

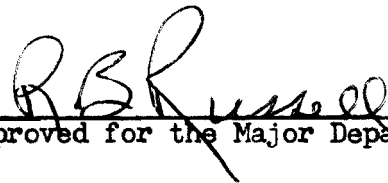
DEVELOPMENT AND USE OF AN INSTRUCTIONAL UNIT
FOR THE MONROE ELECTRONIC PROGRAMMABLE
PRINTING CALCULATOR

A Thesis
Presented to
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Kansas State Teachers College
Emporia, Kansas

In Partial Fulfillment
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Master of Science

by
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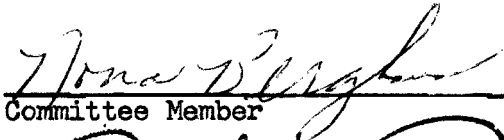
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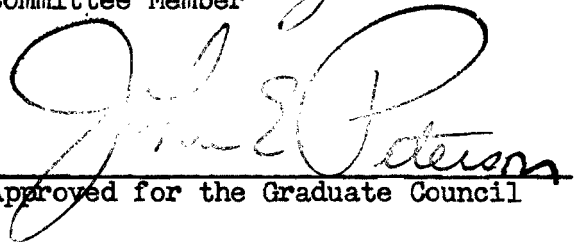
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Chapter 1

INTRODUCTION

Business firms are phasing out older and slower office machines and are purchasing faster, more modern equipment. Many companies are already using the electronic calculator. Many educational institutions, however, are still providing instruction on obsolete equipment in office machines.¹

Business educators prepare people for employment in many different types of companies, therefore, it is necessary that business educators take a look at the business machines field and the changing technology that is taking place.²

Business education teachers should start moving in the same direction as the business firms.

The time is here for curriculum preparation, money allotments and business machines proposals to keep in pace with the innovative advancements that are being made in the electronic calculator technological field.³

The Occupational Outlook Handbook stated that "thousands of job openings for office machine operators are expected each year

¹Charles D. Hayden, "A Comparative Study of Types of Machines Used in Office Machines Classes in Selected Post High School Institutions with Machines Used by Business and Industry," Business Education Forum, XXVI (October, 1971), 37.

²Gary Berg, "Desktop Computers--Electronic Calculators!" Journal of Business Education, XLV (May, 1970), 341.

³Ibid.

through the 1970's."¹ The growing volume of paperwork will offset the effect of automated recordkeeping systems and advances of office automation and inter-office communications.²

The Labor Department's statistical projection estimated that there would be a 106 percent increase of office machine operators in the next ten years. This increase of office machine operators will require an "army of operators." It is apparent that an up-to-date course in office machines can do much to prepare students for office occupations.³

Factor stated that students should be taught the use of equipment commonly used in the business office with emphasis on the newer developments. The more and varied the skills a student has the better their chance of employment and advancement.⁴

The Business Equipment Manufacturers Association indicated a continuous growth in the use of 10-key adding machines and printing calculators. The electronic calculator which appeared on the market a few years ago is now being used by many companies. Therefore, it would appear that an electronic calculator with a 10-key keyboard and tape for listing would be preferred for use in the office machines class.⁵

¹U.S., Department of Labor, Bureau of Statistics, Occupational Outlook Handbook 1972-73 Edition (Washington: Government Printing Office, [1972]), p. 294.

²U.S., Department of Labor, Bureau of Statistics, Occupational Outlook Quarterly, [by Neal Riesenthal] (Washington: Government Printing Office, Spring, 1972), p. 23.

³Paul Factor, "Business Machines," Journal of Business Education XLV (April, 1970), 291.

⁴Ibid., pp. 291-292.

⁵Ibid., p. 292.

The Problem

Statement of the Problem

The problem of this study was to develop an individualized instructional unit for the Monroe Electronic Programmable Printing Calculator and to determine if students in the office machines class at the Haven, Kansas, high school attained comparable achievement by this method of instruction. The instructional unit included (1) taped instructions, objectives, and assignment sheets for each lesson, (2) basic arithmetic calculations and problems frequently used in business, and (3) a comprehensive test.

Importance of the Study

Mach pointed out that all business education teachers should become fully aware of the changes and demands in preparing individuals skilled in office machine operation.¹

A new innovation in the office machines area has been the electronic calculator. Many improvements have been made on these machines since they were first available on the market. They are being used in many offices. If teachers are going to prepare competent machine operators, teachers must be qualified to teach students the operation of the electronic calculator and to use sound instructional methods and materials. Of course, teachers want the students to learn efficient, correct, and accurate operation of the machine as quickly as possible.

¹K. A. Mach, "Machines Training: The Positive Factors," Business Education World, XLIX (December, 1968), 5.

Barnett stated that many publishers believed that there is not a demand for comprehensive texts for machine courses. He found it desirable to prepare his own instructional materials. The student did not have to spend valuable time wading through general instructions that did not apply to his machine. The teacher-prepared material is more comprehensive and a greater challenge to the student.¹

Delimitations of the Study

This study was delimited to a comprehensive instructional unit on the Monroe Electronic Programmable Printing Calculator for high school students. Therefore, if it is used for instructional purposes on other electronic calculators some modification may be necessary.

This study was delimited to the following business calculations: addition, subtraction, multiplication, division, subtotals, credit balances, constant multiplication, percentages, interest, increase and decreases, discounts, chain discounts, payroll, and proration.

Definitions of Terms

Office Machine Operator

The office machine operator operates a machine or machines that automatically perform the basic arithmetic computations of adding, subtracting, multiplying, and dividing.

¹Jack W. Barnett, "Let's Make the Figuring Machines Course Comprehensive," Business Education World, XL (March, 1960), 26.

Electronic Calculator

An electronic calculator performs calculations faster than a mechanical calculating machine. It solves a problem and either flashes its answer on a display board or prints the answer on paper tape. Electronic machines correctly and automatically locate the decimal point.¹

Printing Electronic Calculator

A printing electronic calculator provides a tape that shows the numbers that are involved in a problem and the results. The tape allows the operator to check whether the problem was correctly entered into the machine. It also provides a permanent record of the results.²

Programmable Electronic Calculator

An electronic calculator that is capable of performing steps automatically. The operator does the computation the first time on the machine. Thereafter, the operator only has to enter the variable figures and the necessary steps are performed automatically.³

¹"Calculating Machine," The World Book Encyclopedia, III (1972), p. 20.

²Ed Orloff, "How to Buy Electronic Calculators," Office Equipment and Methods, XVIII (April, 1972), 42.

³Ibid.

Unit of Instruction

A division of a course that can be considered as complete in itself and can be taught as a whole.¹ A unit with complete instructions and problems for the students to solve on the electronic calculator starting with basic arithmetic problems such as adding and subtracting and progressing through more difficult problems such as a payroll.

Taped Instructions

Magnetic taped instruction to use with a prepared unit on the electronic calculator which includes step-by-step individualized instructions. The students listen to the tapes as they worked the problems.

Methods of Procedure

The second chapter includes an extensive review of related literature dealing with trends in office machines, the electronic calculator, individualized taped instruction, and current textbooks. Next, a description of the Epic 3000 Monroe Electronic Programmable Printing Calculator was listed. Then the objectives and assignments were written. The writer compiled the unit of instruction with the correlated tapes for the Monroe Electronic Programmable Printing Calculator. With the help of other textbooks problems were developed for the desired fourteen lessons. A review was included at the completion of the lessons as a preparation for the comprehensive test

¹Carter V. Good (ed.), Dictionary of Education (2d ed; New York: McGraw-Hill Book Company, Inc., 1959), p. 587.

designed for the unit of instruction. A pilot study was used for the unit of instruction during the first nine weeks of school. The necessary revisions and corrections were made in the unit of instruction and on the tapes to complete the instructional unit. The unit of instruction was then ready to be used by the students in the classroom starting the second nine weeks of school. As each student completed the unit of instruction, he was given twenty minutes to complete the forty point test. The following grading system was used: 94 percent for an A; 86 percent for a B; 75 percent for a C; and 60 percent for a D. A questionnaire was written and used to determine students' reactions to the unit of instruction. The questionnaire, unit of instruction, and test are in the appendix. Finally, the summary, conclusions, and recommendations were made.

Chapter 2

REVIEW OF RELATED LITERATURE

Research concerning office machines has not been extensive. The electronic calculator is one of the most modern business machines and has been the subject of recent articles. Little, however, has been written on the most effective methods of teaching the use of the electronic calculator.

Trends in Office Machines

A greater quantity of increasingly complex data is being required by businessmen. The demand is expected to increase at an accelerating rate. To meet this challenge, business employees must acquire the skills necessary to operate machines that compute data more easily, quickly, and accurately than possible by hand calculation.¹

One of the fastest growing job classifications is that of the general clerical worker. Any analysis of the duties of clerical workers will indicate that machine operation is one of their major duties.²

¹Arthur L. Walker, J. Kenneth Roach, and J. Marshall Hanna, How to Use Adding and Calculating Machines (Dallas: McGraw-Hill Book Company, 1967), Preface.

²K. A. Mach, "Machines Training: The Positive Factors," Business Education World, XLIX (December, 1968), 5-6.

In a study done by Cook and Maliche, 80.3 percent of the companies studied had adding or calculating machines. More companies had adding or calculating machines than typewriters. Electric adding or calculating machines were used more often than manuals.¹

The U. S. Department of Labor Occupational Outlook projected that the need for office machine operators would increase in the next few years. The paper work to be processed is growing rather than slackening off and thus creates a demand for qualified office machine operators.²

The office machines course has gained in importance in the last few years. Until recently, office machines were incorporated into several other classes. Today the trend is definitely toward a course designed exclusively for office machine instruction.³

There is a definite need to send students into the business world with some specific skills. Offices of the National City Bank in New York City emphasized that "the applicant who comes to us with definite skills and capabilities starts on a higher salary schedule."⁴

During the past 25 years many surveys have been conducted regarding the specific type of training that employers would like the schools to offer prospective employees. Recommendations that the

¹Fred S. Cook and Eleanor Maliche, "Office Machines Used in Business," Delta Pi Epsilon Journal, VIII (May, 1966), 6.

²Paul Factor, "Business Machines," Journal of Business Education, XLV (April, 1970), 291.

³Donald W. Vigen, "Business Machines--Applying Vocational Concepts," Business Teacher, XLV (May-June, 1968), 26-27.

⁴Factor, loc. cit.

schools offer courses leading to the development of machine operators are always listed.¹

Traditionally, machine operators get on-the-job training after reporting to work. Teachers do not depend on industry to put the finishing touches on high school or college graduates who take type-writing or shorthand. Why should teachers expect industry to train office machine operators? A comprehensive course for office machine operators should be taught so that on-the-job training may be eliminated. Industry could then confine its training activities to methods and procedures necessary to each business office.²

Data processing has had its effect on office machines. Research indicates that small machines are as important as ever in today's data processing systems, though the machines are used in somewhat different ways. The computer is supported by the small machines. "Even where large amounts of data are uniform and adaptable to computer processing, there always seem to be areas of 'exception calculating' that must be done by people, or by people and small calculating machines."³

The rise in sales of all types of office machines has been phenomenal. With these increased purchases; it is evident that more employees will use machines in connection with their other duties. There

¹Mach, loc. cit.

²Jack W. Barnett, "Let's Make the Figuring-Machines Course Comprehensive," Business Education World, XL (March, 1960), 26, 44.

³Marian Darst, "Uses of Small Machines in a Computer Era," Business Education World, XLIX (December, 1968), 6-8.

will be a continued demand for qualified machine operators to fill new positions, and also for replacement purposes.¹

The Electronic Calculator

Speed in performance, efficiency, more speed and more efficiency is the goal for new equipment being developed. With these new developments, the use of some of the traditional equipment is being deemphasized.²

As business educators, who prepare students for the world of work, it is time to introduce current equipment into the classroom and to train students to operate the very latest machines. This question was recently submitted by Marietta.

Will business teachers continue to teach only the traditional business machines such as the ten key and full-bank adding machines, the rotary and key driven calculators, the printing calculator, bookkeeping machines, or will they include some form or degree of automation in this program?³

Terry made the following comment on office machines:

The modern office worker spends 20 percent of his working time performing the calculating function. Management everywhere is vitally concerned with this activity. The key driven calculator and the full key adding machine are much too slow for today's business. The speed of modern calculators is measured in milliseconds as evidenced by the Friden Model 130 electronic calculator.⁴

¹K. A. Mach, "Machines Training: The Positive Factors," Business Education World, XLIX (December, 1968), 6.

²Factor, op. cit., p. 291.

³Robert J. Thompson, "New Media in Teaching Business Machines," New Media in Teaching the Business Subjects, Third Yearbook of the National Business Education Association (Washington D. C.: National Business Education Association, 1965), p. 163.

⁴Ibid.

Pactor stated that the electronic calculator which only a few years ago appeared in the lines of several companies is now being pushed by a dozen or more companies with others getting ready to enter the field. The evolution of the calculator went from the non-listing rotary, to the listing printing calculator, to the non-listing electronic calculator and finally to the listing electronic calculator.¹

The electronic calculator has brought the advancements of electronic technology into the classroom. The electronic calculator may be used by everyone from the executive to the disadvantaged student. The giant corporations, medium companies and the small businesses all have something in common in the use of the electronic calculator. All of the computations done on the electronic calculator can be applied to any type or size operation using any and all areas of computation.² In a recent survey of production of new office machines in the New York area, the electronic calculator comprised 48 percent of the total output.³ Thus, the advent of the electronic calculator has expanded the capacity of business. Business machines are now used to compute percentages, discounts, interest charges, mortgage payments, proration of expenses, depreciation charges, square

¹Paul Pactor, "Business Machines," Journal of Business Education, XLV (April, 1970), 292.

²Gary Berg, "Desktop Computers--Electronic Calculators!" Journal of Business Education, XLV (May, 1970), 341.

³Nicholas J. Cornelia, "Office Machine Trends," Balance Sheet, LI (March, 1970), 303.

root, sums of products, sums of squares, sums of reciprocals, sums of quotients, and engineering problems.¹

There is a variety of electronic calculators on today's market. The electronic calculator can store data and instructions. They operate with such speed that complex problems can be done in a few seconds. The capabilities of the electronic calculator offer opportunities to introduce new and better ways to solve problems that hit on today's important requirements: increased efficiency and reduced costs.²

With programmable machines, once a program has been prepared, the operator enters the variable figures, and the necessary steps for the solution of the problem are performed automatically. If much of the work load consists of repetitive calculations, either simple or complex, these machines help avoid errors and save time. Some of the programmable machines store programs in the machine only; and when the machine is either turned off or a new program is entered, the original program is lost and must be re-entered to be used again. Other machines permanently store programs on tape or cards, and the programs can be re-used any number of times.³

The programmable electronic calculator decreases manual entries and performs repetitive calculations. One company increased their

¹Ibid.

²"Successful Ways to Use Calculators," Modern Office Procedures, XVI (February, 1971), 21.

³Ed Orloff, "How to Buy Electronic Calculators," Office Equipment and Methods, XVIII (April, 1972), 42-43.

efficiency by an average of six key strokes on each calculation. A bank decreased by 95 percent the time required to do the quarterly interest posting. With the old system it took eight people eight days to calculate interest; now one person can post accounts in three days.¹

The printing electronic calculator has a tape for reading the computations. The value of the printed record provided by the tape and the greater ease of checking should not be overlooked. This type of electronic calculator is constructed so as to present the calculations on a paper tape with electronic speed. This enables the operator to read at all times what has transpired in the problem.²

There are many advantages for using the electronic calculator. Berg has listed the following as advantages of the electronic calculator.

1. Instant Answers. This is one of the greatest advantages because many executives are in need of rapid calculations.

2. Less Fatigue. It takes less exertion to operate the electronic calculator for two hours than it takes to operate a mechanical machine for approximately half that amount of time.

3. Decimals. The electronic calculator automatically sets the decimal when activated.

4. Repair and Maintenance. Downtime on these calculators is almost nil.

5. Size. Electronic calculators are becoming smaller and more compact.

6. Electronic Storage. A number, answer, or an accumulation of answers may be stored for future use in almost all of the different types of electronic calculators. This becomes a time saver and increases the efficiency of an operator in a large or small firm.

¹"Successful Ways to Use Calculators," op. cit., p. 25.

²Gary Berg, "Desktop Computers--Electronic Calculators!" Journal of Business Education, XLV (May, 1970), 341.

7. Time and Accuracy. The work to be done on the electronic calculator can be done in less time and with greater accuracy.

8. Quietness. Many executives like quiet, quick and easy-to-read computations while working on the number of reports they have to complete.¹

The electronic calculators are not purported to be equal to the human brain, but the output of these machines does excel in speed and accuracy. They only work under the direction of trained minds who prepare, program, and analyze the data.² It is mandatory that all business education teachers become fully aware of the changes and demands in preparing individuals skilled in the operation of the electronic calculator. The following quote from the U. S. Department of Employment fits very well: "You can't hold tomorrow's jobs with yesterday's skills."³

Individualized Taped Instructions

To provide an education for each student according to his special abilities and his own learning pace should be a primary goal of all schools. Business educators have long advanced the premise that students should progress at their own speed according to their own abilities and interests.⁴

¹Ibid., p. 342.

²Robert J. Thompson, "New Media in Teaching Business Machines," New Media in Teaching the Business Subjects, Third Yearbook of the National Business Education Association (Washington D. C.: National Business Education Association, 1965), p. 165.

³Ibid., p. 169.

⁴Neal B. Dover, "Individualized Instruction Offers Challenge," Business Education Forum, XXV (December, 1970), 17.

Individual-progress education has a built-in-goal--it challenges each student personally. It has a flexible design and allows each student to proceed at his own rate. Individual-progress education gives each student an opportunity to learn.¹

Some students do not like instruction that lacks the security of the traditional classroom situation. When the teacher does not stand at the learner's elbow "cracking the whip," the learner has to take the responsibility for his own learning. He must develop a new sense of responsibility for mastering the material. He must develop patterns of self-motivation.²

When students come to class, they can start to work where they stopped the taped instruction. They may come in before or after school or any time the room is available to work on the machines. Many of them will do this to make up time and to complete jobs after being absent. They can also use this time to complete jobs they might not otherwise have completed.³

The teacher will not be eliminated. He must be more adaptable than ever before. He must be able to answer questions on any lesson in the unit on any day rather than on one lesson on a given day.⁴

¹James Lemaster, "Individual Progress Shorthand," Business Education Forum, XXV (October, 1970), 15.

²Richard L. Hawk, "Individualized Instruction in the School Setting," Educational Horizons, XLIX (Spring, 1971), 75.

³Charles E. Stevens, "A Business Machines Program that Works," Balance Sheet, LI (September, 1969), 5.

⁴Lemaster, op. cit., p. 16.

The tape recorder offers a strong and supportive role in three areas of learning: hearing, seeing, and doing. In office machines, the students have the opportunity of listening while doing instead of receiving instruction before and working the jobs afterward. The earphones shut out some of the clamor which is always present in a machines class, allowing a higher degree of concentration.¹

Tape recorders may readily be used in an office machines class because of one main factor--repetition. An office machines teacher must integrate repetition into the lesson plans in several ways. First, by repeating assignments within the varied sections that are grouped by machine. Second, students have different levels of learning.²

The slower learner reaps benefits from taped instruction because the tapes can be played repeatedly until he understands the technique. The slower student receives instruction individually and quietly from tapes and will not disturb the student who is working on advanced assignments.³

Through the use of the recorded tapes, the instructor is freed from keeping the class at one level of progress. He can devote his attention to the student who is having difficulty. The advanced student can progress at his own speed on the tape.⁴

¹Bill R. Phillips, "Use Tape Recorders to Teach Business Machines," Balance Sheet, XLVI (April, 1965), 341.

²Ibid., p. 340.

³Ibid., p. 341.

⁴"Taped Audio Instruction Speeds Calculator Instruction," Audiovisual Instruction, XIV (February, 1969), 66.

Through taped instructions, the student is introduced to the machine and given the opportunity to explore the keyboard. After the introduction, the student learns the basic operations of the machine and soon finds that he is solving complex problems.¹

Walters concluded in his study that the students on taped instruction in office machines achieved as well or better than students who received traditional instruction. The students liked the taped instructions, and they were able to complete their assignments in less time. The instructors were also able to give more individual assistance to the students.²

Huffman stated that students who understand the principles of decimal machine operation are more capable machine users than those students who learn only the mechanics of machine operation. He recommended the use of visual aids in teaching office machines. Visual aids provided a good review of arithmetic plus a good understanding of the principles of decimal machine operation.³

Edwards made a study to determine whether business machine operation could be learned as effectively from filmed demonstrations viewed individually in an unstructured, open-laboratory situation as from a traditional classroom method and environment. A significant

¹Ibid.

²George Walters, "The Effect of Taped Instruction on Achievement in College Office Machines" (unpublished Doctor's dissertation, University of Northern Colorado, 1968), p. 69-70.

³Harry Huffman, "Recordkeeping Grows Up in Content," Business Education World, LI (January-February, 1970), 29.

difference existed between the experimental and control group in favor of the experimental group.¹

Cook listed the following advantages of self-instructional devices:

1. The material is presented in sequence one item at a time.
2. The student participates in his learning at all times.
3. The student knows immediately if he is correct, which reinforces his learning.
4. The student progresses at his own rate.
5. The teacher is relieved of much time presenting course content.
6. Released teacher time can be used for individual instruction and utilization of other modes of teaching.
7. A student is not limited in his study by the amount of time a teacher has to guide his learning activities.
8. Machines have infinite patience.
9. The process of "programming" the unit or course gives quality control to the subject material presented.²

Current Textbooks

The Operating Instructions for the Monroe Epic have instructions for addition, subtraction, multiplication, division, constants, and negative numbers.³

¹Ronald Kenneth Edwards, "An Experimental Study in the Teaching of Business Machines Utilizing an Audio-Visual Tutorial Laboratory Approach with Continuous-Loop Sound Films," Business Education Forum, XXV (October, 1970), 31.

²Fred S. Cook "Some Advantages and Limitations of Self-Instructional Devices," Balance Sheet, XLII (December, 1960), 156.

³Operating Instructions for The Monroe Epic, (Springfield, Missouri: Monroe International, Inc., 1967), pp. 1-32.

The Office Machines Course by Agnew and Cornelia presented only the basic arithmetic calculations: addition, multiplication, subtraction, subtotal, and division.¹

In How to Use Adding and Calculating Machines constants, percentages, auditing, and invoices, as well as the basic arithmetic calculations were presented.²

How to Use Business Machines included instructions on addition, subtotals, subtraction, multiplication, and division. Projects were added on payroll, purchasing and selling, and finance.³

In Business Machines Exercises a more complete selection of problems were included. The basic arithmetic calculations were presented. Discounts, percentages, invoices, interest, sales analysis, reciprocals, budgets, constants, and payrolls were all introduced.⁴

In the textbook, Office Machines Course by Cornelia, Pasewark, and Agnew a unit is presented on the electronic calculator. It introduced the basic arithmetic calculations of addition, subtraction,

¹Peter L. Agnew and Nicholas J. Cornelia, Office Machines Course (Dallas: South-Western Publishing Company, 1962), pp. 23-48.

²Arthur L. Walker, J. Kenneth Roach, and J. Marshall Hanna, How to Use Adding and Calculating Machines (Dallas: McGraw-Hill Book Company, 1967), pp. 98-141.

³Harold D. Fasnacht, Harry B. Bauernfeind, and Donald W. Vigen, How to Use Business Machines (Dallas: Gregg Division/McGraw-Hill Book Company, 1969), pp. 45-66.

⁴J. H. Dool, Business Machines Exercises (Dallas: McGraw-Hill Book Company, 1963), pp. 1-121.

multiplication, division. The more difficult problems of percentage, constants, discounts, and proration followed.¹

In the Ten-Key Adding-Listing Machine and Printing Calculator

Course addition, subtraction, subtotal, and multiplication were included in the first third of the textbook. Discounts, chain discounts, percentage, decimals, constant multiplication, and division were covered in the second third of the textbook. In the last third of the textbook credit balances, interest, increases and decreases, prorating, payroll, and reconciliation of bank statements were presented.²

Business Mathematics Instructions and Assignments presented instruction on addition, subtraction, multiplication, constants, division, invoices, discounts, chain discounts, percentage, mark-up, proration, payroll, and interest. This textbook also covered some more difficult calculations.³

Standards in Office Machines

Many schools do not have standards for their adding and calculating machines courses. Some schools use a class average as a reference point for evaluating individual student's accomplishments. This is a step toward the establishment of standards. In setting standards, test scores from previous classes must be taken into

¹Nicholas J. Cornelia, William R. Pasewark, and Peter L. Agnew, Office Machines Course (Dallas: South-Western Publishing Co., 1971) pp. 21-30.

²Peter L. Agnew and William R. Pasewark, Ten-Key Adding-Listing Machine and Printing Calculator Course (Dallas: South-Western Publishing Company, 1963) pp. 1-90.

³Business Mathematics Instructions and Assignments (Orange, New Jersey: Monroe International, Inc., 1966), pp. 1-66.

consideration to avoid fluctuating scales because of above-average or below average groups in any one year.¹

One reason that there are no standards for office machines courses is that no unit such as the "words a minute" standard used in typewriting has been developed to aid in evaluation. Some schools use digits per minute, others use strokes per minute, problems per minute, calculations per hour, columns per hour, correct digits per minute, products per minute, checks per minute, key depressions per minute, standard problems per minute, key strokes per minute, or some other means of expressing the accomplishments of their students.²

Lydeen suggested that standards be based on correct digits per minute. This means that, unless the numbers placed into the machine are accurate, no credit is given for the completed problem. An error in numbers is one of the most serious errors made by students. It is better to have no answer at all than an inaccurate answer.³

Summary

The importance of the office machines course has been stressed in the last few years. Most office employees are required to use office machines in their work, and there is going to be a continued demand for good machine operators. Students need to have definite skills and capabilities when they go into the business world.

¹Jerald B. Lydeen, "Formulate Standards for Your Adding and Calculating Machine Course," Business Education World, XLVII (November, 1966), 33.

²Ibid.

³Ibid.

One of the newest machines on the market is the electronic calculator. This machine has greatly expanded the capacity of business. Business educators must keep in pace with business and train students on the operation of the electronic calculator.

Individualized taped instruction gives students an opportunity to progress at their own rate and according to their own abilities. This is an effective and efficient way to teach office machines. Students like this type of learning, and teachers are able to give more individual assistance to the students.

All textbooks included instruction on the basic arithmetic calculations: addition, subtraction, multiplication, and division. Several of the textbooks included the more difficult business problems such as payroll, constants, percentages, interest, discounts, and chain discounts.

Many schools do not have standards for their adding and calculating machines courses. One reason that there are no universally accepted standards for office machines courses is that no unit of evaluation has been developed.

Chapter 3

AUDIO-TUTORIAL INSTRUCTIONAL UNIT FOR THE MONROE ELECTRONIC PROGRAMMABLE PRINTING CALCULATOR

Instruction in office machines is a recognized part of the business education curriculum. This unit of instruction, devised to correlate with the Monroe Electronic Programmable Printing Calculator, was presented in the form in which it was used by the students and the instructor.

Each student received a set of assignment sheets including a description of the machine, objectives, assignments, and the assignment sheets. Each student could progress at his own rate. Some students completed more than one lesson during a class period; others took more than one class period on some lessons. Completing at least one lesson per day was a reasonable goal. The instructions corresponding with the assignment sheets were taped.

Introduction

The Monroe Electronic Programmable Printing Calculator, the EPIC 3000, takes full advantage of electronic capability to eliminate repeated selection of control keys. As the operator does a computation the first time, the EPIC learns the sequence of entries and control keys. Thereafter, the same calculation can be done by listing numbers with an enter bar in the same way that they would be entered in a 10-key adding machine. At the same time a printed record is made of

each number entered, each control key used, and any answer that the operator wants to see.

Description

Register Action. The EPIC has five number holders called registers. Register one, two, three, and four operate as a unit and are called a stack. The other register is independent of the stack and is called the constant register. As a number is set in the keyboard it enters the first register. At the same time the number in each register moves down one position. The contents of the fourth register clear out.

Constant Register. Two control keys, STORE C and RECall C, connect the constant register with register one of the stack. Depression of the STORE C key duplicates the number in register one in the constant register; the number in the constant register is cleared; the number in register one remains in register one. Depression of the RECall C key duplicates the number in the constant register in register one and moves all other numbers down one register. The number in the constant register remains there.

Capacity. The EPIC has a 16 digit printout capacity of which either four or eight digits are reserved for decimal places. A decimal selector is used by the operator to choose the number of decimal places. the EPIC automatically inserts zeros to the right of the last significant digit so that the number will print as a preselected decimal point.

If the operator sets numbers with more places either to the left or right of the decimal point than the capacity described above, the digital keys lock. If an answer exceeds the decimal capacity, the

first four or eight decimal places are retained and the remaining places are dropped.

Start Reset. The START RESET key unlocks the keyboard and clears any information in the calculator: keyboard entry, any learned routing, and answers.

Ready Light. The READY light blinks off during calculation and the keyboard locks momentarily. Since the EPIC calculates silently, the READY light comes on to indicate that the keyboard is prepared to accept input.

Red Light. When the red light goes on it indicates that an improper operation has been performed. The following operation will turn on the red light: (1) An arithmetic operation whose result exceeds the capacity of the calculator. (2) Dividing by zero. (3) Attempting to take the square root of a negative number. (4) Exceeding the number of program steps while in LEARN.

Clear Bar. The clear bar clears the number from register one. All other numbers move up one register.

Interchange Key. The interchange key interchanges the numbers in register one and two.

Repeat Key. The repeat key duplicates in register two the number in register one. All other numbers move down one register.

Learn Key. For addition, subtraction, multiplication, division, or any combination of these arithmetic processes a calculator operator performs a sequence of keyboard entries and control key depressions.

If the operator depresses the LEARN key and then does a calculation, the EPIC learns the sequence of keyboard entries and control key depressions.

Auto Key. To use the program depress the AUTO key. Set the first number in the keyboard and depress ENTER; the second number, ENTER; the third number, ENTER, and so on. The program memory carries out all operations up to the next keyboard entry; then, the READY indicator lights to show that the operations are completed and the EPIC is ready for the next number. The program can be used as many times as required. All keys except the digital keys, ENTER bar, CLEAR bar, and program keys are locked during AUTOMATIC operation so the operator will not inadvertently depress a control key.

Manual Key. The EPIC is not limited to programmed operation only; other calculations can be done in MANUAL. To leave automatic operation depress MANUAL when the READY indicator is on thus the change from AUTOMATIC to MANUAL is made when the calculator is waiting for a keyboard entry. If the operator depresses MANUAL at any other time, a calculation might be interrupted.

Program Steps. Forty-two steps can be learned by the EPIC 3000. A step consists of either setting a number on the keyboard or depressing a control key other than the ENTER bar; if the operator exceeds the number of steps the red light comes on and the keyboard locks. This locking protects the operator from inadvertently exceeding the learning capacity and, as a consequence, operating with an incomplete program in the automatic mode of operation.

Tape. The EPIC gives a complete and easy check on calculations.

The operator needs only check the printed tape to see that the sequence was properly performed and the correct entries were made. No other check is needed. When a problem is completed, there is complete confidence that the results are correct.

Assignments

1. Assignments are due at the end of the class period.
2. Assignments should be corrected before continuing with the next assignment.
3. Students will be given 15 class periods to complete the assignments and take the timed test.
4. Students may use the Monroe for practice during the activity period and before or after school.

Testing

Students will be graded primarily on their performance on the timed skill test. A practice test will be given before the test.

Objectives

The objectives of the unit are to develop proficiency in:

1. Touch addition on the Monroe Electronic Programmable Printing Calculator.
2. Performing the fundamental processes on the Monroe Electronic Programmable Printing Calculator.
3. Programming the Monroe to perform the fundamental processes in addition, subtraction, multiplication, and division.
4. Performing the more difficult transactions such as constant multiplication, percentages, interest, increases and decreases, discounts,

chain discounts, payroll and proration.

5. Programming the Monroe Electronic Printing Calculator to perform the more difficult transactions such as constant multiplication, percentages, interest, increases and decreases, discounts, chain discounts, payroll, and proration.

Audio-Tutorial Instructions

You are about to receive instructions to introduce you to the Monroe Electronic Programmable Printing Calculator, the EPIC 3000, and to start you on lesson 1.

The switch that turns the machine on is located beneath the lower left side of the machine. Turn the switch to the left. The word EPIC will light to indicate that the machine is on. When a green READY light goes on, the machine is ready for operation.

The EPIC has a 16-digit printout capacity of which either four or eight digits are reserved for decimal places. A decimal selector is used to choose the number of decimal places. The decimal selector is located in the middle and toward the top of the machine. Move the decimal selector to the right so the numeral four shows. The EPIC automatically takes care of decimal alignment. Zeros will print on the tape behind the last digit.

If you enter a number with more places either to the left or right of the decimal point than the capacity of the machine allows, the digital keys will lock. If an answer exceeds the whole number capacity, the red light will go on. Depress the MANUAL button then depress START RESET in order to continue. If an answer exceeds the decimal capacity

the first four or eight decimal places are retained and the remaining places are eliminated.

Numbers are set on the keyboard by the touch method. The decimal point is entered by using the decimal bar with the index finger. The keyboard dials will display the numbers set on the keyboard.

Lesson 1

Lesson 1 is on addition. Depress the MANual key. Depress the START RESET key. This key unlocks the keyboard and clears any information in the calculator. Notice the symbol that is printed on the paper tape. If the AUTO key is down, the START RESET key will not depress. In this case, depress MANual then depress START RESET. Check to see that the READY light is on. Since the EPIC calculates silently, the READY light comes on to indicate that the keyboard is prepared to accept input. The READY light blinks off during claculation and the keyboard locks momentarily.

Set the first number on the keyboard as follows: Set the number two, three, a decimal, four, and five. Depress ENTer bar with the little finger. The ENTer bar is always used on the first number in any problem. If a mistake is made in entering a number in the machine, the error may be cleared if a control key has not been depressed. The clear bar clears the number from register one. It will print on the tape, but it will not be used in the calculation of the problem. Set the second number on the keyboard. Depress the plus key with the little finger for addition. Enter the other numbers and depress the plus key. Continue until all numbers in problem 1 are entered. To total, depress the PRINT bar with the little finger. Your answer should be 330.79. Record

the answer in the appropriate place on the assignment sheet. Record the answers for this lesson and for all the following lessons.

Do problems 2 through 15 as you did problem 1. If difficulties are encountered, rewind the tape and listen again to the instructions for problem 1. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. If the LEARN key is depressed before a calculation is done, the EPIC learns the sequence of keyboard entries and control key depressions. It will then do the calculations automatically as you enter the digits. This process is called programming the machine.

Try problem 16. First depress the START RESET. Depress the LEARN key. Now work the problem as any addition problem would be worked. Enter the first number and depress the ENTER bar. Enter the other numbers in the problem and depress the PLUS key. After all numbers are entered in the problem, depress the PRINT bar to total. The correct answer is 1,474.18.

To use the program, depress the AUTO key. Set the first number in problem 17 and depress ENTER; the second number, ENTER; the third number, ENTER; and so on until all numbers are entered. The EPIC will automatically print the total.

The program memory carries out all operations up to the next keyboard entry; then, the READY indicator lights to show that the operations are completed and the EPIC is ready for the next number. The program can be used as many times as required because the EPIC repeats the program continually. All keys except the digital keys,

ENTER bar, CLEAR bar, and program keys are locked during AUTOMATIC operation.

Do problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, rework some of the problems on MANUAL. Then program the machine for addition. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. The switch is located beneath the lower left hand side of the machine. Turn the switch to the left. Cover the machine before leaving. This ends lesson 1. Stop the tape recorder.

Lesson 2

Lesson 2 concerns subtraction. Depress the MANUAL key. Depress START RESET. Check to see that the READY light is on.

Set the first number of problem 1 on the keyboard. Depress the ENTER bar. If a mistake is made entering a number, depress the CLEAR bar. Set the second number on the keyboard. Depress the minus key for subtraction. To total, depress the PRINT bar. The correct answer is 423.46. Do problems 2 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions for subtraction. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do subtraction problems. Try problem 16. First, depress the START RESET. Depress the LEARN key. Work the problem

as any subtraction problem would be worked. Enter the first number and depress the ENTER bar. Enter the second number and depress the subtract key. Depress the PRINT bar to total. The correct answer is 121.57.

The EPIC is now programmed to do subtraction problems. To use the program, depress the AUTO key. Set the first number in problem 17 and depress ENTER; enter the second number and depress ENTER. The EPIC will automatically print the total.

Do problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine for subtraction. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 2. Stop the tape recorder.

Lesson 3

Lesson 3 discusses multiplication. Depress the MANUAL key. Depress START RESET. Check to see that the READY light is on.

Set the first number of problem 1 on the keyboard. Depress the ENTER bar. If a mistake is made entering a number, depress the CLEAR bar. Set the second number on the keyboard. Depress the times key for multiplication. To total, depress the PRINT bar. The correct answer is 6,991.8151. Do problems 2 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions for multiplication.

After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do multiplication problems. Try problem 16. First, depress the START RESET. Depress the LEARN key. Work the problem as any multiplication problem would be worked. Enter the first number and depress the ENTER key. Enter the second number and depress the times key. Depress the PRINT bar to total. The correct answer is 269.6733.

The EPIC is now programmed to do multiplication problems. To use the program depress the AUTO key. Set the first number in problem 17 and depress ENTER; enter the second number and depress ENTER. The EPIC will automatically print the total.

Do problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine for multiplication. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 3. Stop the tape recorder.

Lesson 4

Lesson 4 is about division. Depress the MANUAL key. Depress START RESET. Check to see that the READY light is on.

Set the first number of problem 1 on the keyboard. Depress the ENTer bar. Set the second number on the keyboard. Depress the divide key for division. To total, depress the PRINT bar. The correct answer is 45. Do problems 2 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions for division. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do division problems. Try problem 16. First, depress the START RESET. Depress the LEARN key. Work the problem as any division problem would be worked. Enter the first number and depress the ENTer key. Enter the second number and depress the divide key. Depress the PRINT bar to total. The correct answer is 19.6427.

The EPIC is now programmed to do division problems. To use the program, depress the AUTO key. Set the first number in problem 17 and depress ENTer; enter the second number and depress ENTer. The EPIC will automatically print the total. The correct answer is 12.1704.

Do problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANual. Then program the machine for division. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 4. Stop the tape recorder.

Lesson 5

Lesson 5 shows how to subtotal. Depress the MANual key.

Depress START RESET. Check to see that the READY light is on.

Set the first number of problem 1 on the keyboard and depress the ENTer bar. Set the second number on the keyboard and depress the plus key for addition. Set the third number on the keyboard and depress the plus key. Set the fourth number on the keyboard and depress the plus key. To subtotal, depress the PRINT bar. The subtotal is \$920.91. To continue problem 1 set the next number on the keyboard and depress the plus key. Depressing the plus key instead of the ENTer bar allows the machine to add the numbers to the subtotal instead of starting a new problem. Enter the other numbers and depress the plus key. Continue until all numbers in problem 1 are entered. To total, depress the PRINT bar with the little finger. The correct answer is 3,014.26.

In working problems with a subtotal, always use the ENTer bar on the first number of a problem. Use the plus key on all other numbers. Use the PRINT bar to subtotal on the machine and then use the plus key on the following number. The EPIC will add the numbers to the previous total instead of starting a new problem when the plus key is used.

Do problems 2 through 20 as you did problem 1. Some problems will have more than one subtotal. Complete them as you did the problem with one subtotal. You will not be able to program the machine for subtotal because the subtotals are located at different points in the problems. After finishing problem 20, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 5. Stop the tape recorder.

Lesson 6

Lesson 6 explains credit balances. Depress the MANUAL key. Depress START RESET. Check to see that the READY light is on.

Set the first number of problem 1 on the keyboard and depress the ENTER bar. Set the second number on the keyboard and depress the minus key. To total, depress the PRINT bar. Notice that the answer $-.53$ is printed in red. Red indicates a credit balance. Whenever a credit balance is shown as an answer, record a minus sign before the answer on your answer sheet.

The first 10 problems of lesson 6 are all subtraction problems with credit balances. Do problems 1 through 10 and then turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 11 through 20. These problems are credit balance problems with some numbers added and some numbers subtracted. Set the first number on the keyboard and depress the ENTER bar. Enter all other numbers and depress the plus key for addition or the minus key for subtraction. To total, depress the PRINT bar. Remember the answer is a credit balance and will be printed in red. The correct answer is -2.95 . Be sure to show the credit balance on your answer sheet by putting a minus sign before the answer. After finishing problem 20, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 21 through 30. The EPIC may be programmed to do some credit balance problems. Try problem 21. First depress the START RESET key. Depress the LEARN key. Work the problem as any subtraction problem would be worked. After completing the problem, the EPIC should be programmed to do the subtraction problems. To use the program, depress the AUTO key. Do problems 21 through 30 on automatic. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, rework some of the problems on MANUAL. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 6. Stop the tape recorder.

Lesson 7

Lesson 7 introduces constant multiplication. A constant is a number which is the same or constant in several different problems. To perform this type of problem, enter the constant into the machine by setting the constant number on the keyboard and then depressing the STORE C key located on the lower left hand side of the machine. Then work the problem as usual, but instead of setting the constant number on the keyboard, depress the RECALL C key.

Try problem 1 which is a constant multiplication problem. Depress the MANUAL key. Depress START RESET. Check to see that the READY light is on. Set the constant \$1.25 into storage by setting 1.25 on the keyboard and then depressing the STORE C key. The constant 1.25 is stored and will remain in storage until replaced by another number. Set the 65 on the keyboard and depress the ENTER bar. Depress

the RECALL C key instead of setting the constant 1.25 and depress the times key for multiplication. To total, depress the PRINT bar. The answer should be \$81.25. Do problem 2 by setting the number 58 on the keyboard and depressing the ENTER bar. Depress the RECALL C key, times key, and PRINT bar. The answer should be \$72.50. Complete problems 3 through 15. When your constant changes, you will have to put the new constant into storage. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do constant multiplication problems. Try problem 16. Depress the MANUAL key. Depress START RESET. While the machine is on MANUAL, set the constant 1.50 into storage by setting 1.50 on the keyboard and depressing the STORAGE C key. This operation is done while the machine is on manual because the constant will be the same in several problems. Put the machine on LEARN. Set the first number 56 on the keyboard and depress the ENTER bar. Depress the RECALL C key, times key, and PRINT bar. The correct answer is \$84.00.

The EPIC is now programmed to do constant multiplication. To use the program, depress the AUTO key. Set the next number 32 on the keyboard and depress the ENTER bar. The EPIC will automatically complete the rest of the problem and the answer will be printed on the tape. The correct answer is \$48.00. When the constant number changes, you must reprogram the machine.

Work problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, program problems 1 through 15. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 7. Stop the tape recorder.

Lesson 8

Lesson 8 is on percentages. A percentage tells what part one number is of another. It is found by dividing one number by another and multiplying that answer by 100. This process is done mentally by moving the decimal point two places to the right. For example, .25 becomes 25 percent. Percentages are used as a means of comparison between amounts.

Try problem 1. Depress the MANual key. Depress START RESET and check to see that the READY light is on. To work the problems on percentages accurately, you need more than four decimal places. Move the decimal selector to the right so the numeral eight shows. Divide 23 by 47. The answer on the tape should be .48936170. Round off the answer to four decimal places. Move the decimal two places to the right to show percentage and the answer should be 48.94 percent. Do problems 2 through 15 and then turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do the percentage problems. Depress the START RESET. Depress the LEARN key. Work problem 16. The correct answer is 94.69 percent. After you have programmed the machine, depress the AUTO key to work the remaining problems.

Do problems 17 through 30. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, rework some of the problems on MANual. Then program the machine for percentages. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 8. Stop the tape recorder.

Lesson 9

Lesson 9 shows how to figure interest. Interest is money paid for the use of money. The following formula is used for figuring simple interest: principal times rate times days divided by 360 days. This formula is shown on the top of the assignment sheet. The exact number of days in a year is 365 or 366. Frequently, however, 360 days, "bankers' time," are used to represent a year because of the ease in calculating. "Bankers' time" is based on 12 months of 30 days each.

Try problem 1. Depress the MANual key. Depress the START RESET key. Four decimal places are all that is necessary for interest problems. Move the decimal selector to the left so the numeral four shows. Check to see that the READY light is on. Since 360 days will be used in all problems figuring interest, it is considered a constant. Store the constant by setting 360 on the keyboard and depressing the STORE C key. The 360 will remain in storage to be used in all the problems until the START RESET is depressed or until another number is stored. Set the principal \$1,435 on the keyboard and depress the ENTER bar. Set the rate .06 on the keyboard and depress the times key for multiplication. Set the days 43 on the keyboard and depress the times

key for multiplication. The machine will multiply the 43 times the total of 1,435 times .06. Depress the RECALL C key to recall 360 and depress the divide key for division. Depress the PRINT bar to total. The answer should be \$10.28.

Try problem 2. Set 1629 on the keyboard and depress the ENTER bar. Set .06 on the keyboard and depress the times key. Set 52 on the keyboard and depress the times key. Depress the RECALL C key, the divide key, and the PRINT bar. The correct answer is \$14.12.

Work problems 3 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions for problem 1. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

Instructions for problems 16 through 30. The EPIC may be programmed to do the simple interest problems. Depress the START RESET key to make sure that all other problems are cleared from the machine. Store the constant 360. Remember that when the same constant is used in all problems, always store the constant while the machine is on MANUAL. Depress the LEARN key and work the interest problem 16. Set 1242 on the keyboard and depress the ENTER bar. Set .06 on the keyboard and depress the times key. Set 15 on the keyboard and depress the times key. Depress the RECALL C, the divide key, and the PRINT bar. The correct answer is \$3.11. Put the machine on automatic by depressing the AUTO key.

Try problem 16 on automatic. Set 1592 on the keyboard and depress the ENTER bar. Set .06 on the keyboard and depress the ENTER bar. Set 21 on the keyboard and depress the ENTER bar. The EPIC

will automatically bring the constant out of storage, divide, and print the total. The correct answer is \$5.57.

Work problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, rework some of the problems on MANUAL. Then program the machine for interest. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 9. Stop the tape recorder.

Lesson 10

Lesson 10 explains the percentage of increase and decrease. Percentages of increase and decrease are used to compare business trends in two different periods of time by finding the percentage of change between two numbers. Determine the difference between the older and the newer number by subtracting the older number from the newer number. If the older number is smaller than the newer number, this is an increase and the answer should be preceded by a plus sign. If the older number is larger than the newer number, this is a decrease and the answer should be preceded by a minus sign. A decrease is printed in red on the tape. Divide the difference by the older number. If the older number is smaller than the newer number, this is a percent of increase and the answer should be preceded by a plus sign. If the older number is larger than the newer number, this is a percent of decrease and the answer should be preceded by a minus sign. A decrease is printed in red on the tape.

Try problem 1. Depress the MANUAL key. Depress the START RESET. Check to see that the READY light is on. Set the newer number 360 on the keyboard and depress the ENTER bar. Set the older number 200 on the keyboard and depress the STORE C key. The older number will be used twice in the problem, and storing the older number will save entering the number the second time. Depress the minus key for subtraction. To total, depress the PRINT bar. The total 160 is the amount of increase. To find the percentage of increase, depress the RECALL C key to recall the older number of 200. Depress the divide key to divide the 200 into the increase of 160. Depress the PRINT bar to total. The correct answer is .80. Move the decimal over two places to the right to show percent. The correct answer should be an 80 percent increase. If the answer is printed in red, it is a decrease.

Try problem 2. Set 600 on the keyboard and depress the ENTER bar. Set 450 on the keyboard and depress the STORE C key. Depress the minus key and the PRINT bar. The amount of increase is 150. To find the percent of increase, depress the RECALL C key, the divide key, and the PRINT bar. The answer should be 33.33 percent.

Work problems 3 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do percentage of increase and decrease problems. Try problem 16. Depress the START RESET. Depress the LEARN key. Work the problem as any percentage of increase or decrease problem. Set the newer number 775 on the keyboard and depress the ENTER bar. Set the older

number 667 on the keyboard and depress the STORE C key. Depress the minus key for subtraction. To total, depress the PRINT bar. The amount of increase is 108. Find the percentage by depressing the RECALL C key, the divide key, and the PRINT bar. Remember, if the answer is printed in red, it is a decrease. The correct answer is 16.19 percent increase.

The EPIC is now programmed to do the percentage of increase or decrease problems. To use the program, depress the AUTO key. Set the first number in problem 17 and depress the ENTER bar. Enter the second number and depress the ENTER bar. The EPIC will automatically calculate the rest of the problem and print the amount of increase or decrease and the percent of increase or decrease. The amount of decrease is -588 and the percent of decrease is -62.55 percent.

Work problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice, rework some of the problems on MANUAL. Then program the machine for the percent of increase or decrease. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 10. Stop the tape recorder.

Lesson 11

Lesson 11 is about discounts. A discount is a deduction from the amount of the list price on an invoice. It is usually allowed as a reward for prompt payment, or as a business practice within a trade. Some businesses use discounts as a means of attracting more buyers and

some use it as a matter of policy within a specific trade. The formula for figuring the discount and net amount is given on the assignment sheet.

Gross amount is the price before deducting discounts. Discount rate is the percent to be deducted from the gross amount. Discount is the amount deducted from the gross amount. Multiply the gross amount by the discount rate to find the discount.

Net amount is the price after deducting discounts. Net amount percent is the difference when the discount rate is subtracted from 100 percent. Multiply the gross amount by the net amount percent to find the net amount.

Try problem 1. Figure the discount and then the net amount. Depress the MANUAL key. Depress the START RESET key. Check to see that the READY light is on. Set the gross amount \$624.16 on the keyboard and depress the STORE C key. Store the gross amount because it will be used to figure the discount and the net amount. Set the discount rate .125 on the keyboard and depress the times key. The discount rate .125 is changed from a percent to the decimal equivalent by moving the decimal place two places to the left. To total, depress the PRINT bar. The answer should be \$78.02.

To figure the net amount, depress the RECALL C key. This operation will recall the gross amount of \$624.16. Figure the net amount percent mentally or on a piece of scratch paper. The net amount percent is calculated by subtracting the discount rate of $12\frac{1}{2}$ percent from 100 percent and then changing the answer to a decimal. Set the net amount percent .875 on the keyboard and depress the times key. To total, depress the PRINT bar. The net amount should be \$546.14.

rewind the tape and listen again to the instructions for problem 1. After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do the discount problems. Depress the START RESET key to make sure that all other problems are cleared from the machine. Depress the LEARN key. Work problem 16 to figure the discount and net amount. Set the gross amount on the keyboard and depress the STORE C key. Set the discount rate on the keyboard and depress the times key. Depress the PRINT bar to total. The answer \$216.54 is the discount. To figure the net amount, depress the RECALL C key. Set the net amount percent .575 on the keyboard and depress the times key. Depress the PRINT bar to total. The answer \$292.96 is the net amount.

To use the program, depress the AUTO key. Now try working problem 17. Set the gross amount on the keyboard and depress the ENTER bar. Set the discount rate .275 on the keyboard and depress the ENTER bar. The machine will automatically print the discount of \$225.67. Set the net amount percent .725 on the keyboard and depress the ENTER bar. The machine will automatically print the net amount \$594.93.

Work problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine for discounts. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn

off the machine. Cover the machine before leaving. This ends lesson 11. Stop the tape recorder.

Lesson 12

Lesson 12 involves chain discounts. Discounts that are given in a series, such as 40-30-10 percent, are called chain discounts. They are deducted in sequence to find the net amount of the invoice. Chain discounts are allowed within certain trades or industries as a means of keeping fluctuating catalog prices in line. The size of the purchase frequently determines the amount of the discount. The discount is obtained by deducting each discount individually.

To work the problems on chain discounts, do a multi-factor multiplication of the total times the complements of the discounts. To find the complements of the discount, change the percent to a decimal and subtract it from 1. For example, 15 percent would be .85. On the first problem of \$380.25 less 15-10-2½ percent: multiply \$380.25 times .85, the complement of 15 percent; times .90, the complement of 10 percent; times .975, the complement of 2½ percent.

Try problem 1. Depress the MANual key. Depress the START RESET key. Check to see that the READY light is on. Set \$380.25 on the keyboard and depress the ENTER bar. Set the complement of 15 percent (.85) on the keyboard and depress the times key. Set the complement of 10 percent (.90) on the keyboard and depress the times key. Set the complement of 2½ percent (.975) on the keyboard and depress the times key. To total, depress the PRINT bar. The answer should be \$283.62.

Work problems 2 through 15. If difficulties are encountered, rewind the tape and listen again to the instructions for problem 1.

After finishing problem 15, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 16 through 30. The EPIC may be programmed to do the chain discount problems. Depress the START RESET key to make sure that all other problems are cleared from the machine. Depress the LEARN key. Work the problem as you would work any chain discount problem. Set 471.88 on the keyboard and depress the ENTER bar. Set .38 on the keyboard and depress the times key. Set .95 on the keyboard and depress the times key. Set .975 on the keyboard and depress the times key. Depress the PRINT bar to total. The correct answer is \$166.09.

To use the program, depress the AUTO key. Try working problem 17. Set 35.62 on the keyboard and depress the ENTER bar. Set .90 on the keyboard and depress the ENTER bar. Set .90 on the keyboard and depress the ENTER bar. Set .95 on the keyboard and depress the ENTER bar. The machine will automatically print the total on the tape. The correct answer is \$27.41.

Work problems 18 through 30. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 30, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine for chain discounts. When the time is up, hand your assignment sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 12. Stop the tape recorder.

Lesson 13

Lesson 13 is on figuring the payroll. Every industry, corporation, and private enterprise must have a system of reimbursing its employees for the work they have performed. Good business management and obligations imposed by law demand accurate and complete payroll records. The requirements of this assignment is to make the necessary extensions and deductions to arrive at gross pay, total deductions and net earnings.

Gross pay is figured by multiplying weekly hours times hourly rate. There are several deductions to figure. Income tax is figured by using the Income Tax Table in the instruction sheets. It is based on gross pay and number of exemptions. FICA is the abbreviation for Federal Insurance Contributions Act. Employers and employees each contribute equal percentages of the employees' gross pay based on the rate of 5.5 percent of gross pay. This rate may change from year to year, but it is calculated in the same way. Some companies give employees the opportunity to participate in other deductions such as insurance, savings bonds, or community chest. The total of income tax, FICA tax, and other deductions will give the total deductions. The total deductions are subtracted from the gross pay to find the net earnings. These formulas are all on the top of the assignment sheet.

Try employee 1. Depress the MANual key. Depress the START RESET key. Check to see that the READY light is on. The rate of FICA tax, 5.5 percent, will be the same in all payroll problems. Store the rate to save entering it in each problem. Set .055 on the keyboard and depress the STORE C key. Figure the gross pay by multiplying the weekly hours by the hourly rate. Set 38 on the keyboard and depress the ENTER bar. Set the hourly rate 2.16 on the keyboard and depress the times key.

Depress the PRINT bar to total. The answer \$82.08 is the amount of gross pay.

Figure the deductions. The FICA tax will be figured by multiplying the FICA rate times the gross pay. Depress the RECALL C key to recall the .055. Depress the times key to multiply the FICA rate times the gross pay. To total, depress the PRINT bar. The correct amount of FICA tax is \$4.51. Use the income tax chart to figure the amount of income tax. The income tax chart is prepared for the weekly payroll of married people. Look down the left hand column until you find the amount of gross pay the employee makes. Look across the chart to find the correct number of exemptions for the employee. The amount of income tax is \$6.40. Set the amount on the keyboard and depress the plus key. If the employee participates in any other deductions, enter these amounts in the keyboard and depress the plus bar. Employee number 1 participates in group insurance for \$1.60 and savings bonds for \$6.25. To total, depress the PRINT bar. The answer \$18.76 is the amount of total deductions.

To calculate the amount of net pay, the total deductions are subtracted from the gross pay. The total deductions of \$18.76 is already in the machine. Set the amount of gross pay \$82.08 on the keyboard and depress the ENTER bar. Change the amount of total deductions and gross pay for subtraction by depressing the I or interchange key. The interchange key is located on the lower left hand side of the machine. The interchange key reverses the position of the two numbers so that the machine can subtract the deductions from the gross pay. Depress the minus key for subtraction. To total, depress the PRINT bar. The answer of \$63.32 is the net pay.

Work problems 2 through 12. If difficulties are encountered rewind the tape and listen again to the instructions for problem 1. After finishing problem 12, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 13 through 27. The EPIC may be programmed to do a payroll very efficiently. Depress the START RESET key to make sure that all other problems are cleared out of the machine. Store the rate of FICA taxes .055. Set the amount on the keyboard and depress the STORE C key. Depress the LEARN key. Figure the gross pay. Set 38 on the keyboard and depress the ENTER bar. Set 2.80 on the keyboard and depress the times key. Depress the PRINT bar to total. The answer should be \$106.40.

Figure the deductions. The FICA tax will be figured by multiplying the FICA rate times the gross pay. Depress the RECALL C key and depress the times key. To total, depress the PRINT bar. Use the chart to figure the amount of income tax. It should be \$5.70. Set the amount on the keyboard and depress the plus key. There are no other deductions for these employees. Depress the PRINT bar to calculate the total deductions. The correct total deductions are \$11.55.

Figure the net pay. Set the amount of gross pay \$106.40 on the keyboard and depress the ENTER bar. Depress the interchange key. Depress the minus key for subtraction. To calculate the total net pay, depress the PRINT bar. The correct answer is \$94.85.

The EPIC has now been programmed to calculate payroll problems. To use the program, depress the AUTO key. Try working problem 14. Set on the keyboard the amount of hours 37 and depress the ENTER bar. Set on the keyboard the hourly rate 2.80 and depress the ENTER bar. The

EPIC will print the gross pay and the FICA tax. Enter the amount of income tax from the chart and depress the ENTER bar. The EPIC will print the total deductions \$17.50. Enter the amount of gross pay \$103.60. The EPIC will print the net pay. The correct amount of net pay is \$86.10.

Work problems 15 through 27. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 27, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine for a payroll. When the time is up, hand your instruction sheets with the machine tapes to the instructor. Turn off the machine. Cover the machine before leaving. This ends lesson 13. Stop the tape recorder.

Lesson 14

Lesson 14 is on proration. Prorating means distributing a total amount proportionately. For example, the cost of rent for a department store may be distributed among the departments on the basis of the number of square feet that each department occupies. The square feet occupied would be the basic factor.

To prorate in problems 1 to 5, depress the MANUAL key. Depress the START RESET key. Check to see that the READY light is on. Divide the amount to be prorated by the basic factor to find the prorated factor. Set on the keyboard the amount to be prorated \$4,800. Depress the ENTER bar. Set the basic factor \$3,200 on the keyboard and depress the divide key for division. To total, depress the PRINT bar. The

answer \$1.50 is the prorated factor. There is a \$1.50 rent per square foot of floor space per department.

To find the amount charged to each department, multiply the share of each unit by the prorating factor. The prorated factor \$1.50 will be used several times in the problem. Enter the prorated factor into storage. Set \$1.50 on the keyboard and depress the STORE C key. Multiply the prorated factor by the square feet occupied by each department. Set 800 on the keyboard and depress the ENTER bar. Depress the RECALL C key, the times key, and the PRINT bar. Follow this procedure for the remainder of the units. Set 600 on the keyboard and depress the ENTER bar. Depress RECALL C key, the times key, and the PRINT bar. Do this procedure for all units through 5. Round off the answers to dollar and cents.

Add the total of the amounts prorated to each of the units. The answer should be the same as the amount to be prorated, \$4,800. Since the prorated amounts have been rounded, they seldom total exactly the amount to be prorated. If the individual amounts do not total the amount to be prorated, "force" the total by increasing or decreasing the largest amount to make the sum of the prorated amounts equal the total to be prorated.

Work problems 6 through 12 and 13 through 18. If difficulties are encountered rewind the tape and listen again to the instructions for problems 1 through 5. After finishing problem 18, turn on the tape recorder for further instructions. Stop the tape recorder.

These instructions are for problems 19 through 31. The EPIC may be programmed to do part of the proration. Depress the MANUAL key. Depress the START RESET key. Check to see that the READY light is on.

Find the prorating factor by adding the investment of each person. The total investment is \$178,606. Set the total profit \$57,942 on the keyboard and depress the ENTER bar. Set the investment \$178,606 on the keyboard and depress the divide key. To total, depress the PRINT bar. The prorating factor is .3244.

Put the prorating factor into storage. Set .3244 on the keyboard and depress the STORE C key. Depress the LEARN key. Multiply the share of each investment by the prorating factor. Set 44,150 on the keyboard and depress the ENTER bar. Depress the RECALL C key, the times key and the PRINT bar. The profit for person A is \$14,322.26.

The EPIC has been programmed to calculate the profit. Depress the AUTO key to use the program. Enter the investment for each person and the EPIC will automatically print the profit. Set 12,386 on the keyboard and depress the ENTER bar. Do this operation for problems 21 through 26. Round off your answers to dollars and cents.

After finding the overhead expense for all departments, put the machine back on MANUAL. Add the profit. They should total \$57,942. If the individual amounts do not total the amount to be prorated, "force" the total by increasing or decreasing the largest amount.

Work problems 27 through 31. Program the machine to figure the profit. If difficulties are encountered, rewind the tape and listen again to the instructions for programming the machine. After finishing problem 31, turn on the tape recorder for further instructions. Stop the tape recorder.

For additional practice rework some of the problems on MANUAL. Then program the machine to do proration. When the time is up, hand your instruction sheets with the machine tapes to the instructor. Turn

off the machine. Cover the machine before leaving. This ends lesson 14. Stop the tape recorder.

Lesson 15

Lesson 15 is a review of the problems you have learned to calculate on the Monroe Electronic Programmable Printing Calculator. If you forget how to calculate a problem, rewind the tape and listen to the instructions for that problem. The review is similar to the test on the EPIC. Be sure you know how to do each problem. You will have 20 minutes to complete the test. Work problems 1 through 31 as quickly and accurately as you can.

Test Results

The instructional unit and test for the Monroe Electronic Programmable Printing Calculator was used in the office machines class for the 1972-1973 academic term at Haven High School. Thirteen students worked on the instructional unit. The test is on page 98 in the Appendix.

Table 1 lists the thirteen students, the scores they received on the test, and the grade they received on the test. There were forty possible points on the test. The students were given twenty minutes to complete the test.

Table 1 indicates that three, or 23.0 percent, of the students made perfect scores and received A's on the test. One student, or 7.7 percent, of the students made an A-. One student, or 7.7 percent, of the students made a B+ on the test. The largest percent of the students made C's on the test. Four student's, or 30.7 percent, made a C; and two student's, or 15.4 percent, made a C-. Two student's, or 15.4 percent, failed the test.

Table 1

Student's Scores and Grades on the Monroe Electronic
Programmable Printing Calculator Test

Students	Score	Grade	Percent
3	40	A	23.0
1	39	A-	7.7
1	37	B+	7.7
4	32	C	30.7
2	30	C-	15.4
1	22	F	7.7
1	20	F	7.7

Questionnaire Data

After completing the unit test, the students were given a questionnaire concerning their experiences on the machine. The questionnaire is on page 100 in the Appendix.

Table 2 lists the students, their sex, and their classification. There were ten females and three males in the office machines class. There were twelve seniors and one junior in the class.

Six students, or 46 percent, believed the instructions were always clearly stated and easy to understand. Seven students, or 54 percent, believed that the instructions were usually easy to understand.

In answer to the question on whether the taped instructions should contain either more or less explanation of machine operation, two students, or 15 percent, marked less, and 11, or 85 percent, marked same amount.

Twelve students, or 92 percent, believed that they learned faster from the taped instructions rather than from verbal instructions from the teacher. One, or eight percent, believed he would have learned faster from verbal instructions.

In reply to how many times they had to listen to the instructions for each lesson, six, or 46 percent, replied once, six, or 46 percent, replied twice, and one, or eight percent, replied three times.

Twelve, or 92 percent, believed that they had enough time to complete the assignments; while only one, or eight percent, believed he did not have enough time to complete the assignments.

Ten, or 77 percent, responded that they required less individual help from the instructor; while three, or 23 percent, responded that they required about the same amount of individual help from the instructor.

Table 2

Sex and Classification of Students in the Office
Machines Class at Haven High School
in the 1972-1973 School Term

Student	Sex	Classification
1	Female	Senior
2	Female	Senior
3	Female	Senior
4	Male	Junior
5	Female	Senior
6	Male	Senior
7	Female	Senior
8	Female	Senior
9	Female	Senior
10	Female	Senior
11	Female	Senior
12	Female	Senior
13	Male	Senior

All students, or 100 percent, agreed that they would prefer the individualized instructions from the tape recorder.

Eleven, or 85 percent, preferred taped instructions for other machines used in the class. Two, or 15 percent, did not want taped instructions for other machines in the class.

When asked if they believed that they had as thorough an understanding of the operation of the Monroe Electronic Programmable Printing Calculator as they did of the other machines operated in the class, 11, or 85 percent, replied yes and two, or 15 percent, replied no.

Three, or 23 percent, earned better grades on the final test as compared to the other machines. Five, or 38 percent, earned about the same grades on the test. Five, or 38 percent, earned worse grades on the test.

The students were asked what they liked best about the instructional unit. The following comments were given:

"It was easy to understand."

"The directions were easy to understand."

"It just explained things better. Also, if you needed extra help you could just go back and listen."

"The instructions were easy to follow and you explained the steps."

"The instructions made the problems easy."

"You could listen to the instructions as many times as possible."

"It's easy to work."

"It was very helpful to be able to go back and listen to instructions if I didn't get them the first time."

"I understand it better by someone telling me than if I had to read the instructions."

"I understood the tapes more than when I read the instructions. The tapes made it a lot easier."

When asked what the students least liked about the instructional unit, these comments were made:

"Having to find my place on the tape."

"It was hard to find where you were on the tape."

"When the tape reel stuck and didn't wind, but the tape kept playing."

"By the time I was on the review, I had forgotten how to do some of the things I learned at first."

The following additional comments were made:

"It was fun. It was something to look forward to work on this machine."

"I liked this way of teaching because you could go over the parts you didn't understand."

"Some of the instructions were a little confusing. I had to stop and think it over a couple of times to get things straight."

"I don't believe there is enough room for the machine and a place to put your paper on the little table."

Summary

A description of the Epic 3000 Monroe Electronic Programmable Printing Calculator was listed. The objectives and assignments were written. Then the unit of instruction with the correlated tapes was made. The fourteen lessons developed were followed by a test over the unit of instruction. The results of the test indicated that 30.7 percent of the students made A's on the test, 7.7 percent of the

students made B's on the test, 46.1 percent of the students made C's on the test, and 15.4 percent of the students made F's on the test. After the test was taken by the students, they completed a questionnaire written to determine their reactions to the unit of instruction. Most of the students believed that they learned faster from the taped instruction. All of the students preferred the taped instructions, and most of them believed that they would like to have taped instructions for other machines in the class.

Chapter 4

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this study was to develop an individualized instructional unit for the Monroe Electronic Programmable Printing Calculator and to determine if students attained comparable achievement by this method of instruction. The instructional unit included (1) taped instructions, objectives, and assignment sheets for each lesson, (2) basic arithmetic calculations and problems frequently used in business, and (3) a comprehensive test.

Summary

From the Review of Literature in Chapter 2, it was determined that there is a demand for machine operators. The electronic calculator has expanded the capacity of business' and business educators' need to prepare students to operate the electronic calculator. The individualized taped instruction gives students an opportunity to progress at their own rate and according to their own abilities. Most students like this type of learning, and it is an effective and efficient way to teach office machines.

A description of the Epic 3000 Monroe Electronic Programmable Printing Calculator was listed. Then the objectives and assignments were written. A pilot study was made for the instructional unit. Then the writer compiled a unit of instruction with the correlated tapes for the Monroe Electronic Programmable Printing Calculator. With

material from several textbooks, problems were developed for the lessons. A review was included at the completion of the fourteen lessons as a preparation for the comprehensive test designed for the unit of instruction. A questionnaire was written and used to determine students' reactions to the unit of instruction.

The results of the test indicated that 30.7 percent of the students made A's on the test, 7.7 percent of the students made B's on the test, 46.1 percent of the students made C's on the test, and 15.4 percent of the students made F's on the test. There were ten females and three males in the office machines class. Twelve of these students were seniors and one was a junior.

Most of the students believed that they learned faster from the taped instruction. All of the students preferred the taped instructions, and most of them believed that they would like to have taped instructions for other machines in the class.

Students commented that the instructional unit was easy to understand, that they could listen to the instructions as many times as necessary and that the tapes made the instructional unit easier. The main criticism of the instruction unit concerned problems with the tape recorder.

Conclusions

1. Students should receive instruction on the electronic calculator in the office machines course.
2. Students at the Haven, Kansas, high school achieved as well as or better from audio-tutorial instructions on the electronic calculator as from traditional oral and written instructions on the other machines.

3. Students at the Haven, Kansas, high school liked the audio-tutorial instruction better than written or oral instructions.

4. The teacher is free to work individually with students who have difficulty with the machine, taped instruction, or in solving problems.

5. The individualized approach enables each student to progress according to his special abilities and his own learning pace.

Recommendations

1. Equipment in office machines classes should include electronic calculators.

2. Audio-tutorial instructional tapes should be prepared for the different types of machines in the office machines class.

3. Students who do not achieve a passing grade on the final test should be given the opportunity to complete additional instruction on the machine and retake the final test.

4. The audio-tutorial unit of instruction should be evaluated periodically, and changes in the tapes and lessons should be made as necessary.

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APPENDIX A

Instruction Sheets

Lesson 1--Addition

1	2	3	4	5
23.45	56.78	56.79	24.75	46.72
34.75	45.78	46.89	12.75	56.89
41.67	34.89	21.39	41.78	31.78
49.87	48.57	25.78	39.59	91.25
56.72	24.84	48.82	98.71	42.34
32.79	34.56	46.78	23.89	45.57
45.78	23.89	34.91	23.51	57.95
<u>45.76</u>	<u>66.92</u>	<u>23.14</u>	<u>23.17</u>	<u>78.59</u>
-----	-----	-----	-----	-----
6	7	8	9	10
19.45	36.78	32.48	23.45	34.75
39.93	34.75	37.67	57.78	45.78
39.45	83.58	32.48	34.91	43.80
32.45	13.34	39.57	34.32	34.58
34.59	32.45	45.67	59.97	57.78
46.78	34.57	15.68	38.15	32.14
23.14	14.58	14.59	49.91	67.89
<u>45.18</u>	<u>45.68</u>	<u>32.49</u>	<u>45.78</u>	<u>90.10</u>
-----	-----	-----	-----	-----
11	12	13	14	15
24.84	34.19	18.56	12.34	45.67
21.43	34.56	42.36	56.89	56.78
31.49	13.10	45.68	59.92	43.56
23.95	13.49	45.67	78.91	14.56
64.79	32.45	58.96	56.89	45.78
33.89	45.23	49.18	11.88	67.99
34.78	23.23	78.91	84.34	45.62
<u>54.67</u>	<u>34.78</u>	<u>56.19</u>	<u>92.21</u>	<u>41.45</u>
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Lesson 1--Continued

16	17	18	19	20
145.69	46.87	426.18	163.28	415.70
35.86	190.42	532.80	57.07	157.92
54.79	608.42	58.06	154.96	900.43
357.09	56.82	675.97	654.08	65.03
75.00	246.85	46.10	36.97	548.01
759.07	58.48	243.97	475.78	56.49
<u>46.68</u>	<u>258.95</u>	<u>57.93</u>	<u>190.04</u>	<u>859.48</u>
-----	-----	-----	-----	-----
21	22	23	24	25
847.58	678.58	678.09	78.57	68.59
64.91	64.72	57.24	876.49	243.88
159.88	514.89	66.92	58.10	63.63
89.32	22.86	642.88	66.92	259.04
64.97	243.65	87.90	584.82	67.93
264.78	35.99	545.63	654.85	344.75
<u>35.87</u>	<u>11.80</u>	<u>194.37</u>	<u>917.25</u>	<u>15.76</u>
-----	-----	-----	-----	-----
26	27	28	29	30
190.34	687.92	57.68	573.79	684.82
57.69	68.46	746.36	68.79	57.82
58.48	46.48	72.10	754.98	185.99
466.91	364.85	68.90	576.43	67.19
46.55	352.19	456.72	58.94	386.83
98.76	91.79	106.43	275.91	57.43
<u>765.83</u>	<u>56.17</u>	<u>86.83</u>	<u>65.84</u>	<u>819.03</u>
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Lesson 2--Subtraction

1	2	3	4	5
<u>432.16</u> <u>8.70</u>	<u>59.12</u> <u>.85</u>	<u>409.36</u> <u>183.99</u>	<u>725.60</u> <u>4.78</u>	<u>34.72</u> <u>10.56</u>
6	7	8	9	10
<u>100.00</u> <u>7.36</u>	<u>96.65</u> <u>83.16</u>	<u>762.14</u> <u>386.98</u>	<u>75.18</u> <u>18.75</u>	<u>82.15</u> <u>44.09</u>
11	12	13	14	15
<u>327.17</u> <u>259.60</u>	<u>784.00</u> <u>278.93</u>	<u>96.25</u> <u>87.04</u>	<u>727.17</u> <u>86.09</u>	<u>44.16</u> <u>5.25</u>
16	17	18	19	20
<u>133.76</u> <u>12.19</u>	<u>48.52</u> <u>18.31</u>	<u>53.84</u> <u>9.07</u>	<u>84.26</u> <u>17.60</u>	<u>37.21</u> <u>19.41</u>
21	22	23	24	25
<u>115.90</u> <u>7.05</u>	<u>13.37</u> <u>9.10</u>	<u>51.36</u> <u>15.06</u>	<u>91.82</u> <u>61.00</u>	<u>75.58</u> <u>15.09</u>
26	27	28	29	30
<u>825.50</u> <u>52.75</u>	<u>432.41</u> <u>247.68</u>	<u>207.19</u> <u>147.62</u>	<u>641.75</u> <u>459.50</u>	<u>521.32</u> <u>216.80</u>

Lesson 3--Multiplication

1	2	3	4	5
<u>245.758</u> <u>28.450</u>	<u>82.412</u> <u>767.923</u>	<u>460.751</u> <u>38.105</u>	<u>76.075</u> <u>140.395</u>	<u>168.767</u> <u>13.875</u>
6	7	8	9	10
<u>245.792</u> <u>27.473</u>	<u>179.671</u> <u>248.413</u>	<u>48.479</u> <u>77.318</u>	<u>906.530</u> <u>175.491</u>	<u>18.751</u> <u>88.462</u>
11	12	13	14	15
<u>104.847</u> <u>92.020</u>	<u>36.57</u> <u>91.85</u>	<u>8.095</u> <u>.037</u>	<u>54.090</u> <u>57.802</u>	<u>6.857</u> <u>46.920</u>
16	17	18	19	20
<u>136.890</u> <u>1.970</u>	<u>5.003</u> <u>5.600</u>	<u>38.200</u> <u>9.010</u>	<u>.092</u> <u>4.770</u>	<u>1.926</u> <u>.370</u>
21	22	23	24	25
<u>574.875</u> <u>38.255</u>	<u>83.875</u> <u>135.855</u>	<u>352.250</u> <u>16.175</u>	<u>64.852</u> <u>127.850</u>	<u>158.125</u> <u>88.375</u>
26	27	28	29	30
<u>208.641</u> <u>175.250</u>	<u>86.125</u> <u>62.755</u>	<u>71.238</u> <u>289.500</u>	<u>55.750</u> <u>15.125</u>	<u>627.793</u> <u>15.125</u>

Lesson 4--Division

1. $1980 \div 44 = \underline{\hspace{2cm}}$
2. $3752 \div 56 = \underline{\hspace{2cm}}$
3. $1462 \div 43 = \underline{\hspace{2cm}}$
4. $6942 \div 89 = \underline{\hspace{2cm}}$
5. $1495 \div 23 = \underline{\hspace{2cm}}$
6. $6208 \div 64 = \underline{\hspace{2cm}}$
7. $3276 \div 52 = \underline{\hspace{2cm}}$
8. $4392 \div 61 = \underline{\hspace{2cm}}$
9. $6067 \div 83 = \underline{\hspace{2cm}}$
10. $2639 \div 29 = \underline{\hspace{2cm}}$
11. $58.302 \div 66.1 = \underline{\hspace{2cm}}$
12. $48.594 \div .023 = \underline{\hspace{2cm}}$
13. $.1246 \div .078 = \underline{\hspace{2cm}}$
14. $312.35 \div 66.5 = \underline{\hspace{2cm}}$
15. $82.246 \div 6.51 = \underline{\hspace{2cm}}$
16. $463.57 \div 23.6 = \underline{\hspace{2cm}}$
17. $92.374 \div 7.59 = \underline{\hspace{2cm}}$
18. $8.2736 \div 1263 = \underline{\hspace{2cm}}$
19. $94.5 \div .084 = \underline{\hspace{2cm}}$
20. $2467 \div 78.35 = \underline{\hspace{2cm}}$
21. $5.009 \div 2.1 = \underline{\hspace{2cm}}$
22. $1.908 \div .975 = \underline{\hspace{2cm}}$
23. $23.609 \div 23.08 = \underline{\hspace{2cm}}$
24. $35.468 \div 36.07 = \underline{\hspace{2cm}}$
25. $478.956 \div 26.875 = \underline{\hspace{2cm}}$
26. $295.853 \div 54.465 = \underline{\hspace{2cm}}$
27. $716.375 \div 9.712 = \underline{\hspace{2cm}}$
28. $542.667 \div 130.8 = \underline{\hspace{2cm}}$
29. $946.125 \div 59 = \underline{\hspace{2cm}}$
30. $678.951 \div 8.257 = \underline{\hspace{2cm}}$

Lesson 5--Subtotal

1	2	3	4	5
903.67	17.22	251.45	903.67	2.18
5.56	5.29	.68	5.56	.03
9.15	316.22	2.51	9.15	5.11
<u>2.53</u>	1.33	188.88	<u>2.53</u>	<u>2.11</u>
	945.45	14.05		
	903.40	8.42		
<u>486.14</u>	9.90	<u>.69</u>	<u>486.14</u>	<u>.25</u>
.53	<u>640.54</u>		.53	.03
1.80			9.95	5.33
9.95		<u>906.34</u>	9.87	.69
9.97	<u>6.47</u>	387.49	7.89	.90
721.49	721.03	429.80	721.49	7.16
37.96	368.97	78.44	37.96	8.65
<u>825.51</u>	<u>7.21</u>	<u>.82</u>	<u>825.51</u>	<u>4.47</u>
6	7	8	9	10
2.18	871.57	69.95	5.11	32.45
.21	225.31	<u>2.91</u>	<u>2.11</u>	4.47
.37	<u>11.93</u>			82.56
221.54		<u>639.85</u>		<u>251.67</u>
<u>54.81</u>		.74	.74	
	<u>618.54</u>	.74	.91	
	<u>225.44</u>	<u>68.01</u>	72.10	<u>255.81</u>
<u>32.44</u>			<u>4.15</u>	<u>285.16</u>
824.16				
.25	<u>2.33</u>	<u>3.89</u>		
<u>368.55</u>	227.13	7.62	<u>9.21</u>	<u>8.65</u>
	7.16	8.65	4.47	.37
	8.65	4.47	5.86	61.98
<u>9.21</u>	7.62	3.70	8.32	4.15
.90	.53	.25	5.33	.69
<u>7.16</u>	<u>8.65</u>	<u>4.47</u>	<u>.37</u>	<u>.16</u>

Lesson 5--Continued

11	12	13	14	15
9.38	593.24	.19	2.65	8.64
5.32	788.48	1.72	1.92	597.40
455.71	987.24	.07	1.21	2.13
692.75	<u>26.30</u>	22.18	.27	823.55
258.79		<u>379.41</u>	.15	94.98
382.31			<u>5.80</u>	69.95
67.56	<u>1141.95</u>			<u>2.91</u>
6.03	722.13	<u>5.64</u>		
<u>8.41</u>	867.52	4.49	<u>1.12</u>	
	719.97	7.48	15.58	<u>.74</u>
	202.29	7.76	597.92	.91
<u>.68</u>	173.22	7.39	939.84	.78
3.19	761.18	2.18	26.41	8.73
<u>934.42</u>	<u>.75</u>	<u>.03</u>	<u>6.54</u>	<u>233.87</u>
16	17	18	19	20
15.65	421.63	4.79	77.28	68.38
492.80	<u>9.07</u>	3.67	13.19	3.97
7.03		11.10	.44	.74
<u>.01</u>		<u>6.52</u>	5.52	5.21
	<u>.58</u>		<u>8.90</u>	<u>.50</u>
	793.10			
<u>8.74</u>	406.52	<u>.99</u>		
1.03	<u>.08</u>	.72	<u>.73</u>	<u>3.81</u>
.95		<u>8.00</u>	3.62	678.31
<u>68.43</u>			9.10	291.84
	<u>.24</u>		451.85	<u>938.63</u>
	4.19	<u>3.66</u>	<u>.60</u>	
<u>.22</u>	8.37	4.50		
9.76	5.86	10.50		<u>7.07</u>
<u>3.19</u>	<u>761.18</u>	<u>2.19</u>	<u>26.35</u>	<u>3.78</u>

Lesson 6--Credit Balance

1	2	3	4	5
.25	6.22	5.45	114.20	286.29
<u>.78-</u>	<u>6.37-</u>	<u>8.70-</u>	<u>572.72-</u>	<u>531.08-</u>
6	7	8	9	10
806.29	806.92	138.94	734.07	532.81
<u>916.91-</u>	<u>955.81-</u>	<u>274.18-</u>	<u>981.30-</u>	<u>666.78-</u>
11	12	13	14	15
1.80	2.30	.43	7.15	.54
8.54-	256.57	.38	118.40	382.25-
6.71-	872.90-	50.31-	538.07-	688.42-
7.91	156.22	1.62	65.62	19.26
9.12	56.32	.78-	284.25-	900.00-
6.12-	7.49	3.03	703.52	54.84-
7.76	26.37-	.37	919.67	7.19
4.68-	678.47-	8.29-	3.06-	905.77-
6.26	95.04	37.69	87.27	5.03
9.28-	517.34	3.34	949.80-	.46
6.47	62.86-	.09	803.08-	213.44-
<u>6.94-</u>	<u>8.17</u>	<u>7.68</u>	<u>903.72-</u>	<u>.22</u>
16	17	18	19	20
8.15	.84	1.34	3.53	278.89
.55	2.54	.42	3.42	445.54
469.24-	95.53	24.47-	515.59	564.19
.25	9.65	5.43	.51-	278.89-
5.32	651.50-	5.09	4.15	241.73-
54.50	.34	356.52	74.15-	389.13
4.80	40.75-	6.04	.43	424.92-
4.10	7.74	.49	576.35-	454.32-
45.64-	.14	852.58-	4.31	992.78-
5.40-	2.57-	.44	94.41-	552.16
.04	48.58	.05	.56	332.14
<u>2.67</u>	<u>4.51</u>	<u>52.59-</u>	<u>4.39</u>	<u>225.87-</u>

Lesson 6--Continued

21	22	23	24	25
8.56 <u>14.64-</u>	636.92 <u>922.15-</u>	7.71 <u>9.81-</u>	715.13 <u>911.63-</u>	225.68 <u>534.67-</u>
_____	_____	_____	_____	_____
26	27	28	29	30
481.86 <u>682.85-</u>	4.80 <u>5.87-</u>	979.56 <u>988.68-</u>	9.51 <u>14.98-</u>	543.21 <u>678.90-</u>
_____	_____	_____	_____	_____

Lesson 7--Constant Multiplication

1. $65 \times \$1.25 =$ _____

16. $56 \times \$1.50 =$ _____

2. $58 \times \$1.25 =$ _____

17. $32 \times \$1.50 =$ _____

3. $45 \times \$1.25 =$ _____

18. $33 \times \$1.50 =$ _____

4. $22 \times \$1.25 =$ _____

19. $28 \times \$1.50 =$ _____

5. $60 \times \$1.25 =$ _____

20. $38 \times \$1.50 =$ _____

6. $45 \times \$.98 =$ _____

21. $21 \times \$5.75 =$ _____

7. $95 \times \$.98 =$ _____

22. $30 \times \$5.75 =$ _____

8. $52 \times \$.98 =$ _____

23. $24 \times \$5.75 =$ _____

9. $29 \times \$.98 =$ _____

24. $18 \times \$5.75 =$ _____

10. $13 \times \$.98 =$ _____

25. $72 \times \$5.75 =$ _____

11. $95 \times \$4.32 =$ _____

26. $35 \times \$2.25 =$ _____

12. $48 \times \$4.32 =$ _____

27. $29 \times \$2.25 =$ _____

13. $24 \times \$4.32 =$ _____

28. $53 \times \$2.25 =$ _____

14. $7 \times \$4.32 =$ _____

29. $42 \times \$2.25 =$ _____

15. $56 \times \$4.32 =$ _____

30. $75 \times \$2.25 =$ _____

Lesson 8--Percentages

What percent is

1. 23.00 of 47.00? _____
2. 321.50 of 493.72? _____
3. 8891.55 of 9614.00? _____
4. 6580.51 of 7230.40? _____
5. 425.20 of 592.80? _____
6. 890.60 of 1152.10? _____
7. 354.00 of 400.75? _____
8. 119.60 of 644.30? _____
9. 644.30 of 790.25? _____
10. 1240.32 of 1371.52? _____
11. 2500.00 of 2890.45? _____
12. 3081.55 of 3546.10? _____
13. 6855.22 of 6588.90? _____
14. 4921.00 of 5030.10? _____
15. 755.63 of 891.44? _____
16. 450.56 of 475.81? _____
17. 721.30 of 866.45? _____
18. 1962.08 of 2045.10? _____
19. 6230.50 of 7500.29? _____
20. 1860.33 of 2134.50? _____
21. 340.55 of 385.13? _____
22. 745.31 of 790.56? _____
23. 1483.20 of 1504.26? _____
24. 3251.20 of 3371.40? _____
25. 824.91 of 894.26? _____
26. 1486.31 of 1590.70? _____
27. 928.50 of 1301.46? _____
28. 561.33 of 674.10? _____
29. 504.22 of 549.88? _____
30. 3674.28 of 6945.30? _____

Lesson 9--Interest

$$\text{Interest Formula} = \frac{\text{Principal} \times \text{Rate} \times \text{Days}}{360 \text{ Days}}$$

	<u>Amount</u>	<u>Rate</u>	<u>Days</u>	<u>Interest</u>
1.	\$1435	.06	43	_____
2.	1629	.06	52	_____
3.	1837	.06	63	_____
4.	1969	.06	75	_____
5.	2175	.06	22	_____
6.	1324	.06	19	_____
7.	1585	.06	34	_____
8.	1895	.06	45	_____
9.	1909	.06	16	_____
10.	2165	.06	29	_____
11.	1588	.07	32	_____
12.	1796	.07	25	_____
13.	1843	.07	47	_____
14.	1974	.07	56	_____
15.	2761	.07	56	_____

Lesson 9--Continued

	<u>Amount</u>	<u>Rate</u>	<u>Days</u>	<u>Interest</u>
16.	\$1242	.06	15	_____
17.	1592	.06	21	_____
18.	1387	.06	23	_____
19.	1699	.06	32	_____
20.	1275	.06	40	_____
21.	2654	.08	29	_____
22.	1755	.08	38	_____
23.	1355	.08	17	_____
24.	1270	.08	24	_____
25.	1387	.08	33	_____
26.	2985	.08	36	_____
27.	1912	.06	47	_____
28.	1858	.06	53	_____
29.	1450	.06	27	_____
30.	1483	.06	38	_____

Lesson 10--Percentage of Increase and Decrease

\$360 Newer Number
 -200 Older Number

$$160 \div 200 = .80 = 80\%$$

\$160 Amount of Increase
 or Decrease

	<u>Last Week</u>	<u>This Week</u>	=	<u>Amt. of Inc. or Dec.</u>	=	<u>% of Inc. or Dec.</u>
1.	\$200	\$360	=	_____	=	_____
2.	450	600	=	_____	=	_____
3.	320	450	=	_____	=	_____
4.	689	439	=	_____	=	_____
5.	516	919	=	_____	=	_____
6.	66	86	=	_____	=	_____
7.	391	595	=	_____	=	_____
8.	291	295	=	_____	=	_____
9.	86	80	=	_____	=	_____
10.	255	314	=	_____	=	_____
11.	168	172	=	_____	=	_____
12.	685	650	=	_____	=	_____
13.	985	867	=	_____	=	_____
14.	257	193	=	_____	=	_____
15.	285	256	=	_____	=	_____

Lesson 10--Continued

	<u>Last Week</u>	<u>This Week</u>	<u>Amt. of Inc. or Dec.</u>	<u>% of Inc. or Dec.</u>
16.	\$667	\$775	= _____	_____
17.	940	352	= _____	_____
18.	928	751	= _____	_____
19.	154	460	= _____	_____
20.	715	853	= _____	_____
21.	465	712	= _____	_____
22.	547	877	= _____	_____
23.	388	785	= _____	_____
24.	365	926	= _____	_____
25.	400	551	= _____	_____
26.	762	580	= _____	_____
27.	920	320	= _____	_____
28.	500	467	= _____	_____
29.	261	417	= _____	_____
30.	458	755	= _____	_____

Lesson 11--Discounts

	<u>Discount</u>			<u>Net Amount</u>
\$624.16	Gross Amount		\$624.16	Gross Amount
<u>x.125</u>	Discount Rate (12½%)		<u>x.875</u>	Net Amount Percent (100-12½%)
\$ 78.02	Discount		\$546.14	Net Amount

	<u>Gross Amount</u>		<u>Discount Rate</u>		<u>Discount</u>	<u>Net Amount</u>
1.	\$624.16	less	12 1/2%	=	_____	_____
2.	894.79	less	7 1/2%	=	_____	_____
3.	147.15	less	37 1/2%	=	_____	_____
4.	86.55	less	15%	=	_____	_____
5.	562.50	less	17 1/2%	=	_____	_____
6.	324.56	less	22 1/2%	=	_____	_____
7.	847.76	less	15%	=	_____	_____
8.	11.30	less	20%	=	_____	_____
9.	798.50	less	22 1/2%	=	_____	_____
10.	638.24	less	30%	=	_____	_____
11.	624.16	less	25%	=	_____	_____
12.	732.48	less	7 1/2%	=	_____	_____
13.	236.09	less	12 1/2%	=	_____	_____
14.	79.31	less	25%	=	_____	_____
15.	632.45	less	17%	=	_____	_____

Lesson 11--Continued

	<u>Gross Amount</u>		<u>Discount Rate</u>		<u>Discount</u>	<u>Net Amount</u>
16.	\$509.50	less	42 1/2%	=	_____	_____
17.	820.60	less	27 1/2%	=	_____	_____
18.	980.75	less	37 1/2%	=	_____	_____
19.	840.50	less	25%	=	_____	_____
20.	100.13	less	39%	=	_____	_____
21.	343.32	less	5%	=	_____	_____
22.	416.97	less	32%	=	_____	_____
23.	694.36	less	25 1/2%	=	_____	_____
24.	908.89	less	39%	=	_____	_____
25.	211.00	less	76%	=	_____	_____
26.	100.52	less	30%	=	_____	_____
27.	800.00	less	24 1/4%	=	_____	_____
28.	295.69	less	35%	=	_____	_____
29.	85.39	less	58%	=	_____	_____
30.	582.14	less	2 1/2%	=	_____	_____

Lesson 12--Chain Discounts

1. \$380.25 less 15-10-2 $\frac{1}{2}$ % = _____
2. 226.10 less 12 $\frac{1}{2}$ -10-5 = _____
3. 351.16 less 20-10-10 = _____
4. 402.18 less 25-10-10 = _____
5. 435.15 less 20-10-5 = _____
6. 165.40 less 20-10-5 = _____
7. 325.00 less 20-10-2 $\frac{1}{2}$ = _____
8. 366.04 less 25-10-5 = _____
9. 426.64 less 10-10-5 = _____
10. 475.00 less 15-10-5 = _____
11. 370.15 less 10-10-2 = _____
12. 163.40 less 15-5 = _____
13. 575.00 less 20-10-10 = _____
14. 28.79 less 5-2 $\frac{1}{2}$ = _____
15. 13.44 less 33-5 = _____

Lesson 12--Continued

$$16. \quad \$471.88 \text{ less } 62-5-2\frac{1}{2}\% = \underline{\hspace{2cm}}$$

$$17. \quad 35.62 \text{ less } 10-10-5 = \underline{\hspace{2cm}}$$

$$18. \quad 109.70 \text{ less } 15-10-5 = \underline{\hspace{2cm}}$$

$$19. \quad 66.45 \text{ less } 37-5-10 = \underline{\hspace{2cm}}$$

$$20. \quad 80.67 \text{ less } 20-10-10 = \underline{\hspace{2cm}}$$

$$21. \quad 725.30 \text{ less } 25-10-10\% = \underline{\hspace{2cm}}$$

$$22. \quad 48.73 \text{ less } 33-10-5 = \underline{\hspace{2cm}}$$

$$23. \quad 150.65 \text{ less } 20-5-2 = \underline{\hspace{2cm}}$$

$$24. \quad 288.30 \text{ less } 10-10-10 = \underline{\hspace{2cm}}$$

$$25. \quad 179.64 \text{ less } 5-15-10 = \underline{\hspace{2cm}}$$

$$26. \quad 745.33 \text{ less } 10-10-15 = \underline{\hspace{2cm}}$$

$$27. \quad 621.90 \text{ less } 15-5-2\frac{1}{2}\% = \underline{\hspace{2cm}}$$

$$28. \quad 390.84 \text{ less } 5-5-5 = \underline{\hspace{2cm}}$$

$$29. \quad 9.73 \text{ less } 25-10-10 = \underline{\hspace{2cm}}$$

$$30. \quad 77.11 \text{ less } 5-5-2 = \underline{\hspace{2cm}}$$

Lesson 13--Payroll

Gross Pay = Weekly Hours x Hourly Rate

FICA Tax = Gross Pay x 5.5%

Total Deductions = FICA Taxes + Income Tax + Other Deductions

Net Pay = Gross Pay - Total Deductions

PAYROLL

Emp. No.	Exemptions	Hours	Rate	Gross Pay	Income Tax	FICA Tax	Insurance	Bonds	Total	Net Earnings
1	2	38	2.16				1.60	6.25		
2	1	36	2.85							
3	3	39	3.90							
4	2	35	4.00					6.25		
5	4	40	3.75				2.20			
6	5	39	2.88				2.60			
7	4	30	2.95				2.20			
8	1	20	3.90					6.25		
9	1	39	3.90							
10	1	36	2.16							
11	2	25	2.88				1.60	6.25		
12	3	39	3.75							

Lesson 13--Continued

PAYROLL

Emp. No.	Exemptions	Hours	Rate	Gross Pay	Income Tax	FICA Tax	Insurance	Bonds	Total	Net Earnings
13	4	38	2.80							
14	1	37	2.80							
15	5	40	2.70							
16	3	34	3.50							
17	3	36	3.50							
18	2	39	3.80							
19	4	40	3.50							
20	4	40	4.20							
21	2	40	4.00							
22	1	31	3.80							
23	1	34	3.80							
24	3	35	3.50							
25	4	36	2.70							
26	3	37	2.80							
27	2	39	4.00							

Lesson 14--Proration

Prorating Factor = Amount to be Prorated ÷ Basic Factor

Prorated Amount = Share of each Unit x Prorating Factor

	<u>Department</u>	<u>Square Feet Occupied</u>	<u>Amount Charged Each Dept.</u>
1.	Grocery	800	\$ _____
2.	Produce	600	_____
3.	Bakery	400	_____
4.	Drugs	500	_____
5.	Meat	<u>900</u>	_____
	Totals	3,200	\$4,800

	<u>Person</u>	<u>Investment</u>	<u>Profit</u>
6.	A	\$ 3,500	\$ _____
7.	B	21,800	_____
8.	C	6,500	_____
9.	D	4,100	_____
10.	E	7,700	_____
11.	F	13,700	_____
12.	G	<u>29,000</u>	_____
	Totals	\$ _____	\$3,600

Lesson 14--Continued

	<u>Person</u>	<u>Investment</u>	<u>Profit</u>
13.	A	\$28,000	_____
14.	B	17,000	_____
15.	C	8,900	_____
16.	D	2,200	_____
17.	E	4,700	_____
18.	F	<u>26,000</u>	_____
	Total	\$ _____	\$8,200

	<u>Person</u>	<u>Investment</u>	<u>Profit</u>
19.	A	\$44,150	_____
20.	B	12,386	_____
21.	C	11,987	_____
22.	D	72,583	_____
23.	E	10,705	_____
24.	F	6,574	_____
25.	G	12,162	_____
26.	H	<u>8,059</u>	_____
	Total	\$ _____	\$57,942.00

	<u>Person</u>	<u>Investment</u>	<u>Profit</u>
27.	A	\$35,404	_____
28.	B	26,786	_____
29.	C	45,231	_____
30.	D	37,269	_____
31.	E	<u>25,310</u>	_____
	Total	\$ _____	\$75,000.00

Lesson 15--Review

Directions: Write your answer to the problem in the space provided. Round off all answers to two places. Do each problem only once.

ADDITION

1	2	3	4	5
752.02	820.40	932.15	203.75	386.40
832.84	238.09	<u>345.85</u>	<u>584.20</u>	<u>812.80</u>
570.73	702.83	_____	_____	_____
623.46	836.32			
410.65	461.56			
989.76	624.05	MULTIPLICATION		
328.23	258.63			
207.10	947.40	6	7	8
185.66	436.06			
<u>320.27</u>	<u>317.18</u>	145.812	85.875	193.634
_____	_____	<u>75.175</u>	<u>193.634</u>	<u>62.333</u>
		_____	_____	_____
SUBTOTAL				

9

457.86
6.06
-27.41
4.60
120.32

627.30
12.00
6.00
-39.50
101.01

DIVISION

10. $178.864 \div 1.74 =$ _____
11. $29.467 \div .387 =$ _____
12. $95.625 \div 21.53 =$ _____

CONSTANT MULTIPLICATION

13. $63 \times 2.25 =$ _____
14. $48 \times 2.25 =$ _____
15. $60 \times 2.25 =$ _____
16. $75 \times 2.25 =$ _____

What % is

17. 119.50 of 653.61? _____

18. 561.33 of 582.61? _____

Find the Discount and the Net Amount:

19. 378.25 less 15% Discount _____ Net Amount _____

20. 563.75 less 10% Discount _____ Net Amount _____

Lesson 15--Continued

Find percentage of Increase or Decrease:

	<u>Last Week</u>	<u>This Week</u>	<u>Amt. of Inc. or Dec.</u>	<u>% of Inc. or Dec.</u>
21.	630	960	_____	_____
22.	406	729	_____	_____

Find the Interest:

	<u>Principal</u>	<u>Rate</u>	<u>Time</u>	=	_____
23.	\$5,296	6%	34	=	_____
24.	5,810	7%	17	=	_____

Find the net amount of the following:

25.	545.25 less 20-10-10%	=	_____
26.	931.76 less 20-20-10%	=	_____

PAYROLL

	<u>Exemp-tions</u>	<u>Hours</u>	<u>Rate</u>	<u>Gross Pay</u>	<u>Income Tax</u>	<u>FICA Tax</u>	<u>Insurance</u>	<u>Bonds</u>	<u>Total</u>	<u>Net Earnings</u>
27.	1	37	3.80				7.50	1.25		
28.	2	39	4.00				6.25	1.60		

PRORATION

	<u>Person</u>	<u>Investment</u>	_____
29.	A	850	_____
30.	B	1,275	_____
31.	C	3,150	_____
32.	D	<u>975</u>	_____
	Total	_____	\$67,000.00

APPENDIX B

MONROE ELECTRONIC PROGRAMMABLE PRINTING CALCULATOR TEST

Directions: Write your answer to the problem in the space provided. Round off all answers to two places.

ADDITION

1	2
503.68	635.92
671.50	350.11
649.31	861.22
23.86	38.75
981.09	9.42
522.02	560.31
68.53	954.64
932.42	38.74
21.65	4.67
<u>445.84</u>	<u>123.44</u>
_____	_____

SUBTOTAL

9
146.28
-71.31
54.54
316.47
<u>-47.99</u>

<u>59.64</u>
911.19
634.68
-41.81
<u>70.12</u>

SUBTRACTION

3	4	5
121.01	86.39	635.27
<u>84.21</u>	<u>354.08</u>	<u>46.05</u>
_____	_____	_____

MULTIPLICATION

6	7	8
346.186	154.462	765.258
<u>21.064</u>	<u>867.678</u>	<u>35.789</u>
_____	_____	_____

DIVISION

- 10. $7,498.75 \div 23.50 =$ _____
- 11. $4,511.55 \div 98.90 =$ _____
- 12. $8,145.00 \div 78.50 =$ _____

CONSTANT MULTIPLICATION

- 13. $81 \times 1.75 =$ _____
- 14. $35 \times 1.75 =$ _____
- 15. $56 \times 1.75 =$ _____
- 16. $72 \times 1.75 =$ _____

What % is

- 17. 259.07 of 571.18? _____
- 18. 761.75 of 829.15? _____

Find the Discount and the Net Amount

- 19. 738.24 less 18% Discount _____ Net Amount _____
- 20. 669.70 less 25% Discount _____ Net Amount _____

Test--Continued

Find the Percentage of Increase or Decrease:

	<u>Last Week</u>	<u>This Week</u>	<u>Amt. of Inc. or Dec.</u>	<u>% of Inc. or Dec.</u>
21.	400	551	_____	_____
22.	926	365	_____	_____

Find the Interest:

	<u>Principal</u>	<u>Rate</u>	<u>Time</u>	=	_____
23.	\$1,728	6%	18	=	_____
24.	1,270	7%	48	=	_____

Find the Net Amount of the Following:

25.	\$922.35	less	10-5-15%	=	_____
26.	712.80	less	25-10-5%	=	_____

PAYROLL

	<u>Exemp-tions</u>	<u>Hours</u>	<u>Rate</u>	<u>Gross Pay</u>	<u>Income Tax</u>	<u>FICA Tax</u>	<u>Insurance</u>	<u>Bonds</u>	<u>Total</u>	<u>Net Earnings</u>
27.	2	37	3.80				7.50	1.25		
28.	1	39	4.00				6.25	1.60		

PRORATION

	<u>Person</u>	<u>Investment</u>	
29.	A	6,320	_____
30.	B	2,460	_____
31.	C	2,950	_____
32.	D	4,860	_____
33.	E	<u>4,410</u>	_____
	Total	_____	\$35,600

QUESTIONNAIRE

Name _____ Date _____

Sex _____ Classification _____

How many office machines have you operated in class?

The following questions pertain to the instructional unit on the Monroe Electronic Programmable Printing Calculator that you have completed.

1. Were the instructions clearly stated and easy to understand?

Always _____ Usually _____ Seldom _____

2. Should the taped instructions contain either more or less explanation of machine operation?

More _____ Less _____ Same Amount _____

3. Do you believe that you learned faster from the taped instructions than you might have from verbal instruction by your teacher?

Yes _____ No _____

4. On an average, how many times did you listen to instructions for each lesson?

Once _____ Twice _____ Three Times _____ Four Times _____

5. Did you have enough time to complete the assignments?

Yes _____ No _____

6. How much individual help did you require from the instructor as compared with the other machines?

More _____ Less _____ About the Same _____

7. Would you prefer to read your instructions or to hear them from the tape recorder?

Read _____ Tape Recorder _____

8. Would you like to have taped instructions for other machines used in this class?

Yes _____ No _____

9. If yes, how many of the machines?

One _____ Two _____ Three _____ All _____

10. Do you believe that you have as thorough an understanding of the Monroe Electronic Programmable Printing Calculator as you do of the other machines operated in this class?

Yes _____ No _____

11. How did your final test grade compare to the grades earned on the other machines with which you have worked?

Better _____ About the Same _____ Worse _____

12. What did you like best about this instructional unit?

13. What did you like least about this instructional unit?

14. Additional Comments:
