YOU WISH TO TAKE THE QUIZ, PLEASE TYPE YES.    I F YOU DO NOT WISH TO ‡      0217887
  7      TAKE THE QUIZ AT THIS TIME, PLEASE TYPE NO. ‡                                        0217979
  8   CA YES‡                                                                                 0218038
  9   FN EDITIS     //SH//C/R‡                                                                0218054
 10   WA NO‡                                                                                  0218086
 11   FN EDITIS     //SH//C/R‡                                                                0218101
 12   TY  W HEN YOU ARE READY TO TAKE THE QUIZ, PLEASE USE THE FOLLOWING FORMAT.    U SE ‡    0218133
 13      THE CONTROL WORDS--GC TO--AND THE LABEL SEC1TEST.    Y OU SHOULD COPY THIS ‡         0218225
 14      FORMAT BEFORE SIGNING OFF.    P LEASE SIGN OFF. ‡                                    0218314
 15   UN  P LEASE TYPE YES OR NO $  ‡                                                         0218376
SEC1TEST  ‡                                                                                    0218416
  1   QU 1.    T HE SIMPLEST FORM OF AUTOMATED DEVICE IS -------. ‡                           0218467
  2   CA  N O HELP GIVEN.      ‡                                                              0218536
  3   CA CARBONPAPER‡                                                                          0218569
  4   FN EDITIS     //ALL‡                                                                     0218593
  5   AD 1//C1‡                                                                                0218621
  6   TY  T RY THE NEXT ONE. ‡                                                                0218639
  7   UN  T RY THE NEXT ONE. ‡                                                                0218672
  8   AD 1//C1‡                                                                                0218705
  9   BR TEST1Q2   ‡                                                                           0218723
TEST1Q2   ‡                                                                                    0218774
  1   QU 2.    N AME ONE OTHER SIMPLE AUTOMATED DEVICE. ‡                                     0218825
  2   CA  N O HELP GIVEN.      ‡                                                              0218884
  3   CA EMBOSSEDPLATE‡                                                                        0218917
  4   CB SENSITIZEDPAPER‡          𝒟                                                           0218943
  5   CB PEGBOARD‡                                                                             0218971
  6   CB KEYSORT‡                                                                             0218992
  7   CB KEYSORTPROCESS‡                                                                       0219012
  8   FN EDITIS     //ALL‡                                                                     0219039
  9   AD 1//C1‡                                                                                0219067
 10   TY  L ET 6 S GO ON. ‡                                                                   0219085
 11   UN  L ET 6 S GO ON. ‡                                                                   0219115
 12   AD 1//C2‡                                                                                0219145
 13   BR TEST1Q3   ‡                                                                           0219163
TEST1Q3   ‡                                                                                    0219214
  1   QU 3.    A  CREDIT CARD IS A FORM OF THE ------. ‡                                      0219265
  2   CA  N O HELP GIVEN.      ‡                                                              0219323
  3   CA EMBOSSEDPLATE‡                                                                        0219356
  4   FN EDITIS     //ALL‡                                                                     0219382
  5   AD 1//C1‡                                                                                0219410
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     6    TY   I RY THE NEXT QUESTION. #                                              0219428
     7    UN   T RY THE NEXT QUESTION. #                                              0219466
     8    AD 1//C2#                                                                   0219504
     9    BR TEST1Q4    #                                                             0219522
TEST1Q4    #                                                                          0219573
                                                                                      0220000
     1    QU 4.    T HE ------ USES NUMBERED PEGS TO ALIGN FORMS. #                   0220065
     2    CA  N O HELP GIVEN.     #                                                   0220098
     3    CA PEGBOARD#                                                                0220119
     4    FN EDIT1S     //ALL#                                                        0220147
     5    AD 1//C1#                                                                   0220165
     6    TY   E ACH ANSWER IS BEING RECORDED.    Y OU MAY OBTAIN YOUR SCORE AT #     0220243
     7    TY THE END OF THE TEST FROM YOUR INSTRUCTOR. #                             0220298
     8    UN   E ACH RESPONSE IS BEING RECORDED.    Y OU MAY OBTAIN YOUR SCORE AT #   0220378
     9      THE END OF THE TEST FROM YOUR INSTRUCTOR. #                              0220433
    10    AD 1//C2#                                                                   0220451
    11    BR TEST1Q5    #                                                             0220502
TEST1Q5    #                                                                          0220553
     1    QU 5.    T HE HOLES AROUND THE EDGE OF THE ----- CARD ARE NOTCHED TO #      0220631
     2      RECORD DATA. #                                                            0220657
     3    CA  N O HELP GIVEN.     #                                                   0220690
     4    CA KEYSORT#                                                                 0220710
     5    FN EDIT1S     //ALL#                                                        0220738
     6    AD 1//C1#                                                                   0220756
     7    TY   G O GN. #                                                              0220778
     8    UN   G O ON. #                                                              0220800
     9    AD 1//C2#                                                                   0220818
    10    BR TEST1Q6    #                                                             0220869
TEST1Q6    #                                                                          0220920
     1    QU 6.    A LTHOUGH DATA IS RECORDED MANUALLY ON THE KEYSORT CARD, THE #     0220999
     2      SELECTION OR SORTING GF CARDS IS ------. #                                0221052
     3    CA  N O HELP GIVEN.     #                                                   0221085
     4    CA AUTOMATIC#                                                               0221107
     5    FN EDIT1S     //ALL#                                                        0221135
     6    AD 1//C1#                                                                   0221153
     7    TY   N EXT QUESTION. #                                                      0221183
     8    UN   N EXT QUESTION. #                                                      0221213
     9    AD 1//C2#                                                                   0221231
    10    BR TEST1Q7    #                                                             0221282
TEST1Q7    #                                                                          0221333
     1    QU 7.    T HE UNNOTCHED HOLES ON THE KEYSORT CARD CAUSE THE CARDS TO #      0221411
     2      ----- CN THE NEEDLE. #                                                    0221445
     3    CA  .N O HELP GIVEN.         #                                              0221480
     4    CA REMAIN#                                                                  0221499
     5    CB STAY#                                                                    0221516
     6    FN EDIT1S     //ALL#                                                        0221544
     7    AD 1//C1                                                                    0221624
     8    TY   Y OU HAVE COMPLETED THE QUIZ. #                                        0221668
     9    UN   Y OU HAVE COMPLETED THE QUIZ. #                                        0221712
    10    AD 1//C2#                                                                   0221730
    11    BR TEST1END    #                                                            0221781
TEST1END    #                                                                         0221832
     1    QU  W OULD YOU LIKE TO KNOW YOUR SCORE /    T YPE YES OR NO. #              0221903
     2    CA YES#                                                                     0221919
     3    BR SCRT1D     //-4//C1#                                                     0221978
     4    BR SCRT1C     //-5//C1#                                                     0222037
     5    BR SCRT1B     //-6//C1#
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    6    BR SCRT1A      //-7//C1‡                                              0222096
    7    CA NO‡                                                                0222155
    8    TY  Y OU MAY OBTAIN YCUR SCORE FROM YOUR INSTRUCTOR AT A LATER TIME. ‡  0222170
    9    RC  P LEASE DEPRESS THE EOB  9 ALTN CODING AND 5 0 . ‡                0222249
   10    BR SEC2        ‡                                    ;                 0222312
SCRT1A     ‡                                                                   0222363
    1    QU  Y OU RECEIVED AN  A .   L ET 6 S GO ON TO THE NEXT SECTION.   P LEASE ‡  0222414
    2       DEPRESS THE A KEY. ‡                                              0222498
    3    CA A‡                                                                0222530
    4    BR SEC2        ‡                                                     0222544
    5    UN  P LEASE DEPRESS THE A KEY $ ‡                                    0222595
SCRT1B     ‡                                                                   0222638
    1    QU  Y OU RECEIVED A  B .   P ROCEED TO THE NEXT SECTION.·   P LEASE ‡  0222689
    2       DEPRESS THE A KEY. ‡                                              0222766
    3    CA A‡                                                                0222798
    4    BR SEC2        ‡                                                     0222812
    5    UN  P LEASE DEPRESS THE A KEY $ ‡                                    0222863
SCRT1C     ‡                                                                   0222906
    1    QU  Y OU RECEIVED A  C .   P ROCEED TO THE NEXT SECTION.   P LEASE ‡  0222957
    2       DEPRESS THE A KEY. ‡                                              0223034
    3    CA A‡                                                                0223066
    4    BR SEC2        ‡                                                     0223080
    5    UN  P LEASE DEPRESS THE A KEY $ ‡                                    0223131
SCRT1D     ‡                                                                   0223174
    1    CU  Y OU DID NOT DO TOO WELL.   Y OUR GRADE IS A  D .   T HIS MEANS ‡  0223225
    2       YOU HAD 3 OR MORE INCORRECT ANSWERS.   L ET 6 S SEE IF YOU CAN DO A ‡  0223303
    3       BETTER JOB ON THE NEXT SECTION.   P LEASE STRIKE THE A KEY. ‡     0223384
    4    CA A‡                                                                0223456
    5    BR SEC2        ‡                                                     0223470
    6    UN  P LEASE STRIKE THE A KEY $ ‡                                     0223521
SEC2       ‡                                                                   0223563
    1    RC               S ECTION 2 ‡                                        0223614
    2          W E CAN CONCLUDE FROM THE PREVIOUS SECTION ON SIMPLE DEVICES THAT AUTOMATION  ‡  0223658
    3    IS NOT A MACHINE.   R ATHER IT IS A PROCESS.   T HE CHIEF AIM OF AUTOMATION IS TO   ‡  0223756
    4    REDUCE HUMAN EFFORT AND HANDLING TO OBTAIN LESS ERROR.   T HE SECONDARY AIM IS TO   ‡  0223853
    5    INCREASE THE PROCESSING SPEED.   W E SHALL NOW ATTEMPT TO APPLY THE PRINCIPLES OF ‡  0223950
    6    AUTOMATION TO  D ATA  P ROCESSING. ‡                                 0224045
    7          D ATA PROCESSING IS THE PROCESSING OF INFORMATION.   T HE HUGE VOLUMES CF DATA  ‡  0224093
    8    THAT MUST BE HANDLED EVERY DAY BY BUSINESS, SCIENCE AND GOVERNMENT STAGGERS THE   ‡  0224193
    9    IMAGINATION.   I T IS PHYSICALLY IMPOSSIBLE TO PROCESS, CATALOGUE AND STORE ALL THE   ‡  0224288
   10    VAST QUANTITIES OF INFORMATION ACCUMULATED BY ALL SOURCES WITHOUT THE HELP OF MACHINES. ‡  0224367
   11    A UTOMATED EQUIPMENT ENABLES US TO GATHER DATA, MANIPULATE IT, DRAW CONCLUSIONS   ‡  0224488
   12    FROM IT, AND STORE IT FOR FUTURE USE.   R OUTINE HANDLING CAN BE PERFORMED AT HIGH   ‡  0224584
   13    SPEEDS, FREEING MEN AND WOMEN FOR MORE IMPORTANT TASKS.   T HESE MACHINES CAN DO MANY  ‡  0224682
   14    OF THE TASKS THAT HUMANS FIND BORING WITHOUT BECOMING BORED.   B ECAUSE OUR MACHINES   ‡  0224782
   15    DO NOT BECOME BORED OR TIRED, THEY MAKE VERY FEW MISTAKES.   M OST ERRORS THAT DO   ‡  0224882
   16    OCCUR ARE THE RESULT OF HUMAN ERROR OR MACHINE MALFUNCTION. ‡        0224979
   17          A LL INFORMATION HANDLING, OR DATA PROCESSING, GOES THROUGH A CYCLE.   F IRST, ‡  0225052
   18    THE DATA TO BE PROCESSED MUST BE ASSEMBLED.   T HEN IT MUST BE RECORDED IN A CONVENIENT ‡  0225150
   19    FORM.   N EXT, IT MUST BE MANIPULATED.   T HE RESULTS MUST BE REPORTED.   F INALLY,   ‡  0225251
   20    IT MUST BE STORED.   T HE NEXT SLIDE SHOWS THE DATA PROCESSING CYCLE IN SEQUENCE.   ‡  0225350
   21     P LEASE DEPRESS THE RESPONSE KEY.‡                                  0225447
   22    TY //SS010 // ‡                                                      0225494
FINISH     ‡                                                                   0268859
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REYN	‡	0203451
BEGIN	‡	0203502
SEC1A	‡	0204630
SEC1AQ1	‡	0205936
SEC1AQ2	‡	0207080
SEC1AQ3	‡	0207843
SEC1B	‡	0208772
SEC1BQ1	‡	0210407
SEC1BQ2	‡	0211177
SEC1B Q3	‡	0211756
SEC1B C4	‡	0212360
SEC1B Q5	‡	0213095
SEC1C	‡	0213589
SEC1C Q1	‡	0214772
SEC1C Q2	‡	0215547
SEC1C Q3	‡	0215979
SEC1C Q4	‡	0216759
SEC1C Q5	‡	0217422
SEC1TEST	‡	0218416
TEST1Q2	‡	0218774
TEST1Q3	‡	0219214
TEST1Q4	‡	0219573
TEST1Q5	‡	0220502
TEST1Q6	‡	0220869
TEST1Q7	‡	0221282
TEST1END	‡	0221781
SCRT1A	‡	0222363
SCRT1B	‡	0222638
SCRT1C	‡	0222906
SCRT1D	‡	0223174
SEC2	‡	0223563
FINISH	‡	0268859

APENDIX II

List of Visitors

Partial list of visitors to Providence College Computer
Center to view and try Computer Assisted Instruction techniques.

1. National Teachers Corps enrollee's from Rhode Island College.

2. Reporter from the Providence Journal/Bulletin.

3. Reporter and Photographer from the Pawtucket Times.

4. Representatives from Harvard University Bio-Medical Department, Dr. Lawrence Stolurow: department head.

5. Providence School Superintendent; Dr. Charles O'Connor.

6. Various priests and nuns from the Providence Diocese School Department.

7. Instructors and students from Rodman Job Corps Camp at New Bedford, Mass.

8. Representatives from Entelek Incorporated of Newburyport, Mass.

9. Mrs. Patricia Duffy, Vocational Education Coordinator Pemberton Township School District, Pemberton, New Jersey.

10. Dr. Sidney High, United States Office of Education.

11. Mr. Kenneth Mellor, Manpower Development Project Supervisor, Rhode Island Department of Education.

12. Dr. Finger, Rhode Island College.

13. Representatives from various departments of Brown University.

APPENDIX III

Reprint "Pawtucket Times", August, 1966

This 'Teacher' Takes Nobody's Back Talk

The pupil hesitates, glances around, fiddles with a shirt button, and makes a guess. It's wrong.

"Sorry about that. Let's make one furthur attempt at the correct answer," the "instructor" says.

Surrounded by concrete block walls and electronic gadgetry, the pupil stares at the "teacher:" An oversized electric typewriter. "Sorry, wrong again," the thing chatters. "The correct answer is. . ."

Hardly fantasy, this scene actually took place recently in the computor center of Providence College. There, four men are among a group programming an IBM 1401 computor to be a teaching machine.

"Why, this thing could eliminate teachers!" the pupil exclaimed. Commenting later Robert Reynolds, of Providence, a teacher at Tolman, smilingly disagrees. "It will definitely serve to supplement teachers and use them to the best advantage, though."

Mr. Reynolds is chairman of the coordinating committee charged with writing courses in various subjects for the computor to teach. Others in the committee are Edward P. Sherlock of 22 Miles Ave., Pawtucket, and George J. Grant of 120 Dexter St., Cumberland, both from Pawtucket Vocational High School, and Chase E. Loomis, 161 Balch St. Pawtucket, who teaches at Barrington High.

Their project, which is one of 14 in the nation underwritten by the U.S. Department of Education, is aimed at students on the high school level. Mr. Reynolds has written a program on introductory data processing, and Mr. Sherlock on introductory electrical studies.

The typical instruction program goes something like this: The pupil is asked to identify himself through code words which he types out on a "terminal": in this case, the oversized typewriter. On the same typewriter, the computor explains the purpose of the particular course, and then proceeds to present information and ask questions.

The thing that brings the project many steps beyond being a mere electronic textbook is that it treats the pupil as an individual. "I have written one program that takes 22 pages," Mr. Reynolds said. "An outstanding student could finish it in 10 minutes. A slower student could spend hours."

"The student sets his own pace, and is not handicapped if that pace is different from the rest of the class" the Tolman teacher said.

There are several reasons why these machines will never replace teachers — the main one being that nothing will ever replace the desire to please a human, flesh and blood professor.

But his computor substitute holds out a seemingly unlimited number of uses for the future.

Schools as we know them could be eliminated, the computor specialist theorizes. Instead of spending millions to house pupils in school buildings, their education could be brought to them by installing the terminals of such a computor in a student's home.

The possibilities seem only to be limited by man's imagination.

COMPUTOR programmer Edward Sherlock, seated, acts as pupil to test electronic "brain" that he and, from left, George Grant, Robert Reynolds and Chace Loomis are programming to become a mechanical "teacher."

APPENDIX IV

Time Utilization Table

TIME UTILIZATION TABLE

Activity	Hrs. Wkly.	Period	Total Hrs.
Formal Instruction	2	1 hr.	12
Role of Proctor	2	1 hr.	12
Use of 1050	2	1 hr.	12
Discussion	2	1 hr.	12
Entry and Testing	2	2 hrs.	24
Participant Preparation	15*	--*	90*
	25		162

* No actual time record was kept by participants. However, several participants estimated their own time at 15 hours of work outside committed or allotted time.

APPENDIX V

Participants and Course Title

PARTICIPANTS AND COURSE TITLES

PARTICIPANTS

Robert G. Brooks

Joseph DeFusco

Joseph A. Depasquale

Edward A. DeSanto

George J. Grant

Chace E. Loomis, Jr.

Arthur Montanaro

Amato Nocera

Robert R. Reynolds

Edward P. Sherlock

Allen F. Swann

Raynond Szeflinski

Frank R. Walker, III

COURSE TITLES

Business Law Vocabulary

Survey in General Insurance

Introduction to Transistors

Basic Electric Arc Welding

Special Factors in Math

Automobile Insurance

Filing

General Mathematics

Introduction to Data Processing

Basic Electrical Theory

Basic Data Processing

Postal Services

English Grammar

APPENDIX VI

Communities and Schools Represented

COMMUNITIES AND SCHOOLS REPRESENTED

HIGH SCHOOLS	COMMUNITIES	STUDENTS
Barrington High School	Barrington, R. I.	1
Coventry High School	Coventry, R. I.	2
Cranston High School	Cranston, R. I.	1
Pilgrim High School	Warwick, R. I.	2
Tolman High School	Pawtucket, R. I.	1
Warren High School	Warren, R. I.	1

VOCATIONAL SCHOOLS	COMMUNITIES	STUDENTS
Pawtucket Vocational High School	Pawtucket, R. I.	2
Vocational Tech. School of Rhode Island	Providence, R. I.	3

APPENDIX VII

Basic Computer Assisted Instruction System

BASIC COMPUTER ASSISTED INSTRUCTION SYSTEM

1. Software: Basic IBM Coursewriter Programming Language*

2. Hardware:

QUANTITY	ITEM
1	1401 Central Processing Unit
1	1402 Card Reader-Punch
1	1403 Line Printer
1	1409 Model 2
2	1026 Transmission Control Unit
2**	1050 Data Communications System

* As adapted by the University of Texas to allow batch-loading of punch cards.

**One 1050 Data Communications System has been modified to utilize a slide projector and a tape recorder. This unit serves as the master terminal.

APPENDIX VIII

Report of Technical Difficulties

DIFFICULTIES ENCOUNTERED WHILE OPERATING COURSEWRITER

I) -Loss of continuity of course material
    -Loss of course material
    -Branching to improper course material

All three problems can be linked to the same weakness of the original
CAI system. In order to explain the problem involved it is necessary
to consider in some detail the medium of storage employed by the CAI
system. This medium is a relatively high-speed external storage device
called a disk. Since disk storage is not basically a sequential storage
medium, some means of identifying the location of the desired material
on the disk must be available. The physical location of a record on a
disk lies within a sector of the disk; each sector having a unique ad-
dress.
Therefore, if course material is to be stored on a disk and a course
is to maintain a logical continuity, it is necessary to obtain from the
course record presently being processed by the CPU, the physical location
of the next logical record; not necessarily sequentially stored. This
portion of the record is called a pointer, since it literally points to
the physical location (address) of the next logical record of the course.
If an author should desire to insert some material in his course, the
CAI system would physically position this material at the end of the
course.
To maintain the logical continuity, it would be necessary to
    a. Break the chain of pointers at the logical point of insertion
    b. Cause the pointer in the record preceding the insertion to
        point to the first record of the inserted material, and
    c. Cause the pointer of the last record of the inserted material
        to point back to the record that should follow logically; i.e.
        a so-called "link-up" and "link-back" would have to be estab-
        lished.
If at any time during this process of insertion, the CAI system should
be interrupted, either by a hardware malfunction, a software failure,
or just plain author error the "link-back" address would be lost and
data of an indeterminate nature would be inserted in the "link-back"
pointer of the last record inserted. The inserted course material still
would be available to the user however, the course would lose its logical
continuity after reaching the end of the insertion since no connection
had been established to the next logical record. This condition would
invariably lead to an interrupt condition, causing the breakdown of the
system and possibly the destruction of valuable course material.
In conjunction with this problem, the physical location of some special
function keys on the IBM 1050 keyboard has shown to be the principle
reason for author error. The manufacturer has been informed concerning
this.

II) -Inability of the advanced version of Coursewriter to address the
    IBM 1050 terminals present at Providence College.

During the course of this contract, we obtained from the University of
Texas an improved version of Coursewriter. The original version, as
supplied by IBM, under an inflexible system of console addressing, re-
stricted the modes of console operations. For example, the proctor
(supervisor of the system) could exercise his functions only from the
first console of the system, virtually chaining him to that device and
also removing one terminal from classroom usage, since this terminal had
to be placed in the immediate vicinity of the computer itself.
The CAI system obtained from Texas U. permitted the proctor to control
the system from any console, thus releasing one further terminal for
student and author usage. To make use of this flexibility, the termi-
nal addresses; i.e. the codes by means of which the CPU gains access
to a terminal were changed. Since we had insufficient documentation
on the Texas system, the lack of any response from the terminals was
first attributed to a software malfunction. After extensive debugging
and consultations with personnel from the local IBM Branch Office and
experts from the Advanced Maintenance and Development Department of the
IBM FE Division in Poughkeepsie, N. Y., it was determined that the ter-
minal addresses employed by the original version of Coursewriter were
sufficiently different from the codes used by the Texas system to pre-
vent any response at all from the terminals.
Once this fact had been established, a relatively simple change in the
wiring of the IBM 1050 terminals involved remedied the situation.
No difficulties have since been experienced in this particular part of
the CAI system.