DEVELOPMENT OF A WORKBOOK FOR BUSINESS MATHEMATICS

BASED ON THE NEEDS OF STUDENTS OF BUSINESS AT

NORTH TEXAS STATE TEACHERS COLLEGE

APPROVED:

Byron L. Newton
Major Professor

G.R. Brookshee
Minor Professor

O.J. Curry
Dean of the School of Business Administration

Jack Johnson
Dean of the Graduate School
DEVELOPMENT OF A WORKBOOK FOR BUSINESS MATHEMATICS
BASED ON THE NEEDS OF STUDENTS OF BUSINESS AT
NORTH TEXAS STATE TEACHERS COLLEGE

THESIS

Presented to the Graduate Council of the North
Texas State Teachers College in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF BUSINESS ADMINISTRATION

By

Walter Maxey Williams, B. S.
149480
Dexter, Texas

August, 1947
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>iv</td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td></td>
</tr>
<tr>
<td>Purpose of the Study</td>
<td></td>
</tr>
<tr>
<td>Method of Procedure</td>
<td></td>
</tr>
<tr>
<td>Related Studies</td>
<td></td>
</tr>
<tr>
<td>Scope of the Problem</td>
<td></td>
</tr>
<tr>
<td>II. HOW THE WORKBOOK WAS DEVELOPED</td>
<td>6</td>
</tr>
<tr>
<td>Business Subjects Dependent upon Business Mathematics</td>
<td></td>
</tr>
<tr>
<td>III. DISCUSSION OF THE WORKBOOK</td>
<td>15</td>
</tr>
<tr>
<td>Contents of the Workbook</td>
<td></td>
</tr>
<tr>
<td>IV. SUMMARY AND CONCLUSIONS</td>
<td>27</td>
</tr>
<tr>
<td>Summary of the Workbook</td>
<td></td>
</tr>
<tr>
<td>Conclusion</td>
<td></td>
</tr>
<tr>
<td>APPENDIX</td>
<td>32</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td></td>
</tr>
</tbody>
</table>
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Analysis of the Types of Problems Included in the Workbook</td>
<td>28</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

Statement of the Problem

The business mathematics courses offered by colleges and high schools are of a varied nature. Since the field of business mathematics takes in such a variety of topics and the average college semester gives time for only approximately fifty-four class meetings, out of which an allowance must be made for tests and other normal interruptions, it would be impossible to even touch on all the subjects in the field. The breadth of the field, and the differences of opinion as to what should be taught are the principal reasons why so many texts and workbooks are being used at the present time. Since the field is so broad and the time will not permit all the topics that are included under the heading of business mathematics to be covered, the workbook and text used should be one that fits the needs of the students being taught.

The problem of this study, The Development of a Workbook for Business Mathematics Based on the Needs of Students of Business at North Texas State Teachers College, is to determine the needs of students who are majoring
in business and to design a workbook that will best prepare these students for the business courses offered at North Texas State Teachers College and for the problems of everyday life. As many topics as time will permit will be touched upon, and the time allotted each topic will be based upon the relative importance of the topic.

The problem is strictly one of developing a business mathematics workbook, and no attempt is being made to provide a teachers' manual or a key to the solution of the problems in the workbook.

**Purpose of the Study**

The purpose of this study is to review the business courses offered at North Texas State Teachers College to determine what business mathematics is required for a thorough understanding of these courses, and to develop a business arithmetic workbook to meet the needs of students taking these courses. The importance of business arithmetic in accounting, and the fact that it is an essential part of the training for most of the clerical positions makes the subject a necessary link in the training program of all students of business. If the student is equipped with an adequate knowledge of business mathematics, then the teacher of the other business courses can spend more time explaining the principles of the subject without first
having to review or even teach the student the arithmetic required for mastering the course.

Method of Procedure

A thorough study was made to find out what topics were included in all the principal business mathematics texts and workbooks. This information was compiled and then a survey of the business courses offered at North Texas State Teachers College was made along with the requirements of these courses. This survey revealed what business mathematics was actually needed for the student who planned to major in the field of business. With the information that was acquired from the above surveys the workbook was designed to better prepare students majoring in business. The special instructions, illustrations, and problems in the workbook are planned to give a student a knowledge of mathematics which will enable him to master any problem that might be encountered in any of the courses offered by the business department.

Teachers in the business department were interviewed to find out what types of business mathematics problems were needed. It was found, from the interview with the teachers, just what type of problem the student had shown weakness in, and what type of problem should be shown preference. All this was taken into consideration in the preparation of the workbook.
Related Studies

Practically all business mathematics texts and workbooks are, in the opinion of their authors, designed to fit the specific needs of students. The remaining few are designed to give students a general background in mathematics which, also in the eyes of their authors, is the "specific" need of the students.

The following are paragraphs taken from the introductions of two well-known business mathematics texts:

Commercial arithmetic is strictly a vocational subject. In view of this vocational aim, the content of the text has been limited to such topics as are of direct commercial value, and the practices and techniques used are those that prevail on the job.\(^1\)

An entirely new organization of the material is presented in this fourth edition of Applied Business Arithmetic. The basis for the presentation is the application of business arithmetic to the practical problems found in the major fields of an individual's daily activities. Business arithmetic is applicable specifically to two major phases of an individual's daily life; to the solution of his personal problems and to the solution of problems that confront him in his business activities.\(^2\)

All business mathematics texts and workbooks are related studies since they were designed by their authors to fit the specific needs of students. The workbook


developed in this thesis is designed to fit the specific needs of students majoring in business at North Texas State Teachers College.

Scope of the Problem

This study is concerned with the development of a business mathematics workbook of college level with emphasis on the preparation of students who intend to go farther into the field of business. The workbook is arranged in a logical, progressive manner so that the student may proceed from one unit to the next until the final unit is reached and the student has a well-rounded knowledge of business mathematics. The workbook is so planned as to allow the instructor fifty lessons to cover the course with the four remaining periods during the semester for testing purposes. If additional periods are needed for testing, then arrangements would have to be made to double up on the regular assignments in order to provide more time for testing or examination.
CHAPTER II

HOW THE WORKBOOK WAS DEVELOPED

A survey was made of all available business arithmetic texts and workbooks to determine just what was included in these books. A list of every topic that had been included in these books was made. From this list were chosen the most important subjects, or rather, the subjects that would be the most helpful to students majoring in the field of business. Topics of lesser importance were either touched upon lightly or completely eliminated from the workbook. The importance of certain subjects was determined, in part, by the number of authors who included the subject as part of their texts and workbooks.

A survey was made of four leading business mathematics workbooks. The workbooks were Business Mathematics for Colleges by Louis A. Rice, Alfred C. Boyd, and F. Blair Mayne; Business Mathematics, by R. Robert Rosenberg; Business Mathematics for College Students by George H. Whiteaker; and College Business Arithmetic by J. Marshall Hanna and Arthur L. Walker. It was interesting to note the differences of opinion of these authors as to what
should and should not be included in a business mathematics workbook.

The following results were observed from the survey of the four business mathematics workbooks:

<table>
<thead>
<tr>
<th>Topics Included in the Four Workbooks</th>
<th>Number of Workbooks Including Each Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fundamental Processes</td>
<td>4</td>
</tr>
<tr>
<td>2. Decimals</td>
<td>4</td>
</tr>
<tr>
<td>3. Fractions</td>
<td>4</td>
</tr>
<tr>
<td>4. Aliquot Parts</td>
<td>4</td>
</tr>
<tr>
<td>5. Checks and Check Stubs</td>
<td>2</td>
</tr>
<tr>
<td>6. Selling and Billing</td>
<td>2</td>
</tr>
<tr>
<td>7. Pay Rolls</td>
<td>4</td>
</tr>
<tr>
<td>8. Ratio and Proportion</td>
<td>2</td>
</tr>
<tr>
<td>9. Percentage</td>
<td>4</td>
</tr>
<tr>
<td>10. Discounts</td>
<td>4</td>
</tr>
<tr>
<td>11. Interest</td>
<td>4</td>
</tr>
<tr>
<td>12. Finding the Time Between Two Dates, and Due Date</td>
<td>4</td>
</tr>
<tr>
<td>13. Profit and Loss Statements and Balance Sheet</td>
<td>3</td>
</tr>
<tr>
<td>14. Installment Buying</td>
<td>3</td>
</tr>
<tr>
<td>15. Bank Discount</td>
<td>4</td>
</tr>
<tr>
<td>16. Partial Payments</td>
<td>3</td>
</tr>
<tr>
<td>17. Commission and Brokerage</td>
<td>2</td>
</tr>
<tr>
<td>18. Marked Price</td>
<td>4</td>
</tr>
<tr>
<td>19. Inventory and Turnover</td>
<td>1</td>
</tr>
<tr>
<td>20. Depreciation and Distribution of Overhead</td>
<td>1</td>
</tr>
<tr>
<td>21. Social Security, Sales and Property Tax, and Customs</td>
<td>2</td>
</tr>
<tr>
<td>22. Credit Instruments</td>
<td>3</td>
</tr>
<tr>
<td>23. Discounting and Commercial Paper</td>
<td>3</td>
</tr>
<tr>
<td>24. Computing Other Interest Variables</td>
<td>1</td>
</tr>
<tr>
<td>25. Insurance</td>
<td>2</td>
</tr>
<tr>
<td>26. Annuities</td>
<td>1</td>
</tr>
<tr>
<td>27. Stocks and Bonds</td>
<td>2</td>
</tr>
<tr>
<td>28. Graphs</td>
<td>1</td>
</tr>
<tr>
<td>29. Compound Interest</td>
<td>2</td>
</tr>
<tr>
<td>30. Square Root</td>
<td>1</td>
</tr>
<tr>
<td>31. Weights and Measures</td>
<td>2</td>
</tr>
</tbody>
</table>
These four workbooks were designed to fit specific needs of students and this was the main reason for the difference of opinion as to what should have been included. The first serious disagreement was on Checks and Check Stubs and Selling and Billing which were included by only two of the authors. It is interesting to note that only two of the authors included Ratio and Proportion as part of the curriculum of their workbooks since Ratio and Proportion can be used to solve so many different types of problems, and so many students either did not get it in high school, or had it and did not retain the knowledge. Commission and Brokerage were also included in only two workbooks.

Only one of the authors included Inventory and Turnover, Depreciation and Distribution of Overhead, Computing Other Interest Variables, Annuities, Graphs, and Square Root in his workbook. It was probably the opinion of the other authors that these topics could be learned in accounting, insurance, or statistics, but on the other hand the accounting, insurance, and statistics courses could be understood more thoroughly if these topics were presented in business mathematics.

The following topics were included in two of the workbooks: Social Security, Sales and Property Tax, and Customs; Insurance; Stocks and Bonds; Compound Interest; and Weights and Measures.
Since the time for teaching a business mathematics course is approximately fifty-four class meetings, the material must be cut down and condensed in order to cover the most important topics.

One of the main problems in developing a workbook, after having decided upon the topics to be included, is how much time is to be spent on each of the topics, and just how thoroughly they are to be explained. This problem was somewhat remedied after a thorough study of the courses offered by the School of Business of the North Texas State Teachers College.

Business Subjects Dependent upon Business Mathematics

Upon examination of the curriculum of the School of Business Administration, North Texas State Teachers College, it was found that the following subjects are in some degree dependent upon business arithmetic for a thorough understanding of the subject. The subjects are Secretarial Accounting, Principles of Accounting, Intermediate Accounting, Office Machines, Cost Accounting, Auditing, Statistics, Short Term Finance, Principles of Marketing, Statement Analysis, Income Tax Accounting, Advanced Accounting Principles, and Investments.

Each of these subjects was reviewed and the teacher of each subject was questioned as to what weaknesses
students had shown in mastering each of these subjects. It was found that there had been definite weaknesses in the business mathematics background of a high per cent of the students, and this gave valuable information concerning what topics should be included that were not being included, and what topics should have a greater portion of the total time to be devoted to business mathematics.

The fundamental processes of arithmetic, that is, addition, subtraction, multiplication, and division, are used in all of the above named subjects, and no student can do even fair work in accounting if he does not have an adequate knowledge of these fundamentals. Accuracy, speed, and neatness should also carry over from business mathematics into the other subjects since they are one of the principal objectives of the course. Business mathematics also teaches students to write their figures neatly and legibly, and to be able to transcribe figures with a minimum number of errors.

The study of decimals, fractions, and aliquot parts as presented by business mathematics aids the student in developing short cuts and speed in working problems of accounting. It is very difficult to master an accounting course unless there is a background knowledge of the principles of business arithmetic.
The accounting subjects, that is, Secretarial Accounting, Principles of Accounting, Intermediate Accounting, Cost Accounting, Auditing, and Advanced Accounting Principles, require a broad knowledge of business mathematics for the student to be able to master these subjects. The fundamental processes must be learned by the student if he is to be able to progress rapidly enough to keep up with the speed of the above courses. Decimals and fractions are of equal importance since they will facilitate speed and accuracy. All types of business forms and statements are used in accounting, so the more familiar the student is with business papers the easier it will be, and the more thorough the subject can be comprehended. Inventory, turnover, and depreciation are vital links in the accounting system, and they are taken up to give the student sufficient background for mastering this part of accounting. A large part of the elementary accounting is devoted to exercises and problems that deal with percentage and interest, finding elapsed time and due date, trade and cash discount, and partial payment. Students with a fairly good knowledge of those topics will meet with very little trouble in the accounting problems arising from these topics.

According to teachers who have been teaching the elementary accounting courses, the students have shown a
very inadequate knowledge of credit instruments and bank 
discount. These two topics must be learned by the stu-
dent before the accounting principles based on these cal-
culations can be taught. If the accounting teacher has 
to teach the students the mathematics connected with 
credit instruments and bank discount, that leaves little 
or no time to spend on the accounting principles involved, 
the thing that is actually supposed to be taught.

The Office Machines course should not be attempted by 
a student who does not have a good knowledge of business 
mathematics. In fact, it is the only course offered by 
the School of Business Administration that has business 
mathematics as a prerequisite. Very little mathematics 
is needed for the mastering of the full keyboard adding-
listing machine, and the ten key adding-listing machine. 
On the other hand, for mastering the crank driven calcula-
lator the student should know percentage, discount and 
chain discounts, interest, markup and markdown, recip-
rocals, distribution of overhead, decimal equivalents 
of common fractions, and chain discount equivalents. For 
mastering the key driven calculator course the student 
should have a knowledge of invoices, inventories, sales 
distribution and reports, ledger sheets, freight and par-
cel post charges, deposit slips, markup and markdown, 
pay rolls, and the method of figuring rate of profit 
based on the cost or selling price.
The Statistics course as offered by the School of Business Administration, North Texas State Teachers College, requires that the student understand and be able to use square root and logarithms. All students should have learned square root in high school, but in most high schools square root along with business mathematics is taught in the seventh grade and a high per cent of the students know little or nothing about business mathematics by the time they are graduated. It seems that business mathematics in high schools should be taught in either the junior or senior year where the students, upon graduating, would retain a fairly good knowledge of the subject. Students, to have a complete and thorough knowledge of logarithms, would have to have had a course in trigonometry. The workbook, designed as a part of this thesis, reviews the student in square root and gives explanation and problems in logarithms sufficient to provide him with a background for the course in Statistics. One lesson of the workbook is designed to acquaint the students with simple equations in two unknowns. Many students taking the statistics course do not know how to solve for two unknowns, thus leaving the job of teaching this section of mathematics to the statistics teacher.

The Investments course as offered by the School of Business Administration deals to a large extent with the
problems of the individual investor, business and investment risks, values of corporate securities, and so on. The workbook gives a detailed explanation and problems on stocks and bonds which will aid the student in understanding the investments course.

The courses, Statement Analysis and Principles of Marketing, can be better understood and more can be gained from the subjects if the student first has a broad knowledge of business arithmetic.

As has been stated before, the workbook was designed to better prepare students majoring in business with a background that will enable these students to get more out of the business courses offered at North Texas State Teachers College, as well as prepare them for the problems of everyday life.
CHAPTER III

DISCUSSION OF THE WORKBOOK

The business mathematics workbook consists of exercises and problems on all the important topics of fundamental arithmetic and provides practice in the arithmetic needed for mastering the business courses offered at North Texas State Teachers College. Like all workbooks in business arithmetic, the major objectives are to develop speed and accuracy, develop skill in the use of short cuts, develop ability to make ordinary computations mentally rather than by use of pencil and paper, develop topics that are of particular interest to the student, and to develop habits of accuracy and neatness that will carry over into the other business subjects offered by the business department. The fact that speed should be strived for only after the habits of accuracy have been fixed is pointed out to the student throughout the workbook. The value of neatness in the development of speed and accuracy is also emphasized.

The arrangement of the workbook has been carefully planned so that each successive unit helps in the building of a background for the following units. The workbook is
divided into sixteen units and fifty lessons for the convenience of teaching.

The average college semester is four and one-half months in length. There are eighteen weeks in four and one-half months and a three-hour course meets three times each week, so there are actually fifty-four class meetings in the semester. Since there are only fifty assignments in the workbook, there are four extra class meetings to be used for testing purposes. If this number is considered insufficient, then the instructor may double up on the assignments, taking two per class meeting, to provide additional time for testing.

The units, as they are arranged, contain only one topic or, in some cases, a group of related topics. Each unit is then subdivided into one or more lessons.

Contents of the Workbook

The first unit covers fundamental processes of arithmetic, and the time allotted to this unit is five lessons or five class meetings. This unit contains a vast amount of material but since the students should already know how to add, subtract, multiply, and divide, a large part of the time can be devoted to speed, accuracy, short-cut methods, and methods of proving. One lesson is devoted to each of the four fundamental processes, and the fifth lesson is devoted to stated problems over the four processes.
This does not give the student time to learn all about multiplication, division, addition, and subtraction but he should have done this in high school. Students who are weak in the fundamentals should be urged to do outside work in order to increase their skill.

Unit two takes in the mechanics of decimals and fractions. This, too, should have been learned by the student before enrolling in college, but it is found in many cases that students have a very weak background and need drilling in fractions and in the multiplication and division of decimals. Seven lessons are devoted to this unit. The first two lessons include the handling of decimals. The third is made up of practical problems dealing with decimals. Fractions are handled in about the same way; the first two assignments are on the fundamental operations of fractions and the last, or seventh assignment covers aliquot parts and practical applications in the form of stated problems.

The third unit consists of one lesson on ratio and proportion. The first part of the lesson consists of explanation of ratio and proportion and the last part consists of problems. Ratio and proportion should be understood by all students since a large number of business mathematics problems can be solved by the use of proportion.
Unit four deals with the handling of statements and records, checks and check stubs, and the reconciliation of the bank balance. There are two lessons in this unit, and the main purpose is to familiarize the student with certain statements, records, checks, and check stubs, and how to reconcile a bank statement. Many people, upon receiving their bank statement, have trouble balancing their check stubs against their bank statement. The main purpose of this study is to teach the student the correct procedure to be used in reconciling a bank balance.

The fifth unit deals with selling and billing, requisitions and invoices, and credit memorandums. Since the journal record is not the original evidence of the transaction, accounting students must familiarize themselves with business papers. The movement of business involves the accompanying preparation and use of papers. One lesson is devoted to familiarizing students with the above business papers.

Unit six consists of two lessons on pay rolls, social security deductions, the wage and hour law, the statement of profit and loss, and the balance sheet. This is evidently not sufficient time for mastery of these topics, but it should give the student a general knowledge of each topic. It will greatly help a student enrolling in an accounting course to know the fundamental principles of the
profit and loss statement and the balance sheet. The student is expected to know how to prepare a simple balance sheet, and how to find net sales, the cost of goods sold, gross profit on sales, and the net profit.

Two lessons are devoted to unit seven which covers inventory, turnover, and depreciation. The first lesson is a brief explanation of how inventories are taken, and how they are priced at either cost or selling price, along with the explanation for finding the rate of turnover of stock, and how to figure depreciation. The second lesson consists of problems over the three topics. Finding the rate of turnover should be very simple for the students who have a good knowledge of unit six and understand the profit and loss statement. Depreciation problems are stressed because of the importance the topic carries. In accounting, depreciation problems are frequently encountered. Another reason that depreciation is so important is the income tax system under which we are operating. Fixed asset inventory records should be kept on all fixed properties so that depreciation can be figured on all property owned, and the decrease in value of the property can be considered in a determination of the operating income. Only the straight-line method of figuring depreciation is used in the workbook.
The first seven units and twenty lessons of the workbook are devoted to review work to provide the student with sufficient background to be able to continue with the more difficult material. Students who find the first seven units difficult to master will have to devote much more time to the subject in order to comprehend the last nine units. The main reason for the first seven units is to get all the students on a more or less even footing, regardless of their previous training. With these introductory units, a student with a poor background has an opportunity to learn what he has either missed or forgotten and should be able to master the remaining parts of the workbook.

Unit eight covers percentage and interest, finding elapsed time, and due dates. The unit is divided into four lessons, with the first two being devoted to percentage and problems dealing with per cent. The third lesson covers interest, and the fourth lesson provides practice in finding elapsed time and due dates. It should be stressed in this unit that the following units are solved in a large degree by the information that is learned from this unit. The importance of these topics in accounting, and in the problems of everyday life cannot be over-emphasized.

Unit nine, trade and cash discounts and partial payments, also consists of four lessons. This section carries
a considerable amount of importance, and the problems connected with this unit are somewhat difficult. The first lesson consists entirely of explanation concerning the three topics, trade and cash discount and partial payment. Since these topics are so closely related, they can all be included in the same problem very conveniently. Lesson two deals with cash discount problems. The third lesson consists of problems over both cash discount and partial payment, and the fourth lesson contains problems dealing with the use of cash and trade discount.

The tenth unit deals entirely with marked price; that is, determining the price at which goods must be sold in order to realize a certain profit. The fact that the rate of profit can be based on either the cost or selling price makes the problems dealing with markup more difficult. The unit consists of three lessons, the first being almost entirely devoted to explanations and example problems dealing with marked price. A method is presented in this unit to convert the rate based on the cost into the rate based on the selling price, and vice versa, when either of the rates is known. This enables the students to get a somewhat clearer picture of the problem of marked price. The second lesson covers typical marked price problems, and the third lesson covers practical markup problems that would be encountered in modern business.
Unit eleven covers commission and brokerage, property taxes, and distribution of overhead. Only two lessons are devoted to these topics since they are easy to understand, and the first lesson is devoted to explanations and examples of problems and forms used. The second lesson consists of practical problems dealing with property taxes and distribution of overhead, and with the preparation of account sales and account purchases as they are used in commission and brokerage sales and purchases.

Unit twelve, covering credit instruments and bank discount, is a very important unit as far as accounting is concerned. Business establishments often accept notes to cover bills that their customers cannot pay at their due dates. These notes are known as credit instruments and the two in which we are principally interested are the promissory notes and trade acceptances. The first lesson of this unit is devoted to the explanation of the promissory note and the trade acceptance, what is meant by bank discount, and the discounting of commercial paper. This first lesson is of vital importance to the student, and without it the problems in the following lessons would be very difficult to work. The second lesson consists of problems dealing with the discounting of interest-bearing and non-interest-bearing notes. If the student finds that
the problems in this lesson are not clear, then lesson one should be studied again before attempting problems involving the discounting of notes. The third lesson of this unit covers practical discount problems of the type that would be encountered in business, and the comparison of cash discount with bank discount.

The thirteenth unit, covering compound interest and other interest variables, consists of two lessons. The first lesson covers the explanations and problems of compound interest, while the last lesson is devoted to other interest variables. By other interest variables we mean finding the three other variables in the basic formula

\[ I = Prt \] (meaning interest is equal to principal times rate times time). A simple method for remembering the three formulas for finding the other interest variables is explained in this lesson.

The fourteenth unit of the workbook takes up the subject of installment buying, computing interest on unpaid balances, arithmetic progressions, personal loans, and installment plans. This unit is divided into five lessons, the first two being devoted entirely to explanations and example problems. The third lesson consists of an explanation of installment plans, sample installment problems, and practical problems covering arithmetic progressions and installments. The fourth and fifth lessons
consist entirely of stated installment and personal loan problems along modern business lines. The problems of this unit should not be attempted until the explanations and sample problems have been thoroughly understood. In working the installment problems the students should be urged to work the problems according to steps, labeling each step as he progresses with the problem. The problems in most cases are fairly long and if the parts of the problem are correctly labeled it will aid the student in re-checking the problem for possible errors.

The importance of installment buying and the principle behind the making of installment sales cannot be overemphasized since such a high per cent of all sales are made in this manner. The good points of installment selling should be pointed out along with the many ways that the seller can take advantage of the buyer by using this method of sales. The student, after having studied this unit of the workbook, should be able to investigate all of the advertised rates for installment selling and determine whether the interest is based on the unpaid balances, and what the actual rate of interest is. If time permitted it would be interesting to have each student bring to class an actual installment plan problem from some store in the city.
Unit fifteen, covering square root, logarithms, and simple equations in two unknowns, consists of four lessons. The first two lessons cover explanations and problems of square root. The third lesson deals with explanations and problems in logarithms and antilogarithms, and the fourth lesson deals with the solving for two unknowns. One of the main reasons for including square root, logarithms, and solving for two unknowns is to prepare the business major with a background that would help in mastering the course in business statistics. Square root should still be fairly fresh on the minds of the students since it is taught in high school. A thorough course in logarithms and solving for two unknowns is not being attempted, but rather a knowledge sufficient to enable students to understand statistics without too much mathematical help from the teacher. If the course in statistics should not be taken, the knowledge received will prepare the student with a broader background in the field of mathematics.

The sixteenth and last unit of the workbook is devoted to a discussion of graphs, and stocks and bonds. Three lessons are devoted to this unit; the first covering graphs, and exercises requiring the student to prepare different types of graphs. Lesson two gives an explanation of stocks, and the third lesson covers a discussion
of bonds, and practical problems dealing with the handling of stocks and bonds.

It should be kept in mind that the workbook was designed with emphasis placed on the needs of the business courses available at North Texas State Teachers College.
CHAPTER IV

SUMMARY AND CONCLUSIONS

Summary of the Workbook

Whether or not the workbook accomplishes the five major objectives that it was designed to accomplish will not actually be known until it has been taught. The fact that the workbook is set up to accommodate the average college semester takes the guesswork out of how much time should be spent on each unit. The students and the teacher can see that the semester's work is already laid out and can plan their time economically.

The workbook is complete with explanations and sample problems sufficient for the student to completely master the workbook if carefully studied. Of course, the workbook can serve a much better purpose if the teacher helps to stress the examples and points out the more important points as they are presented.

The workbook is actually a combination text and workbook and has sufficient explanations on each topic for the student to get a complete understanding. After examining the workbook it may be decided that there are too many
problems, but it is much easier for the teacher to leave out some of the problems than to have to make up more problems, or leave the topic not thoroughly explored. It is the author's belief that there are sufficient problems in each unit for the student to become thoroughly familiar with the subject.

In Table 1 are shown the titles of the sixteen units, giving the number of example problems, regular problems, and stated problems included in each unit.

**TABLE 1**

**ANALYSIS OF THE TYPES OF PROBLEMS INCLUDED IN THE WORKBOOK**

<table>
<thead>
<tr>
<th>Unit</th>
<th>Example Problems</th>
<th>Regular Problems</th>
<th>Stated Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Fundamental Processes of Arithmetic</td>
<td>12</td>
<td>138</td>
<td>24</td>
</tr>
<tr>
<td>II Mechanics of Decimals and Fractions</td>
<td>22</td>
<td>172</td>
<td>34</td>
</tr>
<tr>
<td>III Ratio and Proportion</td>
<td>2</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>IV Statements and Cash Records, Checks and Check Stubs, and Reconciliation of Bank Balance</td>
<td>5</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>V Selling and Billing, Requisitions and Invoices, and Credit Memorandums</td>
<td>4</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Unit</td>
<td>Example Problems</td>
<td>Regular Problems</td>
<td>Stated Problems</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>VI</td>
<td>Pay Rolls, Social Security Act, the Wage and Hour Law, and Statement of Profit and Loss and Balance Sheet</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>VII</td>
<td>Inventory, Turnover, and Depreciation</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>VIII</td>
<td>Percentage and Interest, Finding Elapsed Time, and Due Date</td>
<td>12</td>
<td>91</td>
</tr>
<tr>
<td>IX</td>
<td>Trade and Cash Discounts, and Partial Payments</td>
<td>7</td>
<td>13</td>
</tr>
<tr>
<td>X</td>
<td>Marked Price</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>XI</td>
<td>Commission and Brokerage, Property Taxes, and Distribution of Overhead</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>XII</td>
<td>Credit Instruments and Bank Discount</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>XIII</td>
<td>Compound Interest and Other Interest Variables</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>XIV</td>
<td>Installment Buying, Computing Interest on Unpaid Balances, Arithmetic Progressions, Personal Loans, and Installment Plans</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>XV</td>
<td>Square Root, Logarithms, and Simple Equations in Two Unknowns</td>
<td>5</td>
<td>45</td>
</tr>
<tr>
<td>XVI</td>
<td>Graphs, and Stocks and Bonds</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>102</strong></td>
<td><strong>522</strong></td>
<td><strong>219</strong></td>
</tr>
</tbody>
</table>
The workbook contains a total of 102 sample problems. According to teachers who have taught business mathematics, one of the principal weaknesses of most texts and workbooks, in their opinions, is the failure on the part of the author to include enough sample problems. A workbook with sufficient example problems enables a student to gain confidence in his ability to solve problems without the aid of the teacher.

The workbook also contains 522 regular problems which range from simple addition problems to the more complicated problems with several parts. This gives an average of 10.44 of this type of problems per lesson, or 32.625 regular problems per unit.

The workbook also contains 219 stated problems. These problems provide practical applications of the topics covered in the various units of the workbook. This averages 4.38 stated problems per assignment, or 13.69 stated problems within each unit.

The workbook contains sufficient explanation on each type of problem that is presented along with enough sample problems to make it possible for the student to master the entire workbook if enough effort is exerted, and without an undue amount of help from the teacher. The workbook contains a total of 741 problems which is an average of 14.82 problems per lesson, or 46.31 problems
per unit. Since the student is required to work an average of better than fourteen problems for each lesson, he should become thoroughly familiar with each topic that is presented.

Conclusion

In conclusion, it is hoped that this workbook fulfills the two-fold purpose for which it was designed. That is, to prepare students majoring in business with a knowledge of business mathematics sufficient for mastery of the business courses offered at North Texas State Teachers College, and to prepare the student for the problems of everyday life.
PREFACE

The exercises and problems in this workbook provide practice on all the important topics of fundamental arithmetic and of the arithmetic needed in mastering the business courses offered at North Texas State Teachers College.

This workbook endeavors to accomplish the following major objectives:

1. To develop speed and accuracy in the fundamental processes of arithmetic -- that is, addition, subtraction, multiplication, and division.

2. To develop the ability to make ordinary computations mentally rather than by the use of pencil and paper.

3. To develop skill in the use of practicable short cuts in making computations.

4. To develop topics that are of particular interest to the student and will actually aid in a better understanding of the other business subjects.

5. To develop habits of accuracy and neatness that will carry over into the other subjects offered by the School of Business Administration, North Texas State Teachers College.

The importance of business arithmetic in bookkeeping, and its function as an essential link in the chain of training for most all clerical positions, make the subject a most interesting one.

Accuracy is the thing to be strived for at all times, because in business a result is either right or wrong, not partly correct.

Speed should be strived for only when the habits of accuracy have been definitely fixed. Neatness is most valuable and aids in developing both accuracy and speed.
TABLE OF CONTENTS

This workbook is divided into sixteen units, and fifty lessons. That leaves four periods for examinations.

<table>
<thead>
<tr>
<th>Preface</th>
<th>33</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIT I. FUNDAMENTAL PROCESSES OF ARITHMETIC</strong></td>
<td></td>
</tr>
<tr>
<td>Lesson 1. Addition</td>
<td>37</td>
</tr>
<tr>
<td>Lesson 2. Subtraction</td>
<td>42</td>
</tr>
<tr>
<td>Lesson 3. Multiplication</td>
<td>46</td>
</tr>
<tr>
<td>Lesson 4. Division</td>
<td>50</td>
</tr>
<tr>
<td>Lesson 5. Stated Problems over Fundamental Operations</td>
<td>55</td>
</tr>
<tr>
<td><strong>UNIT II. MECHANICS OF DECIMALS AND FRACTIONS</strong></td>
<td></td>
</tr>
<tr>
<td>Lesson 6. Mechanics of Decimals</td>
<td>57</td>
</tr>
<tr>
<td>Lesson 7. Multiplication and Division of Decimals</td>
<td>60</td>
</tr>
<tr>
<td>Lesson 8. Rounding Off Numbers and Practical Problems</td>
<td>63</td>
</tr>
<tr>
<td>Lesson 9. Mechanics of Fractions</td>
<td>66</td>
</tr>
<tr>
<td>Lesson 10. Addition and Subtraction of Fractions</td>
<td>70</td>
</tr>
<tr>
<td>Lesson 11. Multiplication and Division of Fractions</td>
<td>73</td>
</tr>
<tr>
<td>Lesson 12. Aliquot Parts and Business Applications</td>
<td>77</td>
</tr>
<tr>
<td><strong>UNIT III. RATIO AND PROPORTION</strong></td>
<td></td>
</tr>
<tr>
<td>Lesson 13</td>
<td>81</td>
</tr>
<tr>
<td><strong>UNIT IV. STATEMENTS AND CASH RECORDS, CHECKS AND CHECK STUBS, RECONCILIATION OF BANK BALANCE</strong></td>
<td></td>
</tr>
<tr>
<td>Lesson 14. Statements</td>
<td>83</td>
</tr>
<tr>
<td>Lesson 15. Checks, Check Stubs, Deposit Slips, and Reconciliation of Bank Balance</td>
<td>88</td>
</tr>
<tr>
<td><strong>UNIT V. SELLING AND BILLING, REQUISITION AND INVOICES, AND CREDIT MEMORANDUMS</strong></td>
<td></td>
</tr>
<tr>
<td>Lesson 16</td>
<td>95</td>
</tr>
<tr>
<td>UNIT VI. PAY ROLLS, SOCIAL SECURITY ACT, THE WAGE AND HOUR LAW, AND STATEMENT OF PROFIT AND LOSS AND BALANCE SHEET</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Lesson 17. Pay Rolls, Social Security Act, and the Wage and Hour Law</td>
<td>102</td>
</tr>
<tr>
<td>Lesson 18. Profit and Loss Statement and Balance Sheet</td>
<td>106</td>
</tr>
</tbody>
</table>

| UNIT VII. INVENTORY AND TURNOVER, AND DEPRECIATION |
|---|---|
| Lesson 19. Explanations | 109 |
| Lesson 20. Practical Application Problems | 112 |

| UNIT VIII. PERCENTAGE AND INTEREST |
|---|---|
| Lesson 21. Percentage | 115 |
| Lesson 22. Percentage Problems | 118 |
| Lesson 23. Interest | 122 |
| Lesson 24. Finding Elapsed Time, and Due Date | 126 |

| UNIT IX. TRADE AND CASH DISCOUNTS, AND PARTIAL PAYMENTS |
|---|---|
| Lesson 25. Cash Discounts | 130 |
| Lesson 26. Cash Discount Problems | 134 |
| Lesson 27. Cash Discount and Partial Payment Problems | 136 |
| Lesson 28. Cash and Trade Discount Problems | 138 |

| UNIT X. MARKED PRICE |
|---|---|
| Lesson 29. Explanations | 141 |
| Lesson 30. Problems Dealing with Marked Price | 144 |
| Lesson 31. Practical Markup Problems | 146 |

| UNIT XI. COMMISSION AND BROKERAGE, PROPERTY TAXES, AND DISTRIBUTION OF OVERHEAD |
|---|---|
| Lesson 32. Explanations | 148 |
| Lesson 33. Commission and Brokerage | 152 |

| UNIT XII. CREDIT INSTRUMENTS AND BANK DISCOUNT |
|---|---|
| Lesson 34. Explanations | 155 |
| Lesson 35. Discounting Notes | 159 |
| Lesson 36. Practical Discount Problems | 162 |
UNIT XIII. COMPOUND INTEREST AND OTHER INTEREST VARIABLES

Lesson 37. Compound Interest ............................................. 165
Lesson 38. Other Interest Variables ................................. 168

UNIT XIV. INSTALLMENT BUYING, COMPUTING INTEREST ON
UNPAID BALANCES, ARITHMETIC PROGRESSIONS,
PERSONAL LOANS, AND INSTALLMENT PLANS

Lesson 39. Computing Interest on Unpaid Balances ........... 170
Lesson 40. Arithmetic Progressions ................................. 173
Lesson 41. Installment Plans ............................................ 176
Lesson 42. Installment Loans ............................................ 179
Lesson 43. Installment Loans (Continued) ......................... 182

UNIT XV. SQUARE ROOT, LOGARITHMS, AND SIMPLE EQUATIONS
IN TWO UNKNOWNS

Lesson 44. Explanations ................................................... 185
Lesson 45. Square Root Problems ....................................... 187
Lesson 46. Logarithms ..................................................... 189
Lesson 47. Simple Equations in Two Unknowns ................. 193

UNIT XVI. GRAPHS, AND STOCKS AND BONDS

Lesson 48. Graphs ......................................................... 197
Lesson 49. Stocks and Bonds ............................................ 200
Lesson 50. Bonds ......................................................... 204
UNIT I

ADDITION

The objectives of this section are correct reading, writing, and adding of Arabic numbers. The student should learn to write figures carefully in straight columns so there will be no confusion in computation nor misinterpretation of certain numbers. Students should so familiarize themselves with the fundamentals of business mathematics in order to be able to meet any situation with the least possible effort.

In order to add well one must be familiar with the 45 simple combinations of figures that it is possible to make with the nine figures or digits. After mastering these combinations, practice should start with three digits.

```
  1  1  1  1  1  1  1  1  1
   2  3  4  5  6  7  8  9
  2  2  2  2  2  2  2  2
   3  4  5  6  7  8  9
  3  3  3  3  3  3  3
   4  5  6  7  8  9
  4  4  4  4  4  4
   5  6  7  8  9
  5  5  5  5  5
   6  6  6  6
   6  7  8  9
  7  7  7
   8  9
   8  9
   9
```
GROUPING AND CHECKING

In adding the student should seek groups of numbers, that is two or more, that will total 10. By recognizing such groups quickly as 10, then by adding them in one operation, speed can be promoted.

For example:

\[
\begin{array}{cccc}
5 & 9 & 9 & 7 \\
6 & 5 & 4 & 3 \\
8 & 8 & 5 & 9 \\
3 & 1 & 4 & 6 \\
4 & 1 & 4 & 10 \\
\hline
28, & 6 & 5 & 9
\end{array}
\]

Accuracy is by far the most important aim in business arithmetic, and there is no habit that can be more useful than that of verifying all results.

The simplest method of checking addition is the reverse order check. Each column should be added upward first, then downward and results compared.

The "casting out nines" method of proving addition does not prove as successful as in multiplication and division work. There is a possibility of adding or omitting zeros or nines without detection so this method is not so practical.

Addition from left to right is important in billing work, preparation of time sheets and pay rolls, recapitulation statements, summaries of sales and purchases, and other statistical reports.
LESSON 1

A. Practice in Group Counting.

Count by 4's from 5 to 89

Count by 6's from 29 to 101

Count by 8's from 21 to 109

Count by 9's from 86 to 203

Count by 12's from 18 to 126

Count by 13's from 26 to 130

Count by 14's from 9 to 107

B. Add from bottom to top first; then, add from top to bottom to check:

1. 3,735  2. 3,456  3. 7,891  4. 4,857  5. 7,564
   3,246     2,364     6,367     8,664     4,765
   5,354     5,427     5,545     5,347     7,548
   2,464     6,478     9,211     5,784     9,887
   4,562     8,707     8,884     7,854     3,318
   6,789     9,233     2,309     6,457     4,465
   7,612     1,889     7,776     5,687     1,160
C. Horizontal and vertical addition.

1. \[5+8+9+6+4+3 = \underline{24}\]
   \[8+9+6+5+3+7 = \underline{24}\]
   \[1+6+4+9+7+8 = \underline{24}\]
   \[7+7+3+2+9+6 = \underline{24}\]
   \[9+6+9+5+7+3 = \underline{24}\]

   \[\underline{24} + \underline{24} = \underline{48}\]

2. \[37+46+58+27+67 = \underline{195}\]
   \[68+79+36+46+37 = \underline{256}\]
   \[89+47+64+85+93 = \underline{328}\]
   \[56+47+38+29+40 = \underline{198}\]
   \[13+41+75+95+75 = \underline{280}\]

   \[\underline{195} + \underline{256} = \underline{451}\]

3. \[248+569+678+450 = \underline{1945}\]
   \[897+754+472+403 = \underline{2526}\]
   \[645+299+487+309 = \underline{1840}\]
   \[658+937+537+874 = \underline{2686}\]

   \[\underline{1945} + \underline{2526} = \underline{4471}\]

D. Find the total sales for each of the following salesmen and the total sales for each month. Check by finding the grand total.

<table>
<thead>
<tr>
<th></th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wilson</td>
<td>$386.43</td>
<td>$537.41</td>
<td>$189.62</td>
<td>$466.34</td>
<td></td>
</tr>
<tr>
<td>Jones</td>
<td>427.39</td>
<td>276.85</td>
<td>348.69</td>
<td>198.79</td>
<td></td>
</tr>
<tr>
<td>Brown</td>
<td>398.57</td>
<td>389.69</td>
<td>376.21</td>
<td>432.82</td>
<td></td>
</tr>
<tr>
<td>Blagg</td>
<td>217.24</td>
<td>427.96</td>
<td>387.99</td>
<td>321.73</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
E. Acquiring Speed in Addition.

Speed in addition of two numbers of two figures each is acquired by adding the tens numbers and one units number first and then to the sum the other unit number is added.

Example: Add 38 and 57

38 plus 50 is 88 plus 7 is 95.

Problems:

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>65</td>
<td>74</td>
<td>36</td>
<td>67</td>
<td>39</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>47</td>
<td>32</td>
<td>87</td>
<td>48</td>
<td>74</td>
<td>49</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>7.</th>
<th>8.</th>
<th>9.</th>
<th>10.</th>
<th>11.</th>
<th>12.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>64</td>
<td>39</td>
<td>38</td>
<td>48</td>
<td>46</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>67</td>
<td>56</td>
<td>77</td>
<td>92</td>
<td>85</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>74</td>
<td>46</td>
<td>39</td>
<td>24</td>
<td>74</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>63</td>
<td>78</td>
<td>75</td>
<td>83</td>
<td>95</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>29</td>
<td>46</td>
<td>34</td>
<td>67</td>
<td>64</td>
<td>38</td>
</tr>
<tr>
<td></td>
<td>38</td>
<td>67</td>
<td>82</td>
<td>78</td>
<td>28</td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>69</td>
<td>24</td>
<td>79</td>
<td>23</td>
<td>39</td>
<td>89</td>
</tr>
</tbody>
</table>
LESSON 2

SUBTRACTION

Subtraction is the process of taking one number from another, or just the inverse of addition. The minuend is the number to be diminished. The subtrahend is the number by which the minuend is diminished. The difference, or remainder, is the result of subtraction.

A. Simple Subtraction Problems.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>86</td>
<td>576</td>
<td>896</td>
<td>3,879</td>
<td>$86.34</td>
<td>$786.12</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>489</td>
<td>428</td>
<td>1,498</td>
<td>29.45</td>
<td>329.43</td>
</tr>
</tbody>
</table>

B. Find the difference between the smaller and larger numbers without rewriting.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>56</td>
<td>589</td>
<td>8,796</td>
<td>6,536</td>
<td>$87.23</td>
<td>$189.60</td>
</tr>
<tr>
<td></td>
<td>87</td>
<td>642</td>
<td>9,432</td>
<td>4,759</td>
<td>88.92</td>
<td>642.40</td>
</tr>
</tbody>
</table>

C. Horizontal Subtraction.

1. 76 - 34 = ________  
2. 98 - 69 = ________  
3. 864 - 475 = ________  
4. 982 - 768 = ________  
5. 5,432 - 2,547 = ________  
6. 8,223 - 5,864 = ________  
7. $386.47 - $295.58 = ________  
8. $857.76 - $567.77 = ________
D. Checking Subtraction.

Subtraction may be checked by the following procedures:
1. Repeat the work.
2. Add the difference obtained to the subtrahend. The result should agree with the minuend.
3. Subtract the difference obtained from the minuend. The result should agree with the subtrahend.

Problems:
Check the following by adding subtrahend to the difference to get the minuend.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>89</td>
<td>856</td>
<td>972</td>
<td>6,984</td>
<td>9,200</td>
</tr>
<tr>
<td>62</td>
<td>275</td>
<td>869</td>
<td>2,795</td>
<td>3,788</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td></td>
</tr>
</tbody>
</table>

<p>| |</p>
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>89</td>
</tr>
</tbody>
</table>

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>7.</td>
<td>8.</td>
<td>9.</td>
<td>10.</td>
</tr>
<tr>
<td>69,432</td>
<td>89,674</td>
<td>$876.52</td>
<td>$891.99</td>
<td>$5,642.03</td>
</tr>
<tr>
<td>27,586</td>
<td>39,746</td>
<td>569.56</td>
<td>796.34</td>
<td>974.44</td>
</tr>
</tbody>
</table>

E. Subtraction by Addition. Determine in each of the following problems the difference between the sum and the smaller number by adding to the smaller number a number that will result in a sum equal to the larger number.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>756</td>
<td>791</td>
<td>641</td>
<td>236</td>
<td>842</td>
</tr>
</tbody>
</table>

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>961</td>
<td>834</td>
<td>720</td>
<td>445</td>
<td>961</td>
</tr>
</tbody>
</table>
F. Proper Handling of Cash and Making Change.

When change is received, one should be sure to verify the amount. When you give change to anyone else you should be careful to give the right change as well as give it in the correct manner. Change should be given in the fewest possible number of pieces. In giving change, you should repeat the amount to be taken from the bill or coin and then orally add each piece of change, beginning with the smallest denomination, until the addition equals the amount of money given you. For example, if you are given a $10 bill from which you are to take $3.35, you should repeat the amount to be taken out of the bill, "$3.35"; then hand the person to whom you are giving change a nickel, saying, "$3.40"; then a dime, saying "$3.50"; then a half dollar, saying "$3.75"; then a $1 bill or silver dollar, saying "$5.00"; and then a $5.00 bill and say "$10.00."

Show the total amount of change and the number of pieces of change of each denomination that should be given in each of the following problems:

<table>
<thead>
<tr>
<th>Purchase</th>
<th>Payment</th>
<th>Total Change Given</th>
<th>Denominations of Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Pennies</td>
<td>Nickels</td>
</tr>
<tr>
<td>1. $2.89</td>
<td>$10 bill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. .98</td>
<td>$5 bill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 12.75</td>
<td>$25 check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 3.49</td>
<td>$20 check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. .33</td>
<td>$1 bill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 32.15</td>
<td>$50 check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. .57</td>
<td>$5 bill</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. 53.31</td>
<td>$100 check</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Mrs. John Clark purchased 5 yards of gingham at 97¢ a yard. She handed the clerk a $10 bill and received ___ in change.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
10. James Whitcome purchased a suit costing $56.85. He received change amounting to $19.15. The amount of the check he gave in payment was __________.

11. Sam Abbott purchased fishing tackle for $13.37. How much change would he receive if he gave the clerk two $10 bills? __________

12. If John Smith purchases groceries that amount to $10.35 and wants to receive $6.00 in change, for how much will he have to make his check? __________
Lesson 3

Multiplication

Multiplication is the operation, indicated by the symbol \( \times \), by which any given number or quantity is increased a given number of times.

The multiplicand is the number to be multiplied.

The multiplier is the number by which the multiplicand is multiplied, and the number or quantity obtained is called the product.

Multiplication is merely a short method of addition.

For example:

\[
\begin{align*}
876 & \text{ is the same as 876 added} \\
876 \times 6 & \text{ six times} \\
5,256 &
\end{align*}
\]

A. Complete the following multiplication tables. If certain parts seem hard, then repeat several times. Don't read the two numbers, but just look at them and say the answer.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 x 2 =</td>
<td>9 x 2 =</td>
<td>11 x 2 =</td>
<td>12 x 2 =</td>
<td></td>
</tr>
<tr>
<td>8 x 3 =</td>
<td>9 x 3 =</td>
<td>11 x 3 =</td>
<td>12 x 3 =</td>
<td></td>
</tr>
<tr>
<td>8 x 4 =</td>
<td>9 x 4 =</td>
<td>11 x 4 =</td>
<td>12 x 4 =</td>
<td></td>
</tr>
<tr>
<td>8 x 5 =</td>
<td>9 x 5 =</td>
<td>11 x 5 =</td>
<td>12 x 5 =</td>
<td></td>
</tr>
<tr>
<td>8 x 6 =</td>
<td>9 x 6 =</td>
<td>11 x 6 =</td>
<td>12 x 6 =</td>
<td></td>
</tr>
<tr>
<td>8 x 7 =</td>
<td>9 x 7 =</td>
<td>11 x 7 =</td>
<td>12 x 7 =</td>
<td></td>
</tr>
<tr>
<td>8 x 8 =</td>
<td>9 x 8 =</td>
<td>11 x 8 =</td>
<td>12 x 8 =</td>
<td></td>
</tr>
<tr>
<td>8 x 9 =</td>
<td>9 x 9 =</td>
<td>11 x 9 =</td>
<td>12 x 9 =</td>
<td></td>
</tr>
<tr>
<td>8 x 10 =</td>
<td>9 x 10 =</td>
<td>11 x 10 =</td>
<td>12 x 10 =</td>
<td></td>
</tr>
<tr>
<td>8 x 11 =</td>
<td>9 x 11 =</td>
<td>11 x 11 =</td>
<td>12 x 11 =</td>
<td></td>
</tr>
<tr>
<td>8 x 12 =</td>
<td>9 x 12 =</td>
<td>11 x 12 =</td>
<td>12 x 12 =</td>
<td></td>
</tr>
</tbody>
</table>
B. Finding the product of two numbers, each containing two or more figures.

1. Write the smaller number under the larger so that the right-hand figures in both numbers are in the same vertical line.
2. Multiply the multiplicand by the extreme right-hand or units figure of the multiplier, writing the product directly below the line. Example: \(846 \times 4\) equals 3,384.
3. Next, the three, which is actually 30 is multiplied times the multiplicand the result being 2,538, which is actually 25,380. For the sake of speed and neatness the zeroes are eliminated and each successive product is placed one place to the left. 
4. The 2, or 200, is multiplied the same way with the product being placed two places to the left.
5. The three products are then added, the sum being 197,964.

Problems.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
<th>3.</th>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35</td>
<td>87</td>
<td>642</td>
<td>875</td>
<td>3,437</td>
<td>6,575</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>69</td>
<td>37</td>
<td>69</td>
<td>82</td>
<td>476</td>
</tr>
</tbody>
</table>

C. Multiplying in numbers ending in 0.

To multiply a number by 10, we simply add 0 to the number. If we wish to multiply a number by 100, we merely add two zeroes to the number.

Example:
- \(87 \times 10\) equals 870
- \(87 \times 100\) equals 8,700
- \(87 \times 1000\) equals 87,000

If both numbers should end in one or more zeroes, the zeroes should be disregarded and the other numbers multiplied together. To the product should be added the total number of zeroes in both the multiplier and multiplicand.

Example:
- \(3,400 \times 2,600\)
- \(204 \times 68\)

884 plus 4 zeroes equals 8,840,000.
Problems.

1. 2. 3. 4. 5.
24,000 72,400 124,000 8,670 87,000
400 160 8,300 210 761

D. Multiplying When the Multiplier Contains 0.

The 0 is often found in the center of the multiplier. The only difference in this type problem is that when multiplying the figure following the zero, the product is placed two spaces over and that takes care of multiplying by the zero.

Example: 

\[
\begin{array}{c}
864 \\
302 \\
\hline
1728 \\
2592 \\
\hline
260928
\end{array}
\]

It is well to keep in mind that zero times any number is 0, and that any number times zero is 0. If, in the above example, the multiplier had been 3002, the product from multiplying by the three would have been placed three places to the left.

Problems.

1. 2. 3. 4. 5.
2,408 874 83,426 92,560 87,900
807 905 3,006 605 2,003

E. Checking Multiplication. Multiplication may be checked by the following methods.

1. Repeat the work.
2. Interchange the multiplicand and multiplier and multiply again.
   The casting-out-nines method of checking multiplication is a short and helpful check. Add the digits in product, multiplicand and the multiplier horizontally, and cast out the nines and write down the remainder or excess.
When the excess of nines of the multiplicand and multiplier are multiplied together, and the nines cast out of the product, the excess will equal the excess of nines in the product.

Example:

4758—equals 24—2 nines and excess of 6
x 805—equals 13—1 nine and excess of 4

\[
\begin{array}{c}
23790 \\
38064 \\
3830190—equals 24—2 nines and excess of 6
\end{array}
\]

Another method much simpler is:

4758—equals 24, or \(4 + 2 = 6\)
805—equals 13, or \(1 + 3 = 4\)

\(24\), which is expressed above as \(\frac{24}{24}\)
2 nines and excess of 6, can be found by merely adding \(2 + 4 = 6\).

Problems: Multiply the following problems and prove by the casting-out-nines method.

1.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>567</td>
<td>432</td>
</tr>
<tr>
<td>432</td>
<td></td>
</tr>
</tbody>
</table>

2.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9,543</td>
<td>5,638</td>
</tr>
<tr>
<td>5,638</td>
<td></td>
</tr>
</tbody>
</table>

3.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8,436</td>
<td>42</td>
</tr>
<tr>
<td>42</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>83,237</td>
<td>506</td>
</tr>
<tr>
<td>506</td>
<td></td>
</tr>
</tbody>
</table>

F. Check the following problems by reversing the factors and repeating the multiplication.

1. Check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>536</td>
<td>296</td>
</tr>
<tr>
<td>296</td>
<td></td>
</tr>
</tbody>
</table>

2. Check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>827</td>
<td>742</td>
</tr>
<tr>
<td>742</td>
<td></td>
</tr>
</tbody>
</table>

3. Check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>639</td>
<td>735</td>
</tr>
<tr>
<td>735</td>
<td></td>
</tr>
</tbody>
</table>

4. Check

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>714</td>
<td>962</td>
</tr>
<tr>
<td>962</td>
<td></td>
</tr>
</tbody>
</table>
LESSON 4

DIVISION

Division is the operation of finding how many times one number or quantity is contained in another. Division is the inverse of multiplication.

The dividend is the number to be divided.
The divisor is the number by which the dividend is divided.
The quotient is the result of division.
The remainder is the part of the dividend less than the divisor, remaining after subtracting an integral number of times the divisor from the dividend.

Division is indicated by the sign, $\div$; by means of a fraction; and by $)$. Thus $4 \div 2$, $\frac{4}{2}$, and $2)4$ are synonymous.

There are two methods that are commonly used in solving division problems:
1. Short division.
2. Long division.

In short division, the work is done mentally, and only the dividend, divisor, and quotient are written. In long division, the work is written in full.

A. Problems. Short Division, writing remainder as fraction.

\[
\begin{align*}
2) & \ 84 \quad 2) & \ 92 \quad 3) & \ 81 \quad 3) & \ 864 \quad 4) & \ 7,642 \quad 5) & \ 6,785 \\
6) & \ 261 \quad 7) & \ 8,452 \quad 7) & \ 7,643 \quad 8) & \ 991 \quad 8) & \ 7,637 \quad 9) & \ 9,881 \\
\end{align*}
\]

B. Long Division. To divide a long division problem the following form is used:

1. The divisor is written to the left of the dividend.

\[
\begin{align*}
186) & \ 29574 \\
186 & \quad 159 \\
1097 & \quad 930 \\
1674 & \quad 1674 \\
\end{align*}
\]

2. Start at the left of the dividend and divide the first figure or figures by the divisor. Write the quotient figure in the space reserved above the dividend. Multiply the divisor by the quotient figure. Set the product under the part of the dividend used, and subtract. Bring down the next number of the dividend and divide as before, until all the numbers in the dividend are used.
3. The amount over which the divisor goes into the dividend an even number of times is the remainder.

Problems.

1. \[\frac{27}{64,709}\] 2. \[\frac{87}{97,467}\] 3. \[\frac{74}{69,402}\] 4. \[\frac{146}{81,947}\]

5. \[\frac{186}{191,301}\] 6. \[\frac{132}{126,012}\] 7. \[\frac{6,438}{5,807,392}\] 8. \[\frac{826}{8,176,042}\]

C. Check the following division problems by multiplying the quotient times the divisor and adding the remainder. The result should equal the dividend.

1. Check \[\frac{67}{8,723}\] 2. Check \[\frac{387}{18,806}\]

3. Check \[\frac{726}{189,974}\] 4. Check \[\frac{541}{6,189,638}\]
D. Check the following division problems by the "casting-out-nines" method. Show work in detail.

When the excess of nines in the divisor and in the quotient are multiplied together, and to this product is added the excess of nines in the remainder, the result should equal the excess of nines in the dividend.

Example:

\[
\begin{array}{cccc}
86 & (5) \\
\times 4 & 652 & \overline{56437} & (7) \\
\hline
5216 & \overline{2912} & 365 & (5) \\
\hline
\end{array}
\]

Quotient = 5
Divisor = 4
Remainder = 5
Dividend = (7)

Problems.

1. \[368)854,468\] Check 2. \[579)923,571\] Check

3. \[89)1,861,493\] Check 4. \[961)8,849,223\] Check

E. Short Cuts for Division.

To divide by 10: Mark off the figure at the extreme right, which will be the remainder. For example: 387 divided by 10 equals 38 with 7 remainder.

To divide by 25: Multiply the dividend by 4; then divide by 100 (which is the same as marking off the last two figures to the right). For example: \[2,875 \div 25 = 2,875 \times 4 = 11,500 = 115.\]
To divide by 50: Multiply the dividend by 2; then divide by 100. For example: \(2,875 \div 50 = 2,875 \times 2 = 5,750\) with 5 remainder.

Divide by short-cut methods:

<table>
<thead>
<tr>
<th>1.</th>
<th>2.</th>
<th>3.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5,750 by 10</td>
<td>17,875 by 100</td>
<td>875,900 by 1000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4.</th>
<th>5.</th>
<th>6.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,573 by 25</td>
<td>19,946 by 25</td>
<td>846,930 by 25</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7.</th>
<th>8.</th>
<th>9.</th>
</tr>
</thead>
<tbody>
<tr>
<td>525,420 by 50</td>
<td>5,456,847 by 50</td>
<td>9,574,936 by 50</td>
</tr>
</tbody>
</table>

F. Averages. A measure of central tendency of a set of data is a single measure that tends to represent the entire group. The best known of these measures is the arithmetic mean or average. It is found by dividing the sum of the separate measures by the number of measures.

For example:

\[
\begin{align*}
35 \\
50 \\
45 \\
70 \\
\text{\underline{4100}} \\
\end{align*}
\]

\[4100 \div 4 = 50\]

50 is the average.

Find the average for the following:
<table>
<thead>
<tr>
<th></th>
<th>1. 874</th>
<th>2. 4,576</th>
<th>3. 45,978</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>531</td>
<td>6,578</td>
<td>67,879</td>
</tr>
<tr>
<td></td>
<td>367</td>
<td>5,867</td>
<td>45,809</td>
</tr>
<tr>
<td></td>
<td>563</td>
<td>3,679</td>
<td>56,857</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>44,875</td>
</tr>
</tbody>
</table>
A. Solve the following problems:

1. On January 1, C. J. Smith purchased a house for $18,986.47. During the year he paid the following bills on the property: repairs, $796.49; construction of garage, $1,899.98; city taxes, $376.86; state and county taxes, $164.47; insurance, $253.48. He received $75.00 per month rent on the property. On December 31, he sold the property for $22,333.01. Did he make a profit or loss? How much?

2. A grain elevator made a profit of $516.12 by selling 276 bags of wheat for $1,836.54. How many bags of wheat must be sold to realize a profit of $1,398.76?

3. A wheat farmer sold his wheat crop from 269 acres for $2.59 per bushel, which amounted to $18,114.46. How many bushels per acre did he average?

4. A second-hand clothing merchant purchased 169 men's suits at a fire sale for $4,713.41. He sold 38 of them at $24.75; 46 at $29.95; 47 at $34.95; and the remainder at $39.95. His expenses involved in handling these suits were $.89 per suit. Did he make a profit or loss? How much?

5. Three men painted a house for $380. One worked 20 hours; another 24 hours; and the third 212 hours. If each received the same per hour, what was the hourly rate? How much did each receive?

6. If eggs are selling for $.60 per dozen, how much would 89 eggs bring?

7. Find the freight charges on the following shipments, and of the total:

<table>
<thead>
<tr>
<th>Weight</th>
<th>Rate per cwt.</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>8,946 lbs.</td>
<td>78¢ per cwt.</td>
<td></td>
</tr>
<tr>
<td>5,386 lbs.</td>
<td>82¢ per cwt.</td>
<td></td>
</tr>
<tr>
<td>9,035 lbs.</td>
<td>77¢ per cwt.</td>
<td></td>
</tr>
</tbody>
</table>

Total
8. A merchant sold 478 articles which cost him a total of $986.43. His profit was $167.30. How many articles must he sell to realize a profit of $307.65?

9. A drug store had $768.13 on hand at the beginning of the day. During the day $2,756.92 was received and $786.72 was paid out. How much was on hand at the end of the day?

10. A grocer sold $8,761.23 worth of sugar during the month of May. If the sugar was selling at 9¢ per pound, how many pounds did he sell?

11. The temperature as given out by the weather forecaster was as follows: 6 a. m. 68°; 8 a. m. 74°; 10 a. m. 80°; 1 p. m. 82°; 3 p. m. 81°; and 5 p. m. 76°. What was the average temperature for the eleven-hour period?

12. The distance from Dallas, Texas, to Montgomery, Alabama, is 690 miles. If a man wishes to make the trip by car in 15 hours, what must be his average speed?
UNIT II
MECHANICS OF DECIMALS AND FRACTIONS

LESSON 6
MECHANICS OF DECIMALS

"Decimal" comes from the Latin "decem" meaning ten. The decimal system is a system of counting by tens and powers of ten, each figure, or digit, having a place value of ten times that of the next figure to the right.

The sign of the decimal is the decimal point, which is placed before the figures of the decimal. .2 is read as two tenths which is the same as 2/10. .62 is read two hundredths, and so on.

The following is illustrative of the reading of decimal numbers.

\[
\begin{align*}
.5 & \quad \text{five tenths} \\
.05 & \quad \text{five hundredths} \\
.005 & \quad \text{five thousandths} \\
.0005 & \quad \text{five ten-thousandths} \\
.00005 & \quad \text{five hundred-thousandths} \\
.000005 & \quad \text{five millionths} \\
.0000005 & \quad \text{five ten-millionths}
\end{align*}
\]

In reading a decimal number, read from right to left, saying units, tens, hundredths, thousandths, ten thousandths, etc., always including the decimal point in the reading.

The following decimals are read as follows:

\[
\begin{align*}
.56 & \quad \text{fifty-six hundredths} \\
.565 & \quad \text{five hundred sixty-five thousandths} \\
.5656 & \quad \text{five thousand six hundred fifty-six ten-thousandths}
\end{align*}
\]

To save time and possibility of error it is permissible to read the above as, point-five-six; point-five-six-five; and point-five-six-five-six.

Practice reading the following by use of both methods:

\[
\begin{align*}
.1 & \quad .895 & \quad .87658 \\
.25 & \quad .8643 & \quad .80060 \\
.203 & \quad .9005 & \quad .457623
\end{align*}
\]

One dollar is 100 cents, so one cent is 1/100 or is a one-hundredth part of a dollar and is written $ .01. One
mill is one-thousandth part of a dollar, and one tenth part of one cent and is written \$ .001. In the handling of mills, 5 mills is half of a cent so will be carried on to the next higher cent. In case there are less than five mills, they will be dropped in the final product.

Most often decimals will be found with a whole number but will be treated in the same manner. The only difference being in the reading; the whole numbers will be read first followed by and and then the decimal will be read.

Read the following:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>8.7</td>
<td>7.7890</td>
<td>817.1079</td>
</tr>
<tr>
<td>16.14</td>
<td>10.101</td>
<td>8.3095</td>
</tr>
<tr>
<td>35.09</td>
<td>1205.7</td>
<td>156.47</td>
</tr>
</tbody>
</table>

A. Addition of decimal numbers:

Decimals can be added only when in the same order. Whether accompanied by whole numbers or not, the decimal points must be kept in a straight vertical line. When this is done the tenths, hundredths, thousandths, etc., will fall into their correct places.

Add the following:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$ 453.76</td>
<td>2.</td>
</tr>
<tr>
<td></td>
<td>921.23</td>
<td></td>
</tr>
<tr>
<td></td>
<td>824.79</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1234.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td>816.08</td>
<td></td>
</tr>
<tr>
<td></td>
<td>841.20</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8756.48</td>
<td></td>
</tr>
<tr>
<td></td>
<td>46.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.45</td>
<td></td>
</tr>
</tbody>
</table>

B. The same plan is followed in subtraction of decimals.
The only rule to remember is to keep the decimal points in a vertical line. Subtract the following:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>$ 18.56</td>
<td>2.</td>
<td>$ 187.59</td>
</tr>
<tr>
<td></td>
<td>6.47</td>
<td></td>
<td>89.98</td>
</tr>
</tbody>
</table>
C. Write the following numbers in columns and add.

1. \(18.75, 0.95, 1.7,\)
   \(189.076\)

2. \(7.3, 132.7, 0.97, 186,\)
   \(18.1\)

3. \(0.085, 14.5, 1.357, 0.878,\)
   \(18.65\)

4. \(307,0008, 0.78, 1.5, 0.55,\)
   \(87.87, 100.0004\)
LESSON 7

MULTIPLICATION AND DIVISION OF DECIMALS

A. Multiplication of Decimals.

In multiplying decimals, multiply the given numbers as if they were whole numbers, and point off in the product as many decimal places as are found in the multiplicand and multiplier combined.

For example: \[ 5.74 \times 0.456 = 2.61744 \] 5 decimal places

Problems:

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>2.</td>
<td>3.</td>
<td>4.</td>
<td>5.</td>
</tr>
<tr>
<td>12.5</td>
<td>1,856</td>
<td>14.9</td>
<td>872</td>
<td>234.50</td>
</tr>
<tr>
<td>6.4</td>
<td>7.6</td>
<td>18.4</td>
<td>.09</td>
<td>.054</td>
</tr>
</tbody>
</table>

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>7.</td>
<td>8.</td>
<td>9.</td>
<td>10.</td>
</tr>
<tr>
<td>525.7</td>
<td>.9587</td>
<td>31.24</td>
<td>.0076</td>
<td>29.71</td>
</tr>
<tr>
<td>83.8</td>
<td>.2376</td>
<td>.0042</td>
<td>.006</td>
<td>.025</td>
</tr>
</tbody>
</table>

B. Approximation. If a student could develop the habit of approximating answers and can develop skill it would probably help more than any other thing in the mastering of business mathematics. In the multiplication and division of decimals, the student should be able to tell whether the decimal is in the right place by approximation. The following principles will be found useful in approximating the multiplication of decimals:
1. When a whole number is multiplied by a decimal, the result will be less than the original whole number.

2. When a decimal is multiplied by a whole number, the product will be greater than the original decimal, unless the whole number is one.

3. When a decimal is multiplied by a decimal, the product will be less than either the multiplicand or the multiplier.

C. Division of Decimals.

To divide decimals, move the decimal point in the dividend as many places to the right as there are decimal figures in the divisor. This is done to make the divisor a whole number. Place the decimal point in the quotient directly over the decimal point in the dividend. Then proceed as if with whole numbers.

For example: Divide 2.96 by .016.

\[
\begin{array}{c|c}
185 & \\
\times 016 & 2960 \\
\hline
16 & \\
136 & \\
128 & \\
80 & \\
80 & \\
\end{array}
\]

Another very common rule is "Subtract the number of places in the divisor from the number of decimal places in the dividend. The result is the number of decimal places in the quotient." If there are fewer decimal places in the dividend than in the divisor, annex zeroes.

Problems: Carry out to three decimal places where necessary.

1. \(0.07 \div 74.9\)
2. \(0.27 \div 39.84\)
3. \(0.48 \div 7496\)
4. \(36 \div 2.16\)
5. 6. 7. 8.
754)91.87  .075)642.1  .037)39.945  1.44)174.96
LESSON 8

A. Rounding Off Numbers.

In business transactions dealing with money, numbers are rounded off to the nearest cent. For example: $1.5867 would be rounded off to $1.59. While $1.5849 would be rounded off to $1.58. Rounding off occurs in the final answer or results, and not before multiplying other numbers.

Other decimals may be rounded off to two, three, four, or more places. For example, to round .678285 to four places would give .6783. The same number rounded to three places would give .678.

Round the following to two decimal places:

1. $1.565  6. 18.0009
2. 18.534  7. 2.5708
3. 99.997  8. 30.9951
4. 24.3645  9. 35.3333
5. 87.0059  10. 29.6666

B. Real-estate and property tax rates are dependent upon decimals. In some places the rate may be expressed in dollars and cents per hundred-dollar valuation, or in others it may be expressed in mills per dollar of assessed value. A rate of 15 mills is $.015 on the dollar, or $1.50 per hundred dollars.

Change the following rates from mills to dollars and cents per $100.

1. .0102  4. .0016
2. 1.6 mills  5. 5 mills
3. 45 mills  6. .02027

C. Find the amount of tax on each of the following assessments:

1. $5,450  $2.10  $_________
2. $4,239  36 mills  $__________
3. $10,432  .0254  $__________
4. $8,895  97 cents  $__________
5. $6,587  .0017  $__________

D. Solve the following problems, carrying the answers to four decimal places when necessary.

1. A farmer sells 57 watermelons at an average price of 55 cents. He purchases baby chicks at $ .085 each. If he spends all his watermelon money for baby chicks, how many does he get?__________

2. A certain building concern employs 27 laborers for an 8-hour day at 75 cents an hour. What is his daily pay roll?__________

3. A coal dealer purchases coal by the long ton (2,240 lbs.) at $9.86. Freight charges for delivering the coal from the mine to his place of business average $1.84 per long ton. If he sold the coal at $12.75 per short ton, how much profit would he make on 75 tons (long) purchased from the mine?__________

4. The Jones Company purchases alarm clocks at $35.88 per dozen and retails them at $4.50 each. How many clocks must be sold to realize a gross profit of $27.18?__________

5. A submarine travels 23 miles per hour when surfaced and 13 mph when submerged. If it travels 69 hours surfaced and 28 submerged in reaching its destination, how far did it travel?__________ How much time would have been saved by traveling the entire distance surfaced?__________

6. Compute the cost of each of the following and the total cost.

35,875 # prairie hay @ 22.50 per ton  __________
9,725 # alfalfa hay @ 27.50 per ton  __________
10,500 # ground feed @ 37.50 per ton  __________
8,650 # baled straw @ 14.75 per ton  __________

Total cost  __________
7. Merchandise valued at $2,600, after being damaged by fire, was sold at a reduction of .25. For what was the merchandise sold?

8. What was the cost of shipping 42 pieces of freight which averaged 24.25 lbs., at 16.5 cents per hundred pounds?

9. The weight of water per cu. ft. is 62.5 lbs., and lead is 11.36 times as heavy as water. Find the weight of 3.25 cu. ft. of lead.

10. A certain type bolt weighs .574 lb. How many bolts are in a keg weighing 275 lbs. if the keg weighs 4 lbs. empty?

11. A carpenter completed a garage by working 6 hours a day for 10 days. How many days would it have taken him if he had worked 8 hours per day?

12. If an automobile averages 17.5 miles per gallon of gas and drives 640 miles, what was the cost of the gasoline at 21¢ per gallon?

13. A grocer purchased 1,785 pounds of coffee for $462.25. If he sold 130 pounds for $48.10, what was his profit per pound on this sale?

14. An automobile was driven 26 miles in 38 minutes. What was the rate of speed per hour?
LESSON 9

MECHANICS OF FRACTIONS

A fraction is used to express one or more of the equal parts of a quantity. Thus, 1/2, one half; 3/4, three fourths, are fractions.

In the above illustrations, the numbers above the line are the numerators, while the numbers below the line are the denominators. The line between the two numbers denotes division. Thus 1/2 actually means one divided by two.

There are two types of fractions, namely, common fractions and decimal fractions. A common or proper fraction is a fraction that is less than a unit. In such a fraction the numerator will always be smaller than the denominator.

A decimal fraction, as was explained in Lesson 6, would read as .3, which is the same as 3/10, or .03 which would be read three hundredths.

Common fractions are classified as either proper or improper fractions. A proper fraction is a fraction having the numerator less than the denominator. Thus, 1/2 and 1/8 are proper fractions.

An improper fraction is one having the numerator equal to or greater than the denominator. Thus, 5/5 and 11/5 are improper fractions.

Mixed numbers are numbers that are composed of whole numbers and a proper fraction. Thus, 1 1/2, 3 3/4, and 2 7/8 are mixed numbers.

A simple fraction is a fraction whose terms are whole numbers. Thus, 3/4, 1/5, 7/8 are simple fractions.

A complex fraction is a fraction one or both of whose terms contain a fraction. Thus, 1/2/3/4, 1/1/2, and 2½/3 ½ are complex fractions.

A fraction may be reduced to lower terms or raised to higher terms without changing the value of the fraction. For example, 1/3 can be raised to 10/30 by multiplying both the numerator and the denominator by 10. By dividing by 10, the 10/30 can be reduced to 1/3 without having changed the value of the fraction at any time.

A. Reduce the following numbers to higher terms:

1. 3/4 to twenty-eighths.

2. 7/11 to forty-fourths.
3. \( \frac{18}{7} \) to one hundredths.

4. Seven twenty-firsts to two hundred fifty-seCONDS.

B. The following facts lead to the fundamental principles of fractions:

1. Multiplying the numerator of a fraction multiplies the fraction. For example: \( 3 \times \frac{2}{3} = \frac{6}{3} \) or 2.

2. Multiplying the denominator of a fraction divides the fraction. For example: \( \frac{1}{3} \div 2 = \frac{1}{6} \).

3. Multiplying both numerator and denominator of a fraction by the same number does not change the value of the fraction. For example: \( \frac{1}{2} = \frac{2}{4} \).

4. Dividing the numerator of a fraction divides the fraction. For example: \( \frac{2}{5} \div 2 = \frac{1}{5} \).

5. Dividing the denominator of a fraction multiplies the fraction. For example: \( 2 \times \frac{3}{10} = \frac{3}{5} \).

6. Dividing both numerator and denominator of a fraction by the same number does not change the value of the fraction. For example: \( \frac{9}{15} = \frac{3}{5} \).

C. Addition and Subtraction of Fractions.

Fractions having the same denominator may be added or subtracted by adding or subtracting their numerators.

For example: \( \frac{3}{7} + \frac{1}{7} = \frac{4}{7} \); \( \frac{8}{9} - \frac{5}{9} = \frac{3}{9} \) or \( \frac{1}{3} \).

If they have different denominators, they must be changed to equivalent fractions having the same denominators. Another name for the common denominator is the common multiple. When adding fractions with different denominators, the first thing to accomplish is to get the least common multiple. The least common multiple is found as follows:

Problem: Find the least common multiple for the following fractions: \( \frac{5}{12}, \frac{7}{16}, \frac{5}{18}, \) and \( \frac{7}{24} \).
Divide the numbers by any prime number. (A prime number is a number that is divisible only by itself and 1.) The quotients are written beneath, and if any number is not divisible evenly by the divisor used, write that number along with the quotients. This process is continued until no two numbers have a common divisor. Then multiply the divisors and remainders together.

To add the $5/12$, $7/16$, $5/18$, and $7/24$, we raise all the denominators to $144$ths as follows:

$$\frac{60 + 63 + 40 + 42}{144} = 205/144 \text{ or } 1 \frac{61}{144}.$$

D. Improper Fractions and Mixed Numbers.

To reduce an improper fraction to a whole or a mixed number, divide the numerator by the denominator. The quotient will be the whole number part of the mixed number, and the remainder will be the numerator part of the fraction part over the original denominator.

To reduce a mixed number to an improper fraction, multiply the denominator of the fraction times the whole number, and add the numerator of the fraction, and place this number over the original denominator.

The process of changing the form of an arithmetical expression, without changing the value it represents, is referred to as reducing.

Reduce the following improper fractions to whole or mixed numbers:

1. $27/6$
2. $39/8$
3. $42/7$
4. $97/12$
5. $178/13$
6. $157/9$
7. $437/28$
8. $876/84$
9. $647/5$
10. $3,576/7$
Reduce the mixed numbers to improper fractions:

1. 1 3/8
2. 7 8/12
3. 15 7/16
4. 769 2/3
5. 168 3/5
6. 876 8/9

Reduce the following fractions to their lowest terms:

1. 12/72
2. 28/12
3. 36/128
4. 16/72
5. 57/95
6. 516/1,728
LESSON 10

ADDITION AND SUBTRACTION OF FRACTIONS

A. Add the following fractions:

1. $\frac{1}{4}$ $\frac{3}{8}$ $\frac{1}{2}$

2. $\frac{1}{7}$ $\frac{7}{10}$ $\frac{3}{5}$ $\frac{1}{2}$

3. $\frac{5}{14}$ $\frac{9}{28}$ $\frac{4}{21}$

4. $\frac{5}{6}$ $\frac{7}{10}$ $\frac{4}{15}$ $\frac{9}{30}$

5. $\frac{5}{8}$ $\frac{1}{3}$ $\frac{7}{15}$ $\frac{3}{5}$

6. $\frac{5}{32}$ $\frac{3}{20}$ $\frac{7}{64}$ $\frac{3}{16}$

7. $\frac{3}{7}$ $\frac{5}{8}$ $\frac{2}{21}$ $\frac{5}{24}$

8. $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{12}$ $\frac{1}{15}$

9. $\frac{10}{15}$ $\frac{16}{18}$ $\frac{35}{45}$

10. $\frac{4}{7}$ $\frac{9}{11}$ $\frac{18}{77}$

B. Add the following mixed numbers:

1. $365\frac{1}{6}$ $364\frac{2}{7}$ $316\frac{1}{9}$ $315\frac{3}{5}$ $132\frac{1}{2}$ $17$ $91$

2. $487\frac{1}{2}$ $316\frac{1}{9}$ $18\frac{1}{3}$ $17$ $17$

3. $18\frac{5}{8}$ $13\frac{8}{11}$ $45\frac{3}{5}$ $64\frac{7}{15}$ $81\frac{3}{4}$
C. Change the following complex fractions to simple fractions:
1. \(\frac{3}{3/4} \div \frac{3}{3/4} = \frac{3}{3/4} \times \frac{3}{3/4} = \frac{2}{5}\)
2. \(\frac{5}{3/4} = \frac{5}{3/4}\)
3. \(\frac{6}{1/3} = \frac{6}{1/3}\)
4. \(\frac{15}{3/4} = \frac{15}{3/4}\)

D. Subtract the following fractions:
1. \(\frac{3}{4} - \frac{2}{3} = \frac{9}{12} - \frac{8}{12} = \frac{1}{12}\)
2. \(\frac{7}{8} - \frac{3}{7} = \frac{7}{8} - \frac{3}{7}\)
3. \(\frac{5}{9} - \frac{3}{15} = \frac{5}{9} - \frac{3}{15}\)
4. \(\frac{13}{14} - \frac{8}{16} = \frac{13}{14} - \frac{8}{16}\)
5. \(\frac{11}{12} - \frac{17}{44} = \frac{11}{12} - \frac{17}{44}\)
6. \(\frac{1}{3} - \frac{1}{4} = \frac{1}{3} - \frac{1}{4}\)
7. \(\frac{3}{4} - \frac{5}{9} = \frac{3}{4} - \frac{5}{9}\)
8. \(\frac{7}{9} - \frac{3}{5} = \frac{7}{9} - \frac{3}{5}\)
9. \(\frac{8}{9} - \frac{13}{24} = \frac{8}{9} - \frac{13}{24}\)
10. \(\frac{7}{10} - \frac{9}{16} = \frac{7}{10} - \frac{9}{16}\)
11. \(\frac{1}{2} - \frac{1}{16} = \frac{1}{2} - \frac{1}{16}\)
12. \(\frac{10}{21} - \frac{1}{15} = \frac{10}{21} - \frac{1}{15}\)

E. Subtract the following mixed numbers:
1. \(\frac{18}{6} - \frac{3/4}{1/2} = \frac{18}{6} - \frac{3/4}{1/2}\)
2. \(\frac{21}{18} - \frac{7/8}{5/9} = \frac{21}{18} - \frac{7/8}{5/9}\)
3. \(\frac{8}{3} - \frac{7/8}{2/5} = \frac{8}{3} - \frac{7/8}{2/5}\)
4. \(\frac{25}{14} - \frac{3/5}{5/1/4} = \frac{25}{14} - \frac{3/5}{5/1/4}\)

When borrowing is necessary, borrow 1 unit. \(\frac{1}{2} = 2/2, \frac{3}{3}, \frac{4}{4}, \text{ etc.}\)
5. \(\frac{15}{8} - \frac{3/4}{1/2} = \frac{15}{8} - \frac{3/4}{1/2}\)
6. \(\frac{21}{19} - \frac{1/3}{2/3} = \frac{21}{19} - \frac{1/3}{2/3}\)
7. \(\frac{25}{14} - \frac{1/7}{7/8} = \frac{25}{14} - \frac{1/7}{7/8}\)
8. \(\frac{27}{18} - \frac{2/3}{3/4} = \frac{27}{18} - \frac{2/3}{3/4}\)
9. \(\frac{87}{29} - \frac{16/31}{6/3/4} = \frac{87}{29} - \frac{16/31}{6/3/4}\)
10. \(\frac{29}{6} - \frac{3/4}{1/9} = \frac{29}{6} - \frac{3/4}{1/9}\)
11. \(\frac{579}{86} - \frac{1}{9} = \frac{579}{86} - \frac{1}{9}\)
12. \(\frac{897}{498} - \frac{8/9}{8/9}\)

13. From the sum of \(\frac{9}{8/16}, \frac{12}{5/6}, \text{ and } \frac{28}{3/4}\) take \(\frac{21}{1/5}\).
14. From the sum of $6 \frac{7}{8}$, $12 \frac{1}{2}$, and $4 \frac{5}{6}$ take $19 \frac{5}{8}$.

15. From $836 \frac{7}{38}$ take the sum of $89 \frac{2}{3}$, $28 \frac{7}{8}$, and $238 \frac{7}{16}$.
LESSON 11

MULTIPLICATION AND DIVISION OF FRACTIONS

To multiply two or more fractions together, first do all the cancelling that is possible. When cancelling, cross out equal factors from the numerator and the denominator. Next multiply the numerators times the numerators and the denominators times the denominators. Reduce the product to its lowest terms or to a mixed number.

\[
\frac{2}{5} \times \frac{1}{1} = \frac{2}{5}
\]

For example:

\[
\frac{2}{5} \times \frac{1}{1} = \frac{2}{5}
\]

Cancellation is more important when more than two fractions are multiplied together. It saves work and reduces possibility of error. The student should cancel as much as possible before beginning the multiplication process.

To multiply mixed numbers together there are two methods that may be employed.

Probably the shortest method in most cases is to reduce each mixed number to an improper fraction, cancel where possible, and then multiply.

For example:

\[
8 \frac{3}{4} \times 7 \frac{1}{3} = \frac{35}{4} \times \frac{11}{3} = \frac{385}{6} \text{ or } 64 \frac{1}{6}
\]

The other method is as follows:

\[
\begin{array}{ccc}
8 \frac{3}{4} & 7 \frac{1}{3} \\
\hline
1\frac{1}{4} & (\frac{3}{4} \times \frac{1}{3}) \\
5 \frac{1}{4} & (7 \times \frac{3}{4}) \\
2 \frac{2}{3} & (8 \times \frac{1}{3}) \\
56 & \\
64 & \frac{1}{6}
\end{array}
\]

1. Multiply the two fractions together.
2. Multiply each fraction by the opposite number.
3. Multiply the whole numbers together.
4. Add the products.

To divide two simple fractions, invert the divisor and multiply. To divide a whole number by a fraction, or a mixed number by a fraction or another mixed number, reduce the mixed number to an improper fraction and follow the same method.

For example:

\[
\frac{7}{8} \div \frac{3}{4} = \frac{7}{8} \times \frac{4}{3} = \frac{7}{6} \text{ or } 1 \frac{1}{6}
\]

\[
2 \frac{1}{3} \div 1 \frac{7}{8} = \frac{7}{3} \times \frac{8}{15} = \frac{56}{45} \text{ or } 1 \frac{11}{45}
\]

\[
2 \frac{2}{3} \div 9 = \frac{2}{3} \times \frac{1}{9} = \frac{2}{27}
\]
A. Multiply the following fractions:

1. \( \frac{5}{6} \times \frac{3}{8} \)

2. \( \frac{11}{23} \times \frac{3}{44} \)

3. \( \frac{3}{4} \times \frac{8}{9} \)

4. \( \frac{2}{3} \times \frac{7}{8} \)

5. \( \frac{1}{4} \times \frac{8}{9} \)

B. Multiply the following fractions, whole and mixed numbers:

6. \( \frac{6}{9} \times 10 = \)

7. \( \frac{7}{15} \times 25 = \)

8. \( \frac{2}{3} \times 196 = \)

9. \( \frac{3}{1/3} \times \frac{8}{9} = \)

10. \( \frac{4}{2/7} \times 3 \frac{2}{5} = \)

11. \( \frac{16}{4/5} \times 18 \frac{1}{3} = \)

12. \( \frac{5/8}{15/31} \times \frac{4}{15} = \)

13. \( \frac{11/3}{18/33} \times \frac{36}{42} = \)


14. \( 78 \frac{1}{2} \times 48 = \)

15. \( 74 \frac{3}{8} \times 186 = \)

16. \( 86 \frac{2}{3} \times 21 \frac{1}{9} = \)

17. \( 9/20 \times 24/15 \times 13/36 \times 17/25 = \)

18. \( 465 \frac{1}{4} \times 29 \frac{5}{8} = \)

19. \( 76 \frac{1}{3} \times 26 \frac{1}{3} = \)

20. \( 84 \frac{1}{2} \times 38 \frac{1}{3} = \)

21. \( 654 \frac{1}{6} \times 8 \frac{1}{2} = \)

C. Multiply the following mixed numbers as they stand, using the four steps that were explained earlier in this lesson.

1. \( \frac{27}{21} \frac{1}{5} \)

2. \( \frac{28}{7} \frac{1}{3} \)

3. \( \frac{37}{42} \frac{5}{6} \)

4. \( \frac{96}{21} \frac{1}{3} \)

5. \( \frac{865}{68} \frac{1}{5} \)

6. \( \frac{89}{22} \frac{3}{4} \)
D. Divide the following fractions:

1. \[ \frac{8}{9} \div 6 = \]
2. \[ \frac{3}{4} \div \frac{7}{8} = \]
3. \[ \frac{105}{3} \div \frac{1}{16} = \]
4. \[ \frac{181}{1} \div \frac{3}{8} = \]
5. \[ \frac{3}{4} \div \frac{1}{8} = \]
6. \[ \frac{21}{32} \div \frac{3}{2} = \]
7. \[ \frac{8}{1} \div \frac{8}{3} = \]
8. \[ \frac{1}{4} \div \frac{15}{8} = \]
9. \[ \frac{1}{7} \div \frac{32}{3} = \]
10. \[ \frac{127}{13} \div \frac{24}{16} = \]
11. \[ \frac{375}{1} \div \frac{6}{1} = \]
12. \[ \frac{841}{3} \div \frac{716}{4} = \]

E. Relationship Between Fractions and Decimals:

All fractions have their decimal equivalent and decimals their fractional equivalent. For example, .3 may be written as \( \frac{3}{10} \) without any change of value. .35 may be expressed as \( \frac{35}{100} \), .356 as \( \frac{356}{1000} \), etc. This interchangeability makes it very convenient in handling problems of modern business.

To change a fraction to its decimal equivalent, divide the denominator into the numerator. For example: The fraction \( \frac{2}{5} \) would be divided as follows: \( 2 \div 5 \) is equal to .4.

Multiply the following fractions both by the fractional and decimal methods.

1. \[ 18 \frac{3}{10} \times 16 \frac{2}{5} = \]

   Fractional method    Decimal method

   \[
   \text{(Results)}
   \]

2. \[ 21 \frac{6}{8} \times 8 \frac{3}{12} = \]

   Fractional method    Decimal method

   \[
   \text{(Results)}
   \]
Divide the following fractions both by the fractional and decimal methods.

3. \( \frac{42}{5} \div \frac{8}{1\frac{1}{4}} = \)

Fractional method \hspace{2cm} Decimal method

4. \( 8\frac{1}{8} \div 2\frac{1}{20} = \)

Fractional method \hspace{2cm} Decimal method
LESSON 12

ALIQUOT PARTS AND BUSINESS APPLICATIONS

Any number that is contained in any other number an even number of times without a remainder is referred to as an aliquot of that number. Thus, 3 is an aliquot part of 6, 4 of 8, 5 of 85, and so on.

Most commonly aliquot parts are referred to parts of $1, $100, or $1,000, but the term "aliquot part" can be applied to other numbers.

We are primarily interested in the aliquot parts of a dollar since it is of essential use in billing and figuring prices of articles. Aliquot parts will be stressed throughout this workbook in work dealing with fractions, percentage, discount, interest, etc. It would be time well spent in memorizing these aliquot parts.

The common aliquot parts of a dollar are:

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Cent Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>50 cents</td>
</tr>
<tr>
<td>1/3</td>
<td>33 1/3 cents</td>
</tr>
<tr>
<td>2/3</td>
<td>66 2/3 cents</td>
</tr>
<tr>
<td>1/4</td>
<td>25 cents</td>
</tr>
<tr>
<td>3/4</td>
<td>75 cents</td>
</tr>
<tr>
<td>1/5</td>
<td>20 cents</td>
</tr>
<tr>
<td>2/5</td>
<td>40 cents</td>
</tr>
<tr>
<td>3/5</td>
<td>60 cents</td>
</tr>
<tr>
<td>4/5</td>
<td>80 cents</td>
</tr>
<tr>
<td>1/6</td>
<td>16 2/3 cents</td>
</tr>
<tr>
<td>5/6</td>
<td>83 1/3 cents</td>
</tr>
<tr>
<td>1/8</td>
<td>12 1/2 cents</td>
</tr>
<tr>
<td>3/8</td>
<td>37 1/2 cents</td>
</tr>
<tr>
<td>5/8</td>
<td>62 1/2 cents</td>
</tr>
<tr>
<td>7/8</td>
<td>87 1/2 cents</td>
</tr>
<tr>
<td>1/10</td>
<td>10 cents</td>
</tr>
<tr>
<td>2/10</td>
<td>20 cents, etc.</td>
</tr>
<tr>
<td>1/12</td>
<td>8 1/3 cents</td>
</tr>
<tr>
<td>1/16</td>
<td>6 1/4 cents</td>
</tr>
<tr>
<td>1/20</td>
<td>5 cents</td>
</tr>
</tbody>
</table>

A. To multiply by an aliquot part of 100 per cent or $1.00, proceed exactly as in multiplying by a fraction. To multiply by an aliquot part of 100, follow the same procedure and take 100 times the result.

Make the following extensions:

1. 24 articles at $ .25 2. 16 lbs. at $ .50
   18 articles at .25 12 lbs. at .75
   36 articles at .50 53 lbs. at .25
   31 articles at .25 50 lbs. at .79
   15 articles at .75 13 lbs. at 1.00
   25 articles at .76 17 lbs. at .75
   75 articles at .13 15 lbs. at .25

Total

Total
B. Practical Application Problems:

1. What is the cost of 5,357 pounds of sugar at 9 2/5 cents a pound?

2. What must have been the selling price of a washing machine that cost $150 and sold at 1/4 above the cost?

3. Is 2/5 of 7/8 more or less than 2/3 of 8/9? How much more or less?

4. Three workmen worked 21 1/2 hours, 27 3/8 hours, and 36 3/4 hours at $.65 an hour. How much did each receive?

5. Smith owns 3/4 of a business and sells 1/5 of his share for $3,000. What was the value of the entire business at the same rate? After the sale, what part of the business did Smith still own?

6. Three partners of a concern agreed to share the profits and losses as follows: Moore, .25; Jones, 33 1/3; and Ramsey, 41 2/3. If Moore received $16,500 as his share of the profits, how much did Jones receive? Ramsey? What were the total profits of the concern?

7. An estate was divided as follows: The wife received 3/4, and the remainder was divided equally among three children. If the wife received $9,000, how much would one child receive?

8. Mr. James owned 4/5 of a baseball club and sold 2/3 of his share for $16,800. What is the value of the whole club at this rate? What fractional part of the club does he still own?

9. An inventory taken by a certain merchant included quantities of canned goods. These were as follows:
   15 3/4 dozen canned plums
   21 11/12 dozen canned tomato juice
   18 1/4 dozen canned canned apricots
   34 1/3 dozen canned pears
   18 2/3 dozen canned sardines
   27 1/12 dozen canned prune juice

Find the total number of dozens on hand.

10. How much less than 95 3/5 minus 57 2/3 is 75 2/3 minus 47 7/8?
11. Find the profit on 138 yards of cloth purchased at $1.16 3/4 a yard and sold at $2.28 1/4 a yard.

12. Helen receives $35.61 a week while Ruth on the same job gets 2/3 as much. How much more will Helen have received at the end of the year than Ruth?

13. Upon entering college a student set aside 1/2 of his funds for room and board, 1/5 for tuition and miscellaneous fees, 1/4 for clothing, and the remainder, amounting to $50.00, for miscellaneous expenses. What was the total amount of his funds at the beginning of the year?

14. A pocket watch and chain were worth $150. The watch was worth 4 1/2 times as much as the chain. What was the value of the watch? The chain?

15. An estate was to be divided as follows: 2/3 to the wife, and the remainder divided equally among 3 children. If one of the children received $1,500, how much did the wife receive?

16. Smith, Jones, and Brown have equal ownership interests in a business. Jones sells 1/5 of his interest to Brown and Smith sells 1/4 of his interest to Brown. At the end of the fiscal period there was a profit of $15,000. How much did each of the partners receive if profits were distributed in proportion to ownership? Smith, Jones, and Brown

17. Mr. Aberdeen bought 47 7/8 pounds of nails, 28 9/10 pounds of tacks, and 2 4/5 pounds of screws. If he returned 1/2 of the nails, what would be the total number of pounds he would have left?

18. The King Grocery Company sold 2/3 of its stock of oranges for $742.40 and 1/2 of the remainder for $252. If there were 62 barrels of oranges left, how many were there at first? If the remaining 62 barrels were sold for $215.40, how much was received for his entire stock? Find the average amount received for each barrel.
19. John can do a piece of work in $1\frac{1}{4}$ days and James can do it in 20 days. What fraction of the work can they both do in one day?

20. A Lake Dallas fisherman catches 23 bass weighing all together 15 pounds. At this rate, how much would 42 such bass weigh?
UNIT III

RATIO AND PROPORTION

LESSON 13

Ratio is the numerical relation of one number to another as shown by the quotient of the first divided by the second. A ratio is expressed by either the use of the colon, :, or in the form of a fraction.

Thus, the ratio of 1 to 3 is expressed as 1:3, or $\frac{1}{3}$, which is a simple ratio.

Proportion is an expression of equality of two ratios. Thus, $3 : 5 = 9 : 15$ and $a : b :: c : d$ are proportions. The double colon, or the equal sign can be used in proportions. The proportion $a : b :: c : d$ is read: $a$ is to $b$ as $c$ is to $d$.

The first and last terms of a proportion are called the extremes of the proportion. The second and third terms are called the means.

There are three kinds of proportions, simple proportion, compound proportion, and multiple proportion. We are primarily interested in the simple proportion which consists of only simple ratios. For example: $2 : 4 :: 4 : 8$, or $a : b :: c : d$ are simple proportions.

The primary principle relating to proportion is as follows:

(1) The product of the extremes of a proportion is equal to the product of the means.

A proportion is a statement that two ratios are equal. Thus, $2 : 3 :: 4 : 6$ is a proportion. By use of the above principle we have $2 \times 6$ is equal to $3 \times 4$, by multiplying together the means and extremes.

Many problems involving only multiplication and division can be stated in the form of a proportion. In such problems there are two sets of like quantities from which the two equal ratios are obtained.

For example: If an automobile travels 80 miles in 2 hours, how far will it travel in 6 hours at the same rate?

Solution: $80 : 2 :: x : 6$ or $\frac{x}{2} = \frac{80}{x}$
$2x = 480$ or $80 \times 2$
$x = 240$, answer

In using the fractional method, cancellation is a time saver.
A. Work the following problems by use of simple proportion.

1. Find the missing terms of the following proportions:
   a. 6 : 55 :: 675 :
   b. 174 : 877 :: 78 :
   c. 108 :: 7.8 :: 57 :
   d. 870 :: 62 :: 97
   e. 25.5 :: 150 :: 300
   f. 15 :: 180 ::

2. If 22 men can do a piece of work in 40 days, how long will it take 30 men to do the work?

3. If 40 men can do a piece of work in 64 days, how many men will be required to do the work in 38 days?

4. John Adams took an automobile trip of 450 miles and used 22.5 gallons of gasoline. How much gasoline would be used on a trip of 1,000 miles? How much gasoline would be used on a 50 mile trip? How far would the automobile go on 15 gallons of gasoline?

5. If it costs 18 cents to send a package 60 miles, how much would it cost to send the same package 187 miles?

6. Jim can read 50 pages, while Tom can read 40. How many pages can Tom read while Jim is reading 90?

7. If Johnson sells 15 brushes for $10.50, how much will he receive for selling 19 brushes?

8. A clock manufacturing concern is capable of manufacturing 1,200 clocks in 6 days. At the same rate of speed how many days would it take them to make 3,000 clocks?

9. A man invests $500 and receives interest to the amount of $30. How much would he have to invest to receive $100 interest?

10. Farmer Brown fed an 80-pound hog for 60 days and found it to weigh 170 pounds. If he wants to market a 240 pound hog, how much longer will he have to feed the animal?
UNIT IV

STATEMENTS AND CASH RECORDS, CHECKS AND CHECK STUBS, RECONCILIATION OF BANK BALANCE

LESSON 14

STATEMENTS

A statement is a formal declaration or communication sent to a customer, usually at the end of the month, showing the condition of the customer's account. The statement should also show the balance that was due at the end of the previous month, all payments that have been made during the month, and any returns and allowances due the customer. The form of statements varies with the type and kind of business.

<table>
<thead>
<tr>
<th>Name</th>
<th>Mr. Scurlock Spivins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>915 W. Sycamore St.</td>
</tr>
<tr>
<td></td>
<td>Denton, Texas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>8/1</th>
<th>8/11</th>
<th>8/20</th>
<th>8/31</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Balance</td>
<td>9.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Merchandise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Slack suit</td>
<td>19.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Ties</td>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Shoes</td>
<td>9.89</td>
<td>32.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cr.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Slack suit</td>
<td>19.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Cash</td>
<td>20.00</td>
<td>39.95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Balance</td>
<td></td>
<td></td>
<td></td>
<td>2.39</td>
</tr>
</tbody>
</table>
A. Arrange the information in the statements below, finding the totals and balance due:

1. Jim Montgomery, 186 Oak Street. July 1, bought hammer, $1.89; July 8, bought wrench set, $9.65; July 15, paid cash, $3.50; July 16, returned hammer; July 18, bought radish, $8.69; July 25, gave check as payment on account, $25.00; July 31, paid cash, $10.50.

2. Mary Smith, 113 Elm Street. February 1, Balance $13.45; Feb. 1, bought a skirt, $4.98; Feb. 5, bought stockings, $1.65; Feb. 8, paid cash, $10; Feb. 15, bought dress, $19.95; Feb. 21, gave check as payment on account, $15.00; Feb. 28, bought purse, $6.95
CASH AND CUSTOMER ACCOUNTS

In the keeping of cash accounts, it is customary to enter on the left or debit side of the account all cash that is received, and all payments of cash on the right or credit side.

Customer accounts are handled in a similar manner with the merchant recording the amount charged to his customers on the left, or debit side. The amounts that the customer pays are entered on the right, or credit side. Returned goods are entered on the credit side, or rather credited to the customer's account.

The difference between the debit and the credit side is said to be the balance, and if both sides are equal, the account is said to be in balance.

An account is balanced in the following manner:

1. The total of the debit side of the account is found, and written in small pencil figures below the last figure in the debit column.
2. The total of the credit side of the account is found, and written in small pencil figures below the last figure in the credit column.
3. On separate paper, the smaller of the above mentioned figures is subtracted from the larger, and the balance is found. The balance is entered on the side of the smaller amount with the following information: the date, the word "balance" in the explanation column, and the amount.
4. A single line is drawn across the money columns of each side directly beneath the last amounts the same distance down from the top of the page. Add and find that the two totals are equal.
5. Double lines are then drawn across all columns except the explanation column.
6. On the first line below the double line on the side of the greater total before the account was balanced, write the following information: the date, the word "balance" in the explanation column, and in the money column the amount of the balance.
7. A check mark is placed in the folio columns in each place after the word "balance" to show that the balances are correct. If this were not done, incorrect balances might be brought down causing the following work to be incorrect.

An account after it has been balanced would appear as follows:
### James A. Willingham

<table>
<thead>
<tr>
<th>Date</th>
<th>Explanation</th>
<th>Folio</th>
<th>Amount</th>
<th>Date</th>
<th>Explanation</th>
<th>Folio</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr. 15</td>
<td></td>
<td>S3</td>
<td>186.16</td>
<td>Apr. 18</td>
<td></td>
<td>CJ5</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5</td>
<td>24.84</td>
<td>25</td>
<td></td>
<td>CJ7</td>
<td>85.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>S5</td>
<td>125.25</td>
<td>30</td>
<td></td>
<td>CJ8</td>
<td>101.50</td>
</tr>
<tr>
<td>28</td>
<td></td>
<td>S6</td>
<td>75.50</td>
<td>30</td>
<td>Balance</td>
<td></td>
<td>274.75</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>S7</td>
<td>150.00</td>
<td></td>
<td></td>
<td></td>
<td>561.75</td>
</tr>
<tr>
<td>May 1</td>
<td>Balance</td>
<td></td>
<td>274.75</td>
<td></td>
<td></td>
<td></td>
<td>561.75</td>
</tr>
</tbody>
</table>

B. Balance and rule the following accounts: Cash accounts are handled in the same manner as customer accounts.

### Cash

<table>
<thead>
<tr>
<th>194</th>
<th>194</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 1</td>
<td>Balance</td>
</tr>
<tr>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>1</td>
<td>187.25</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>452.15</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>89.16</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>551.57</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>28.14</td>
</tr>
<tr>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>18.86</td>
</tr>
</tbody>
</table>
### Cash

<table>
<thead>
<tr>
<th>Oct. 1 Balance</th>
<th>194</th>
<th></th>
<th>Oct. 2</th>
<th>194</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>6</td>
<td>15</td>
<td>94</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>1432</td>
<td>17</td>
<td>11</td>
<td>5</td>
<td>9.75</td>
</tr>
<tr>
<td>15</td>
<td>561</td>
<td>42</td>
<td>13</td>
<td>6</td>
<td>154.15</td>
</tr>
<tr>
<td>29</td>
<td>1964</td>
<td>15</td>
<td>15</td>
<td>6</td>
<td>14.93</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>7</td>
<td>67</td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>

### Cash

<table>
<thead>
<tr>
<th>Nov. 1 Balance</th>
<th>194</th>
<th></th>
<th>Nov. 2</th>
<th>194</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>66</td>
<td>75</td>
<td>9</td>
<td>15</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>181</td>
<td>46</td>
<td>4</td>
<td>9</td>
<td>4100</td>
</tr>
<tr>
<td>15</td>
<td>71</td>
<td>40</td>
<td>13</td>
<td>11</td>
<td>14.71</td>
</tr>
<tr>
<td>21</td>
<td>216</td>
<td>86</td>
<td>25</td>
<td>11</td>
<td>56.83</td>
</tr>
</tbody>
</table>
LESSON 15

CHECKS, CHECK STUBS, DEPOSIT SLIPS, AND
RECONCILIATION OF BANK BALANCE

It is a common practice for a person or a business to deposit money in the bank and establish a checking account, and then write checks against this account. These checks may be bound in books, or in pad form. A pad of checks is very commonly found around retail stores for the use of their customers. The check books are for the use of depositors for the purpose of keeping records of their accounts on the attached stub. The stub is bound permanently to the check book, and the checks can be torn out easily by tearing down a perforated line.

```
No. 28
June 16, 1947

To H. M. Rickow

Pay to the
order of H. M. Rickow
$12.50

Bal. for'd $243.61
Deposited $11.50
Total...... $255.11
This check $12.50
Balance... $242.61

Twelve and 50/100 Dollars

James E. Rice
```

The check stub contains information as to the checks the depositor writes, deposits made, and his balance. His balance is shown after each check is written with all detailed information about the check. If deposits are made, they will be added to the balance brought forward and this will produce a new total, and the next check will be deducted from this total. The final balance is carried forward to the next check stub as the balance brought forward.

On the following page is an example of a deposit slip. This is of vital importance to the depositor because it is his only proof that he actually deposits money in the bank. It should be kept by the depositor until he has reconciled his bank statement at the end of the month and found there is no error.
Deposited With
FIRST STATE BANK
of Denton
Denton, Texas

James E. Rice

June 17, 1947

Information as to what risk the bank assumes, etc.

<table>
<thead>
<tr>
<th>Currency</th>
<th>Dollars</th>
<th>Cents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>21</td>
<td>26</td>
</tr>
</tbody>
</table>

Checks as follows:

---

---
A. Fill in the following checks and stubs as if drawing on your account. Make two deposits, and show final balance.

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas 194 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>FIRST STATE BANK of Denton</td>
</tr>
<tr>
<td>To</td>
<td>Pay to the order of $</td>
</tr>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited. $</td>
</tr>
<tr>
<td>Total... $</td>
<td>This check. $</td>
</tr>
<tr>
<td>Balance... $</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas 194 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>FIRST STATE BANK of Denton</td>
</tr>
<tr>
<td>To</td>
<td>Pay to the order of $</td>
</tr>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited. $</td>
</tr>
<tr>
<td>Total... $</td>
<td>This check. $</td>
</tr>
<tr>
<td>Balance... $</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas 194 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>FIRST STATE BANK of Denton</td>
</tr>
<tr>
<td>To</td>
<td>Pay to the order of $</td>
</tr>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited. $</td>
</tr>
<tr>
<td>Total... $</td>
<td>This check. $</td>
</tr>
<tr>
<td>Balance... $</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas 194 No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>194</td>
<td>FIRST STATE BANK of Denton</td>
</tr>
<tr>
<td>To</td>
<td>Pay to the order of $</td>
</tr>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited. $</td>
</tr>
<tr>
<td>Total... $</td>
<td>This check. $</td>
</tr>
<tr>
<td>Balance... $</td>
<td></td>
</tr>
</tbody>
</table>
B. Bring forward the final balance on the previous page and continue to write checks, to bring forward balances, and make two deposits.

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas</th>
<th>194</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIRST STATE BANK of Denton</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To</th>
<th>Pay to the order of $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited...$</td>
</tr>
<tr>
<td>Total......$</td>
<td>This check.$</td>
</tr>
<tr>
<td>Balance....$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No.</th>
<th>Denton, Texas</th>
<th>194</th>
<th>No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIRST STATE BANK of Denton</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>To</th>
<th>Pay to the order of $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bal. for'd. $</td>
<td>Deposited...$</td>
</tr>
<tr>
<td>Total......$</td>
<td>This check.$</td>
</tr>
<tr>
<td>Balance....$</td>
<td></td>
</tr>
</tbody>
</table>
RECONCILIATION OF BANK BALANCE

Each depositor should receive a statement from the bank at regular intervals, usually once a month. It is the custom of some banks not to send out statements until the depositor requests one. The bank statement shows the amounts deposited to the customer's credit, the amounts charged to the customer's account for checks written, and any additional charges or collections that have been made by the bank for various reasons.

By the reconciliation of a bank balance, we mean bringing our check stub balance and our bank balance into agreement. Reasons why the checkbook balance is sometimes found to be different from the bank statement balance are as follows:
1. Some of the depositor's checks may be outstanding.
2. The depositor may have been charged for some bank service that he did not know about; for example, imprinting checks, collecting notes, other services, etc.
3. The bank may have credited the depositor's account for the collection of a note or something that he did not know about.

To reconcile a bank balance, the depositor should proceed as follows:
1. Compare the checks returned from the bank with the check stubs, and make a list of all outstanding checks. The outstanding checks should then be subtracted from the bank statement balance to get the corrected balance.
2. Any charges not known about by the depositor are subtracted from the checkbook balance, and any unrecorded credits are added. After these adjustments have been made, the corrected balance of the checkbook and the bank statement should agree. If there are no errors, or when the errors have been corrected, the right balance should be placed in the checkstub of the checkbook.

A form very commonly used in making up a reconciliation statement is illustrated on the following page:
RUDOLPH ASHEY

Reconciliation Statement, June 30, 1947

Bank balance as shown by statement .... $ 3,236.46
Checks outstanding:  No. 8, $53.30;
No. 10, $15.61; No. 12, $12.50
Total ............ 81.41
Corrected bank balance .......... $ 3,155.05

Balance according to checkbook .... $ 3,025.50
Less unrecorded bank charges:
  Collection chg ................ $ 2.00
  15 checks @ 4¢ each ........ .60
Total bank charges ... 2.60
  $ 3,022.90
Add: Note collected by bank ........ 132.15
Corrected checkbook balance ........ $ 3,155.05

C. Using the information given, reconcile the following bank balances:

1. The balance as shown on the bank statement of Howard Blagg, August 31, 194_, $656.45. The balance as shown by the checkbook, $586.27.
   Checks outstanding:
   No. 12 $ 8.78
   No. 14  15.42
   No. 16  5.00
   No. 20  1.50
   Collection charge, $1.56.
   Collections made by the bank for the depositor, $41.04.
   Note: Neither the charge or the collection was entered on the check stub.

2. The bank balance is $859.63. The checkbook balance is $693.18. Checks No. 17, 21, 22, and 27 for $39.65,
   $14.83, $56.97, and $46.80 were outstanding. The bank had charged $1 for collection and 80¢ service charge.
   The bank credited out account with $10 they had collected for us. What is our correct balance?
3. The balance as shown on the bank statement of William B. Bellomy on July 3, was $38,877.00. Balance as shown by the checkbook, $34,947.98. A charge made by the bank for collecting a sight draft, $5.75, and a service charge of $.69 was made by the bank. A check deposited by the depositor returned to the bank, $56.23. Sight draft collected for the depositor, by the bank, $57.50.

Outstanding checks:

<table>
<thead>
<tr>
<th>No.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>527.03</td>
</tr>
<tr>
<td>25</td>
<td>28.91</td>
</tr>
<tr>
<td>26</td>
<td>905.07</td>
</tr>
<tr>
<td>28</td>
<td>2,473.18</td>
</tr>
</tbody>
</table>

None of the charges or collections shown on the bank statement were recorded on the check stubs. Reconcile Mr. Bellomy's statement.
UNIT V
SELLING AND BILLING, REQUISITION AND INVOICES, AND CREDIT MEMORANDUMS

LESSON 16

The forms used in the selling and billing of merchandise depend upon the size and needs of the particular type of business. The forms that have been selected are not the only type that can be used, but rather forms that are used by a particular type of business.

It is customary, upon making a sale, for the clerk to make out a sales ticket similar to that of the R. D. BODOUSKY CO., Inc. The sales ticket should give the customer's name and address, quantity and description of each article, and the price and amount. These sales tickets are usually made out in duplicate with the customer getting the original and the clerk retaining the original for record purposes.

On the following page is a sales ticket such as might be used by an automobile agency or a garage.

<table>
<thead>
<tr>
<th>R. D. BODOUSKY CO., Inc.</th>
<th>21 W. Main Street</th>
<th>Milwaukee, Wisconsin</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 16, 1947</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Charles W. Cain</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>18 M. 3d., City</td>
<td></td>
</tr>
<tr>
<td>B 18563</td>
<td>Sold by W</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Article</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pattern</td>
<td>.25</td>
<td>.25</td>
</tr>
<tr>
<td>1</td>
<td>Hat</td>
<td>8.00</td>
<td>8.00</td>
</tr>
<tr>
<td>1</td>
<td>Ribbon</td>
<td>.50</td>
<td>.50</td>
</tr>
</tbody>
</table>

8 75
<table>
<thead>
<tr>
<th>No.</th>
<th>Quan</th>
<th>Part or Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Master Cyl. Kit</td>
<td>1.75</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Oil line</td>
<td>1.80</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Total Parts</strong></td>
<td><strong>3.55</strong></td>
</tr>
</tbody>
</table>

**James Coleman Motor Co.**
Chicago, Illinois

**Name** W. M. Williams  **Date** 11/7/46

**Address** 915 W. Sycamore St.

**Make of car** Ford-40  **License No.** B.C. 6500

**Repair Order—Labor Instructions**

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check Brakes, New M. Cyl.</td>
<td>3.50</td>
</tr>
<tr>
<td>Check oil leak &amp; filter</td>
<td>1.50</td>
</tr>
</tbody>
</table>

**Total**

<table>
<thead>
<tr>
<th>Bulbs</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>50</td>
</tr>
</tbody>
</table>

**Total labor** 5.00
**Total Parts** 3.55
**Gas, Oil, Grease, Accessories**
**Tires, Tubes, outside work** .50

**Total Amount** 14.05
A. Prepare sales tickets for the following problems, showing the heading of sales ticket, quantity, unit price, extended cost, and the total of the sales ticket.

<table>
<thead>
<tr>
<th>R. D. BODOWSKY CO., Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>21 W. Main Street</td>
</tr>
<tr>
<td>Milwaukee, Wisconsin</td>
</tr>
</tbody>
</table>

1. Mrs. Ruth Jenkins who feeds college students, purchased the following groceries from a local store.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Article</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 doz.</td>
<td>eggs @ 45¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 lbs.</td>
<td>coffee @ 37¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 lbs.</td>
<td>steak @ 67¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 lbs.</td>
<td>sugar at 10¢</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 lbs.</td>
<td>lemons @ 12¢</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B

Name
Address

Sold by

19
2. Mr. James A. Daniel buys the following items from the R. D. Bodosky Co., Inc.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Quantity</th>
<th>Article</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 notebooks @ 15¢ each</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 bottles ink @ 20¢ per bottle</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 dictionary @ $4.50</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 packages typing paper @ 15¢</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
B. Using the form given below, prepare a sales ticket for the
Acme Automobile Company showing all necessary data.

1. Raymond Dobbs of 139 W. Center Street, had his 1942 model
Chevrolet overhauled. His license number was EX6661, and
motor number 43R3189.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Amount</th>
<th>Labor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 set rings, $10.00</td>
<td></td>
<td>1 1/2 hours dismantling and cleaning motor.</td>
</tr>
<tr>
<td>1 set gaskets, 35¢</td>
<td></td>
<td>2 hours grinding and replacing valves, and installing rings.</td>
</tr>
<tr>
<td>5 bolts, 7¢ each</td>
<td></td>
<td>3 hours, reassemble work.</td>
</tr>
<tr>
<td>4 exhaust valves, 65¢ each</td>
<td></td>
<td>Labor cost $1.75 per hour.</td>
</tr>
<tr>
<td>2 intake valves, 75¢ each</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gas, Oil, Grease
5 qts. oil, 35¢ a quart
11 gals. gas, 22¢ per gallon

REPAIR ORDER

<table>
<thead>
<tr>
<th>Quan.</th>
<th>Part or Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acme Automobile Co. No. 4900</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oshkosh, Wisconsin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Date</td>
</tr>
<tr>
<td></td>
<td>Address</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Make of car</td>
<td>License No.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Repair Order—Labor Instructions</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gals Gas @</th>
<th>Qts. Oil @</th>
<th>Lbs. Grease @</th>
</tr>
</thead>
</table>

Total Parts

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total labor</td>
<td></td>
</tr>
<tr>
<td>Total parts</td>
<td></td>
</tr>
<tr>
<td>Gas, oil, grease</td>
<td></td>
</tr>
<tr>
<td>Tires, tubes</td>
<td></td>
</tr>
<tr>
<td>Outside work</td>
<td></td>
</tr>
</tbody>
</table>

Total |
Total amount |
G. REQUISITION AND INVOICE.

There are many ways of handling purchases, every business having its more or less individual method. Four business papers are commonly used in connection with purchases. Their names and functions are as follows:

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase requisition</td>
<td>Initiates the buying activity.</td>
</tr>
<tr>
<td>Purchase order</td>
<td>Authorizes the vendor to ship goods.</td>
</tr>
<tr>
<td>Purchase invoice</td>
<td>Shows the indebtedness for the goods.</td>
</tr>
<tr>
<td>Debit or credit memorandum</td>
<td>Adjusts the indebtedness.</td>
</tr>
</tbody>
</table>

Other papers may be used, but these are typical of the average business.

The requisition and invoice form combines the operation of the two forms listed above, the purchase requisition and the invoice. The form is sent out by the purchaser as a requisition, and a copy of the requisition comes back as an invoice with the extended amounts, unit prices, and information as to what goods are sent, and what goods are out of stock and are to be back ordered. Below is an example of a requisition and invoice form that might be received by a retailer from a wholesaler.

<table>
<thead>
<tr>
<th>To</th>
<th>HARDY WHOLESALE GROCERY COMPANY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dallas, Texas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>From</th>
<th>J. Hogan Retail Grocers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td>Keller, Texas</td>
</tr>
<tr>
<td>Requisition</td>
<td>No. 885</td>
</tr>
<tr>
<td>Invoice</td>
<td>No. 1,359</td>
</tr>
<tr>
<td>Date</td>
<td>June 16, 1947</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shipped VIA</th>
<th>Freight</th>
<th>Terms</th>
<th>2/10, n/30</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Quantity Ordered</th>
<th>Explanation</th>
<th>Quantity Shipped</th>
<th>Unit Price</th>
<th>Invoice Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 lbs.</td>
<td>Sugar, pure cane</td>
<td>1000 lbs.</td>
<td>8¢ per lb.</td>
<td>80 00</td>
</tr>
<tr>
<td>85 lbs.</td>
<td>Lemons, Texas</td>
<td>85 lbs.</td>
<td>9¢ per lb.</td>
<td>7 65</td>
</tr>
<tr>
<td>150 lbs.</td>
<td>Coffee, Sunshine Spcl.</td>
<td>150 lbs.</td>
<td>23¢ per lb.</td>
<td>34 50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Freight Prepaid</th>
<th>2 35</th>
</tr>
</thead>
</table>

| Total           | 124 45 |
D. THE DEBIT OR THE CREDIT MEMORANDUM.

If goods are damaged, inferior in quality, or short in quantity, an adjustment in the charge made by the vendor must be obtained. In such a case the purchaser may prepare a debit memorandum, which charges the vendor for the amount of the adjustment, or the vendor may issue a credit memorandum, which shows the credit allowed to the purchaser. This is a matter involving the agreement of the two parties to the transaction, and the memorandum serves as written evidence of this agreement.

Example of a credit memorandum:

<table>
<thead>
<tr>
<th>CREDIT MEMORANDUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office Furniture Company</td>
</tr>
<tr>
<td>Furniture and Fixtures</td>
</tr>
<tr>
<td>Chicago, Illinois</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

We credit your account as follows:

| June 16 | 1 No. 834-41 24x36 maple table | 20 75 |
UNIT VI

LESSON 17

PAY ROLLS, SOCIAL SECURITY ACT,
AND THE WAGE AND HOUR LAW

Records showing the number of hours worked by each employee, or the number of articles produced, his rate of pay, and the amount he is to receive is called a pay roll. Although the amount in the total pay-roll column indicates the amount that the employee earned during the period, it may not necessarily be the amount he will receive. There are certain deductions that may come off, some compulsory, and some voluntary. One important deduction of a compulsory nature for some businesses is the Federal Old-Age Insurance Tax, which comes under the Social Security Act.

The amount withheld from the employee's salary is treated as an income tax on the employee. The employer deducts the amount and matches the amount paid by the employee, and sends the total amount in to the Collector of Internal Revenue. As was stated before, the purpose of the tax is to establish a fund so that the employees who are taxed may receive regular monthly benefits after they reach the age of sixty-five. This may differ slightly with different states.

Other deductions may be group insurance, and hospital care and benefits for the employees.

The most commonly used wage payment systems of today are as follows:
1. The time payment, or day, wage system.
2. The straight piecework wage system.
3. The differential piecework wage system.

The time payment method is the most common, where the employees use clocks to record the time of arrival and departure, and the time-keeping or bookkeeping department makes out their weekly or monthly pay rolls from this information.

The straight piecework method of payment is a fixed amount on each article produced. Each worker would receive the same rate, but the one producing the most would get the greater wages.

The differential piecework system of payment is based upon the number of articles produced, but the rate per article is either increased or decreased, depending on whether a greater or a smaller number of articles than the number fixed is produced in the given time. Under this system an energetic person could receive a higher rate than under the straight piecework plan.
In computing overtime pay, the Federal Wage and Hours Law provides that employees shall be paid at the rate of at least 50% greater than their regular hourly rate for all time worked in excess of 40 hours during a work week. If a man was making 96 cents an hour, his overtime pay would be at least $1.44. Many industries use various wage payment plans and bonus systems as an incentive to the employees.

A. Complete the following pay-roll sheet, finding the total number of hours worked during the week by each employee, and the weekly salary.

HOLMES MANUFACTURING COMPANY

For week ending September 8, 1947

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Employee</th>
<th>M.</th>
<th>T.</th>
<th>W.</th>
<th>T.</th>
<th>F.</th>
<th>S.</th>
<th>Total Hours</th>
<th>Rate Per Hr.</th>
<th>Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flemmons, D.</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>6</td>
<td>9</td>
<td>4</td>
<td>43</td>
<td>$.75</td>
<td>$32.25</td>
</tr>
<tr>
<td>2</td>
<td>Gibbs, B.</td>
<td>4</td>
<td>8</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>10</td>
<td></td>
<td>.90</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Holland A.</td>
<td>8</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td></td>
<td>.95</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Layman, A.</td>
<td>9</td>
<td>9</td>
<td>9</td>
<td>8</td>
<td>10</td>
<td>6</td>
<td></td>
<td>.98</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lenderman, M.</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td></td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Moore, J.</td>
<td>7</td>
<td>5</td>
<td>9</td>
<td>6n</td>
<td>5</td>
<td>9</td>
<td></td>
<td>1.65</td>
<td></td>
</tr>
</tbody>
</table>

B. Many firms pay their employees by check, but the majority still pay by cash on a weekly basis. This brings up a problem of change necessary to pay each worker. To determine this information he must prepare a memorandum showing the exact number of bills, and change of the largest denomination to pay each worker.

Prepare a change memorandum. Complete a change memorandum for the payroll sheet in problem A.
<table>
<thead>
<tr>
<th>No.</th>
<th>Name of Employee</th>
<th>Salary</th>
<th>$20</th>
<th>$10</th>
<th>$5</th>
<th>$1</th>
<th>50¢</th>
<th>25¢</th>
<th>5¢</th>
<th>1¢</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Flemmons, D.</td>
<td>$32.25</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Gibbs, B.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Holland, A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Layman, A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Lenderman, M.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Moore, J.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
C. Complete the following pay roll for the James Crawford Manufacturing Corporation. The rate of pay is based on a 40-hour week, and all over 40 hours receives time and one-half for overtime. There is also a 1% deduction for the Federal Old-Age Tax, and a 1% deduction for unemployment compensation.

**JAMES CRAWFORD MANUFACTURING CORPORATION**

For week ending July 18, 1947

<table>
<thead>
<tr>
<th>Employee's Name</th>
<th>Hours Worked</th>
<th>Rate Per Hour</th>
<th>Time</th>
<th>Salary</th>
<th>Total Amount Earned</th>
<th>Unemployment Tax</th>
<th>Old Age Tax</th>
<th>Total Deduction</th>
<th>Net Amount Due</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mulkey, W.</td>
<td>M. T. W. T. T. F. S.</td>
<td>$ .90</td>
<td>40 4½</td>
<td>$36  $6.08</td>
<td>$42.08  $42  $42  $41.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McBee, H.</td>
<td>8 8 6 9 9½ 9½ .85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McGaughy, W.</td>
<td>9 7 8 8 9 10 1.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McLemore, J.</td>
<td>8 8 8 10 10 11 .98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patrick, O.</td>
<td>8 9 10 9 10 .80</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patterson, R.</td>
<td>8 8 8 8 8 10 1.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pierce, J.</td>
<td>9 9 10 10 10 9½ 1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renfro, J.</td>
<td>8 8 8 8 8 8 .75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schoenerstedt, P.</td>
<td>7 6 8 5 7 4  .90</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shubert, F.</td>
<td>8 8 7 9 8½ 9½ .98</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smith, H.</td>
<td>9 8 9 9½ 9½ 9½ .96</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spencer, J.</td>
<td>9 7 8 9 7 8 1.25</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LESSON 18

PROFIT AND LOSS STATEMENT AND BALANCE SHEET

For the proprietor of a business to know the financial condition of the business at all times, and the changes in the financial condition, it is necessary for him to keep certain records. The balance sheet shows the amounts and the nature of the proprietor's assets, liabilities, and proprietorship. By comparing the present balance sheet with the one prepared at the beginning of the period, changes in financial condition may be determined and adjustments made.

A balance sheet is merely an elaboration of the equation:
\[ \text{Assets} = \text{Liabilities} + \text{Proprietorship} \]

Upon examination we find the assets of Henderson to consist of the following: cash, $640; merchandise, $1,200; store equipment, $765; building, $3,000; furniture and fixtures, $400; land, $1,000; store supplies, $100; office supplies, $50. Mr. Henderson owes Jacques and Co. $1,500 for merchandise, and owes $1,000 on a note for which he mortgaged his store building. His financial condition as stated in balance sheet form would be as follows:

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Jacques &amp; Co.......... $1,500.00</td>
</tr>
<tr>
<td></td>
<td>Mortgage payable... 1,000.00</td>
</tr>
<tr>
<td>Merchandise</td>
<td>Proprietorship</td>
</tr>
<tr>
<td>Store equipment</td>
<td>Jim Henderson, capital......... 4,655.00</td>
</tr>
<tr>
<td>Building</td>
<td>Total liabilities and proprietorship.... $7,155.00</td>
</tr>
<tr>
<td>Furniture and fixtures</td>
<td></td>
</tr>
<tr>
<td>Land</td>
<td></td>
</tr>
<tr>
<td>Store supplies</td>
<td></td>
</tr>
<tr>
<td>Office supplies</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Total assets</td>
<td>$7,155.00</td>
</tr>
</tbody>
</table>

A. Prepare a balance sheet from the following information:

E. C. Anderson, a retail merchant, has the following assets: cash, $4,000; merchandise, $3,500; store equipment, $1,350; land and building, $4,500; store supplies, $850. He owed the bank $3,500, and owed $2,350 to merchantid creditors.
PROFIT AND LOSS STATEMENT

The primary objective of the proprietor is to operate his business in such a manner that he will increase his proprietorship. He desires his accounting records to provide information that will aid him in accomplishing this end. The proprietor needs to know at frequent intervals the amount and the causes of his profit or loss in order that he may plan his future operations so as to increase his profit or to eliminate his loss. He needs a report showing the amount of his sales, the cost of procuring and selling the goods, and the difference, which is the profit or the loss. The statement that gives this information is known as the statement of profit and loss, and is sometimes called an operating statement.

Below is an example of a profit and loss statement.

Frank Wood
Statement of Profit and Loss
For Year Ending December 31, 1947

<table>
<thead>
<tr>
<th>Income from sales:</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross sales</td>
<td>60,800</td>
<td>60,000</td>
</tr>
<tr>
<td>Less returned sales and allowances</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Net sales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of merchandise sold:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory, Jan. 1, 1947</td>
<td>8,000</td>
<td></td>
</tr>
<tr>
<td>Purchases</td>
<td>$41,600</td>
<td></td>
</tr>
<tr>
<td>Less ret'd pur. &amp; allow.</td>
<td>2,400</td>
<td></td>
</tr>
<tr>
<td>Net purchases</td>
<td>39,200</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>47,200</td>
<td></td>
</tr>
<tr>
<td>Less inventory, Dec. 31, 1947</td>
<td>4,000</td>
<td>43,200</td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td></td>
<td>16,800</td>
</tr>
<tr>
<td>Gross profit on sales</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating expenses:</td>
<td></td>
<td>10,400</td>
</tr>
<tr>
<td>Rent</td>
<td>3,600</td>
<td></td>
</tr>
<tr>
<td>Taxes</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td>Salaries</td>
<td>4,100</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>Other expenses</td>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td>Total operating expense</td>
<td></td>
<td>10,400</td>
</tr>
<tr>
<td>Net profit</td>
<td></td>
<td>6,400</td>
</tr>
</tbody>
</table>

The students should thoroughly familiarize themselves with the profit and loss statement and be able if asked to re-construct one similar to the above example.
B. The specialty shop gives you the following data on its operations for the past year: gross sales, $20,800; sales returns and allowances, $800; inventory at the beginning of the year, $14,600; purchases during the year, $46,955; and inventory at the end of the year, $12,300.

1. What was the amount of the net sales? 

2. What was the total cost of goods available for sale? 

3. What was the cost of goods sold? 

4. What was the gross profit on sales?
UNIT VII

INVENTORY AND TURNOVER, AND DEPRECIATION

LESSON 19

An inventory is a list of goods on hand at a specific date, valued at either cost or selling price, according to whichever is the lower.

The three main things to be considered in taking the inventory are quantity, quality, and price. Inventory forms are of a varied nature. Below is a form sometimes used in taking inventory.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Stock No. and Description of Articles</th>
<th>Unit Price</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>87</td>
<td>15-C tubs, galvanized #3</td>
<td>$2.50</td>
<td>$217.50</td>
</tr>
<tr>
<td>120</td>
<td>17-G buckets, 2 gallon, galv.</td>
<td>1.25</td>
<td>150.00</td>
</tr>
</tbody>
</table>

If the inventory is calculated at sales price, then the cost price of the inventory can be found by subtracting the average mark-up percentage. For example, in an inventory that totaled $36,400 at the marked price. It is known that the markup is on the average of 20% of the marked price. $36,400 x 20% = $7,280. $36,400 less $7,280 = $29,120 estimated cost value.

TURNOVER

Turnover is the number of times the average inventory is sold each year, or for a specific period of time. For example, the total cost of goods sold for the year amounted to $257,500. Inventories for the year averaged $103,000. Then, the cost of the goods sold divided by the average inventory gives the rate of turnover. Thus, $257,500 divided by $103,000 equals 2.5, the rate of turnover. The rate of turnover is not a per cent, but the actual number of times the goods are turned.
In figuring the rate of turnover, the cost of goods sold and all inventories that are averaged should be based on the same denomination. That is, all must be figured on either the cost price, or all on the selling price.

Method for finding the rate of turnover:

Inventory, January 1, 1946.............. 100,000
Purchases during 1946..................... 150,000
Less returns and allowances............. 5,000

Net purchases...................... 145,000

Total............................. 245,000
Inventory, January 1, 1947............ 50,000

Cost of goods sold..................... 195,000

Average inventory = $100,000 + $50,000 equals...$ 75,000

$195,000 ÷ $75,000 = 2.6, rate of turnover.

DEPRECIATION

Depreciation is the decrease in value of a fixed asset due to usage. By fixed assets we mean machinery, buildings, furniture and fixtures, and other articles of a similar nature. Depreciation due to usage includes wear and tear, obsolescence, etc.

Since depreciation is an important factor in figuring income tax, regular records should be kept, and depreciation figured on all fixed assets. Where records are carefully kept, depreciation can be figured on all property owned, so that the amount of loss is known and can be properly deducted from the profits.

The most frequently used method for figuring depreciation is known as the straight-line method. There are three factors that are needed in order to figure depreciation. They are as follows:

1. The estimated life or service of the article. The estimated life may be stated in years of usefulness, number of hours of operation, or the number of units that might be produced by a certain machine. The estimated life of an article can not be exact, but after years of experience it is possible to estimate very closely.

2. The scrap or junk value at the end of its estimated life.
3. The original cost of the article. The original cost includes the actual cost plus any additional costs of installation, etc.

To find the amount of annual depreciation, divide the difference between the cost and scrap value of the machine by the probable life.

To find the rate of depreciation, divide the annual depreciation by the original cost.

For example (as stated in years of usefulness):
Automobile: Cost price, $1,650
Estimated life, 5 years
Estimated scrap value, $165
Total depreciation, $1,650 - 165 = $1,485
Annual depreciation, $1,485 \div 5 = $297
Rate of depreciation, $297 \div $1,650 = 18\%

For example (as stated in hours of operation):
Machine: Cost price, $15,000
Estimated hours of operation, 80,000
Estimated scrap value, $3,000
Total depreciation, $15,000 - $3,000 = $12,000
Hourly depreciation, $12,000 \div 80,000 = $0.15
Depreciation first year (machine operated 3,400 hours first year), 3,400 \times $0.15 = $510

If the depreciation of a machine is based on the number of units it will produce during its normal life, it is figured very similar to the hours of operation example. Find the cost per unit that it will depreciate, and then multiply that times the number of units produced.

In finding the book value of an article being depreciated, first find the annual depreciation, then multiply the number of years known times the annual depreciation, and subtract from the original cost. For example: Find the book value of the automobile in the first example after three years. Annual depreciation, $297 \times 3$ equals $891$, the amount depreciated during three years. $1,650$ less $891$ equals $759$, which is the book value.
LESSON 20

Practical Application Problems:

1. J. Smith & Sons took an inventory on January 1, 1946, and found that they had $86,500 worth of merchandise valued at cost price. During the year, purchases were made amounting to $320,000. On January 1, 1947, their inventory showed to be $105,500.
   (a) What was the cost of goods sold during the year?
   (b) What was the average inventory?
   (c) What was the rate of stock turnover for the year?

2. The Abner Corporation figured its inventories quarterly at sales price. They were found as follows:
   January 1, 1946........ $20,716.45
   April 1, 1946......... 16,483.08
   July 1, 1946........... 19,758.93
   October 1, 1946....... 21,758.45
   The total sales for the year amounted to $86,974.35. What was the average inventory? What was the rate of turnover?

3. The Bargain Shoppe gives you the following data on its operation for the past year: gross sales, $30,800; sales returns and allowances, $1,800; inventory at the beginning of the year, $15,000; purchases during the year, $11,160; and inventory at the end of the year, $1,800.
   (a) What was the average inventory?
   (b) What was the rate of turnover for the year?

4. The Jones Company takes inventory every six months. The inventory at the beginning of the year amounted to $54,860; at midyear, $46,832; and at the end of the year, $49,754. Gross sales for the year amounted to $101,500. Sales returns and allowances were .02 of the gross sales.
   (a) What are the total net sales?
   (b) What is the average inventory?
   (c) What is the rate of turnover?

5. Furniture when new cost $640 with an estimated life of 6 years, and a scrap value at that time of $40.
   (a) What is the total depreciation?
   (b) What is the annual depreciation?
6. A delivery truck costing $1,850 when new has an estimated life of 8 years. At the end of this period it has a scrap value of $150. The annual depreciation amounts to __________. What would be the book value at the end of 6 years? __________

7. A certain machine cost $18,000. It is estimated that the machine is good for 90,000 hours of operation and that the scrap value is $4,500. If the machine is used 13,564 hours the first year, what is the depreciation? __________

8. A certain machine cost $1,860. It is estimated that the life of the machine will be 6 years with a junk value of $150. What is the annual rate of depreciation? $ __________, __________% 

9. A large engine cost $20,000. It is estimated that the engine will last 80,000 hours of operation, and the scrap value at that time will be $1,600. If the engine is used 18,024 hours the first year, what is the depreciation? __________

10. A building contractor bought a sawmill for $18,000. Its estimated life was 8 years with a junk value of $1,000 at that time. At the end of 6 years the machine was worn out and sold for junk for $1,050. How much was the difference between the book value and the actual value of the machine on the date of the sale? __________

11. The Johnson Supply Store during last year made sales of $115,175. Sales returns amounted to $3,587.50. The turnover was 3.8. What was the average inventory at retail prices? __________

12. The rate of turnover of the McCall Grocery Store last year was 12.5. The inventory on January 1 was $36,560. On December 31 the inventory was $34,575. What was the total sales for the year? __________

13. The inventory of a small furniture store is as follows. The inventory is valued at cost or market price, whichever is the lower;
<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Unit Cost Price</th>
<th>Unit Mkt. Price</th>
<th>Extension</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>Desks, No. 8</td>
<td>$15.60</td>
<td>$17.95</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Tables, cocktail</td>
<td>8.49</td>
<td>10.49</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Tables, radio</td>
<td>6.59</td>
<td>5.46</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Chair, rocker</td>
<td>15.98</td>
<td>16.12</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Chair, tilt-back</td>
<td>39.95</td>
<td>38.59</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Chifforobes, maple</td>
<td>33.98</td>
<td>32.69</td>
<td></td>
</tr>
</tbody>
</table>
UNIT VIII
PERCENTAGE AND INTEREST

LESSON 21

PERCENTAGE

Percentage is the term applied to that phase of arithmetic which deals with rates expressed in terms of hundredths. Rate is the term applied to the numerical expression of a value based on a comparison of some number with another regarded as a standard. Per cent is a contraction of the Latin "per centum," meaning of or by the hundred. For example, 2 per cent may be written as 2%, which is the symbol that denotes per cent, as the fraction 2/100, or as the decimal .02.

The applications of percentage in business are numerous, and embrace two classes of problems. One with time the essential element, and the other with time not the essential element. The applications of percentage are better expressed in the units dealing with interest, partial payments, bank discounts, etc.

In percentage the three main terms that are used are base, rate, and percentage. The base is the number of which a certain per cent is taken. The rate is the part of the base taken, and is always expressed in per cent. The percentage is the result obtained in taking a certain per cent of the base.

Thus 2% of 300 equals 6; the base is 300, the rate 2%, and the percentage 6.

Three formulas are used in figuring percentage problems. If any two of the factors, base, rate, or percentage, are known, then the third can be found by the use of a formula. The basic formula is $B \times R = P$. For example:

\[
\frac{150}{0.05} = 7.50 = \text{percentage}.
\]

To find the base, the percentage and rate being given:

\[
B = \frac{P}{R}, \text{ or } B = \frac{P}{R}.
\]

$7.50 \text{ is } 5\% \text{ of what number?} \quad \frac{150}{.05} \quad \frac{5}{25} \quad \frac{25}{0}$

115
To find the rate, the percentage and the base being given: What per cent of $150 is $7.50?

\[
\frac{.05}{150} = \text{rate, 5%}
\]

\[
\frac{7.50}{150} = \frac{7.50}{150} = \frac{5}{10}
\]

To find 10% of a number, move the decimal point one place to the left in that number.
To find 1% of a number, move the decimal point two places to the left in that number.

Examples:
10% of $100 equals $10.
10% of 585 equals 58.5
10% of $146.45 equals $14.645 or $14.65
10% of 1,765 equals .1765
1% of $100 equals $1.
1% of $146.45 equals $1.4645 or $1.46
1% of 585 equals 5.85
1% of 1,765 equals .01765

Very good use may be made of the aliquot parts studied in Unit II. The same use of 100% and the aliquot parts for 100% can be made, as was made of the aliquot parts of $1. For example: 25% is 1/4, 50% is 1/2, 75% is 3/4, etc. Care must be taken not to confuse the aliquot parts of 100% with the fractional parts of 1%. There is a lot of difference between 25% of $1,600 equals $400, while 1/2% of $1,600 equals $8.00.

A. Find the percentage on the following problems:

1. 2% of 875
2. 5% of 2,376
3. 8% of $345.50

4. 15% of $896
5. 1/4% of 890
6. 1/2% of $550
7. 1.15% of $645  
8. 125% of $875  
9. 12.5% of $12.50  

B. Find the base in the following problems:

10. $420 = 5% of ________  
11. $865 = 24% of ________  

12. $15.65 = 10% of ________  
13. $45.50 = 4\frac{1}{2}% of ________  

C. Find the rate in the following problems:

14. 85 is what per cent of 460? ________  
15. $125 is what per cent of $2,000? ________  

16. $15.50 is what per cent of $193.75? ________  
17. 184 is what per cent of 900? ________  

18. 144 = ________ times 1728  
19. $92.75 = ________ times $265
Lesson 22

A. Solve the following problems. Use aliquot parts when possible.

1. \( \frac{1}{2}\% \) of 1568

2. \( \frac{1}{4}\% \) of 2278

3. 50% of 684

4. 25% of 1,784

5. 16 2/3% of $125

6. 33 1/3% of $896

7. 12\% of $875.20

8. 52% of $432

9. 87\% of $536

10. 16 2/3% of $3,666

11. 8 1/3% of $1,728

12. 230\% of $320
B. Change the following per cents to fractions:

1. 60%______________ 5. 66 2/3%______________
2. 75%______________ 6. 87 1/2%______________
3. 8 1/3%______________ 7. 16 2/3%______________
4. 12 1/2%______________ 8. 20%______________

C. Change the following per cents to decimals:

9. 25%______________ 13. .5%______________
10. 2.13%______________ 14. .16 1/2%______________
11. 16 1/2%______________ 15. 8 1/3%______________
12. 100%______________ 16. 17 9/10%______________

D. Change the following decimals to per cents:

17. .25______________ 21. .005 1/2______________
18. .12 1/2______________ 22. 3/5______________
19. .005______________ 23. 2/5______________
20. 1.18______________ 24. 18/200______________

E. Practical Application Problems.

1. The sales in 1946 amounted to $12,000 and in 1947, $14,000. What was the per cent of increase of the 1947 sales over the sales of 1946?______________

2. 1/5 of 200 is 40. What is 20% of 200?______________

3. $38.50 is 125% of a number. The number is______________

4. ________________ is 150% more than 96.

5. $125 is 12 1/2% less than______________

6. $87.50 is $25% more than______________
7. Three baseball teams played a total of 144 games during the season. If the first team plays 25% of all the games played, and the second team 8/9 as many games as the first, and the third team plays the remainder, how many games did each team play?

8. Matthews made $5,632 last year. He spent 21% for food, 11% for rent, 12% for clothing, 18½% for other items, and saves the remainder. What per cent of his income did he save? How much money did he save? How much did he spend on each of the above items? Food, Rent, Clothing, Other items

9. A number increased by 16 2/3% of itself equals 360. The number is__________

10. The sales of a chain grocery store increased 12% each year for four years. If the sales the first year amounted to $23,965, find the sales the fourth year.

11. A number decreased by 12 1/2% of itself equals 116. The number is__________

12. The costs of advertising costs of a certain concern amounted to 18% of its gross sales. If the expenses amounted to $3,850, find the gross sales.

13. $17.85 is 75% smaller than__________.

14. The following is the record of the number of games won and lost by the teams of the Texas League. Find their standing in per cent to three decimal places.

<table>
<thead>
<tr>
<th>Team</th>
<th>Games Won</th>
<th>Games Lost</th>
<th>Per Cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houston</td>
<td>40</td>
<td>22</td>
<td>________</td>
</tr>
<tr>
<td>Shreveport</td>
<td>36</td>
<td>27</td>
<td>________</td>
</tr>
<tr>
<td>Fort Worth</td>
<td>34</td>
<td>30</td>
<td>________</td>
</tr>
<tr>
<td>Dallas</td>
<td>34</td>
<td>31</td>
<td>________</td>
</tr>
<tr>
<td>Beaumont</td>
<td>33</td>
<td>34</td>
<td>________</td>
</tr>
<tr>
<td>Tulsa</td>
<td>29</td>
<td>36</td>
<td>________</td>
</tr>
<tr>
<td>San Antonio</td>
<td>26</td>
<td>39</td>
<td>________</td>
</tr>
<tr>
<td>Oklahoma City</td>
<td>26</td>
<td>39</td>
<td>________</td>
</tr>
</tbody>
</table>

15. $16.75 increased by 87 1/2% amounts to__________.
16. The Standard Grocery received a shipment of 462 pineapples, which were sold at the following rates: 16⅔% at $ .40 each, and 50% of the remainder at $ .36 each. Of the remaining amount, 25% were spoiled, and the remainder sold at $ .15 each. How much was received for the entire shipment?

17. A 37% discount is received on $89.90. The amount received is __________.

18. John Greer made a payment of $87 on an old debt. If this is 14½% of the debt, what does he owe? __________

19. In one year Jack Smith saved $1,640, which represents 34½% of his total income. Find the amount of his income. __________

20. An 8% commission on a sale amounts to $16.50.

21. The total attendance at a certain auditorium was 3,640. Of this total, 1,230 were children, 1,050 were men, and the remainder women. Find the percent of the total attendance represented by each group. Children __________, men __________, women __________

22. A building cost $20,500. Find its value at the end of 5 years if it depreciates at the rate of 4% on the declining balance each year. __________

23. __________ is still due on a purchase of $195, if 5½% of it was paid.

24. A man invests $4,560 in government bonds, which was 18½% of his total capital. What is the amount of his total capital?

25. Mr. Jim Reece received 80% of a consignment of barley; he sold 17% of what he received and then found that he had left 4,564 bushels. What was the entire consignment? __________
INTEREST

Interest is the consideration for the use of capital, or that which is earned by the productive investment of capital. It is the sum of money charged for the use of borrowed money, or the income credited for the use of money loaned or invested.

Elements to become familiar with in figuring interest are as follows:
1. Principal.
2. Time.
3. Rate.
4. Interest.
5. Amount.

The principal is the sum of money at interest.
The time is the period the borrower uses the money.
The rate of interest is the rate of compensation paid the lender for one year's use of each unit of the principal.
The rate is customarily expressed as a per cent of the basic unit of the principal.
The amount is the principal plus the interest.

Simple interest is interest which, if not paid when due, does not increase the principal or draw interest on itself, however long the borrower retains it.

Interest is found by multiplying the principal by the interest rate and by the time. Thus, \( I = P \times r \times t \), or \( I = Prt \).

For example:

\[ \frac{\$500 \text{ (principal)} \times 6\% \text{ (interest rate)} \times 1 \text{ year (time)}}{\$500 \times .06 \times 1} = \$30 \]

If the term had been for less than a year, the number of days over 360 or 365 would replace the 1 in the above illustration.

Ordinary and Exact Interest Methods. Ordinary interest is simple interest calculated on the basis of 360 days in the year, that is 12 months of 30 days each. Ordinary interest may be calculated for ordinary time or exact time. Ordinary time is from one date to another calculated on the basis of the 360-day year, and expressed in years, months, or days.

Exact interest is simple interest calculated for the exact number of days in a given interval on the basis of 365 days in the ordinary year and 366 days in the leap year.
The legal rate of interest in a given state is the rate of interest allowed by law. The legal rate for the majority of states is from 5% to 8%.
Usury is the taking of a higher rate of interest than is allowed by law.

Methods of Figuring Interest.

In figuring interest using 365 days, or the exact interest method, the same procedure is always used. Substitute for the formula, \( I = Prt \), for example: Find the interest on $1,500 at 5% for 30 days.

\[
I = \frac{1,500 \times 0.05 \times 6}{73}
\]

\[
0.05 \times 1,500 = \$75 \text{ interest for one year.}
\]

\[
\frac{75 \times 6}{73} = \$6.164 \text{ or } \$6.16 \text{ interest for 30 days at 5%}
\]

There are no short-cut methods to be used in the exact interest method, and all problems will be handled similar to the above illustration. It is advisable to cancel whenever possible, but in all cases be cautious of the decimal point.

There are several short-cut methods that may be employed in figuring interest by use of the ordinary interest method, or the 360-day year. The most common of these short-cut methods is the 6%, 60-day method. For example: Find the interest on $860, for 60 days at 6%.

\[
0.01 \\
\frac{860 \times 0.01 \times 60}{360}
\]

\[
= \$8.60
\]

Since the \( 0.06 \times 360 \) cancels out to .01, or 1%, and we know that to multiply 1% times a number you merely move the decimal point two places to the left, the problem is simplified.

Use aliquot parts of 60 days in finding the number of days, since the number of days for which the interest is to be found is not always 60.

The more important and frequently used aliquot parts of 60 days are:

- 30 days = 1/2 of 60 days
- 20 days = 1/3 of 60 days
- 15 days = 1/4 of 60 days
- 12 days = 1/5 of 60 days
- 10 days = 1/6 of 60 days
- 6 days = 1/10 of 60 days

A very good and practical use of the 6%, 60-day method as a short cut for figuring interest by the ordinary interest method is as follows:
Use the 6% and the 60 days as the base and figure all problems of ordinary interest as if they were 6% for 60 days. For example:

Find the interest on $600 at 4% for 60 days.
If the interest had been 6% for 60 days, the amount of the interest would have been $6.00, which is 1% of $600. Thus,

\[
\frac{6.00 \times \frac{4}{2} \times \frac{80}{60}}{2} = \frac{6.00 \times 2/3 \text{ or } 4.00}{2}
\]

Much of the computations can be made mentally without the trouble of going through the long and drawn-out process.

If the problem had been as follows: Find the interest on $600 at 4% for 80 days, the solution would have been obtained in the same manner.

\[
600 \times 4\% \times 80 \text{ days} = 6.00 \times \frac{4}{2} \times \frac{80}{60} = 6.00 \times \frac{8}{9} \text{ or } 5.33
\]

A. Find the interest in each of the following problems, using both the 360 and 365 day methods.

1. $400 at 4% for 60 days 360-day_____ 365-day_____
2. $500 at 6% for 30 days 360-day_____ 365-day_____
3. $860 at 5% for 75 days 360-day_____ 365-day_____
4. $940 at 4\% for 6 days 360-day_____ 365-day_____
5. $1,540 at 8% for 135 days 360-day_____ 365-day_____

B. Using the 6%, 60-day method, find the ordinary interest on the following:

1. $565 for 140 days at 6%________________________
2. $849 for 98 days at 7%________________________
3. $786 for 134 days at 7%________________________
4. $165.75 for 54 days at 4%________________________
5. $1,750.50 for 150 days at 8%________________________
6. $348 for 98 days at 4%________________________
7. $750 for 56 days at 4%________________________
8. $875 for 38 days at 4 1/2%

9. $213.40 for 102 days at 8%

10. $486.12 for 92 days at 6%
LESSON 24

FINDING ELAPSED TIME, AND DUE DATE

The procedure for finding the time from one date to another depends upon whether the interest calculation requires ordinary or exact time.

In the figuring of ordinary time from one date to another, it is customary to consider a 360-day year, and a 30-day month, and to disregard the number of days in a particular month.

In figuring exact time, the exact number of days in a particular month is used and a 365-day year.

In many instances the actual due date is given, and it is necessary to determine the actual number of days to be used in computing the interest.

A note dated June 19 is due August 14. For how many days is the interest computed? The following is procedure for finding the number of days between two dates:

June 19 to August 14
30 Is the number of days in June
-19 The number of days up to and including the date of the note -- June 19
11 Is the number of days note held in June
31 Is the number of days in July
14 The number of days in August, up to and including the maturity date
56 Is the number of days to be used in computing the interest.

It is the best policy to count either the first or the last day, but not both. In the above illustration, the first day was not counted and the last was counted.

If the time of the note had been given in days to run, then it would have been necessary to determine the date of maturity of the instrument. For example, on what date would a 60-day note dated June 19 mature? The maturity date would be found as follows:

30 Is the number of days in June
-19 The number of days up to and including the date of the note -- June 19
11 Is the number of days note held in June
31 The number of days in July
18 Number of days in August
50

The due date of the note is August 18.
When the time is expressed in years or months, the date is advanced the number of months or years, and the same day of the month is supplied. If this day does not appear in the month of maturity, the last day in the month should be taken. For example, if the maturity date should fall on the 30th of February, in a year other than leap year, the maturity date would be February 28. In problems of this unit, Februaries not followed by a year have 28 days.

Unless otherwise specified, the student should use the exact time between dates in working problems in this unit.

A. Find the exact number of days between the following dates:
   1. From May 1 to July 3
   2. From January 15 to April 12
   3. From December 8, 1944, to April 16, 1945
   4. From October to December 20
   5. From August 1, 1945, to October 15, 1946

B. Find the maturity dates of the following notes:

<table>
<thead>
<tr>
<th>Date of Note</th>
<th>Time</th>
<th>Maturity Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. January 5</td>
<td>90 days</td>
<td></td>
</tr>
<tr>
<td>2. March 18</td>
<td>87 days</td>
<td></td>
</tr>
<tr>
<td>3. April 16</td>
<td>52 days</td>
<td></td>
</tr>
<tr>
<td>4. June 19</td>
<td>4 months</td>
<td></td>
</tr>
<tr>
<td>5. December 30</td>
<td>125 days</td>
<td></td>
</tr>
<tr>
<td>6. November 30</td>
<td>3 months</td>
<td></td>
</tr>
<tr>
<td>7. April 12</td>
<td>11 months</td>
<td></td>
</tr>
<tr>
<td>8. February 8</td>
<td>45 days</td>
<td></td>
</tr>
<tr>
<td>9. May 31</td>
<td>6 months</td>
<td></td>
</tr>
<tr>
<td>10. July 3</td>
<td>89 days</td>
<td></td>
</tr>
</tbody>
</table>
C. Compute the interest due at maturity on the following notes, and fill in maturity date and time where necessary. Compute the interest for the exact number of days even though expressed in months. Assume that none of the problems fall in leap year.

<table>
<thead>
<tr>
<th>Face of Instrument</th>
<th>Date</th>
<th>Days</th>
<th>Time</th>
<th>Due Date</th>
<th>Interest Rate</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $840</td>
<td>Jan. 8</td>
<td>90</td>
<td></td>
<td></td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>2. $580</td>
<td>March 14</td>
<td>72</td>
<td></td>
<td></td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>3. $1,450</td>
<td>June 18</td>
<td>3 mo.</td>
<td></td>
<td></td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>4. $875.50</td>
<td>Aug. 29</td>
<td>____</td>
<td>Nov. 13</td>
<td></td>
<td>4.3%</td>
<td></td>
</tr>
<tr>
<td>5. $3,640</td>
<td>Sept. 30</td>
<td>____</td>
<td>Jan. 3</td>
<td></td>
<td>5.3%</td>
<td></td>
</tr>
<tr>
<td>6. $87.58</td>
<td>Nov. 20</td>
<td>____</td>
<td>Dec. 29</td>
<td></td>
<td>7%</td>
<td></td>
</tr>
</tbody>
</table>

D. Solve the following problems:

1. Find the difference between the exact and ordinary interest on $960 for 96 days at 5%.
   Ordinary interest: ____________________
   Exact interest: ____________________
   Difference: ____________________

2. Using the exact interest method, and the exact number of days, find the interest on:
   (a) $315 at 6% from March 23 to June 3
   (b) $165 at 5% from July 18 to Nov. 23

3. Find the interest on $300 at 5% for 73 days using the 365-day year.

4. Determine the maturity dates on the following notes:

<table>
<thead>
<tr>
<th>Date of Note</th>
<th>Time</th>
<th>Maturity Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aug. 15</td>
<td>90 days</td>
<td></td>
</tr>
<tr>
<td>Oct. 1</td>
<td>90 days</td>
<td></td>
</tr>
<tr>
<td>Jan. 1</td>
<td>3 months</td>
<td></td>
</tr>
</tbody>
</table>

5. Joseph Cotten agreed to accept a 90-day note amounting to $960 at a discount of 5% in part payment of a debt amounting to $1,350 due mm for goods sold to L. A. Clark. What is the balance still due Cotten?
5. A certain tax bill of $154.50 is overdue 72 days. Interest is charged at the rate of 5\% per annum. What is the amount due?

7. What is the maturity date and the amount due on a note for $678 for 90 days at 5\% per cent, dated March 29, 1947?

   Due __________________________

   Amount $______________________

8. A loan amounting to $916.40 is due in 90 days, with interest at 5\%. What is the interest charge? ______

   What amount is necessary to repay the loan? ______
Cash discount is a discount allowed on a bill, or invoice of merchandise, by a seller to induce the buyer to pay cash or to make payment within a specific period of time.

Wholesalers and jobbers allow cash discounts to customers for each payment or for payment within a period of 10 days from the date of shipment of the goods.

The terms of the discount are usually printed in the heading of the invoice. For example, 3/10, n/30 (read three ten, net thirty means that a 3 per cent discount will be given if the bill is paid within ten days, but that the net amount is to be paid within thirty days. The "n" means the net amount of the invoice, that is the full amount of the invoice.

An example of a cash discount is as follows: An invoice for $181.65 with terms 3/10, n/30 was paid within 10 days.

\[
\begin{align*}
181.65 & \quad \text{net amount of invoice} \\
.03 & \quad \text{three per cent discount} \\
5.4495 & \quad \text{amount of discount} \\
181.65 & - 5.4495 = 176.20, \text{ amount to be paid}
\end{align*}
\]

If the bill had not been paid within 10 days, the total amount of $181.65 would have to be paid by the end of the 30-day period.

In case any of the goods are returned, it is necessary to subtract the amount of the return from the amount of the invoice before figuring the discount. No discount would be allowed on the returned merchandise. Hence in the above example, if $18 worth of merchandise had been returned, the amount to be paid would be determined as follows:

\[
\begin{align*}
181.65 & \quad \text{net amount of invoice} \\
18.00 & \quad \text{value of returned goods} \\
163.65 & \\
.03 & \quad \text{rate of cash discount} \\
4.9095 & \quad \text{rate of cash discount} \\
163.65 & - 4.9095 = 158.74, \text{ amount to be paid}
\end{align*}
\]
If freight charges have been added to the invoice, then they must be deducted in the same manner as the returned goods. The only difference being that the freight charges must be added in again after the discount has been figured to find the amount to be paid.

PARTIAL PAYMENTS

A partial payment is a part payment of a debt. Partial payments are most generally used in accordance with previous agreement, or according to contract.

It is very common that a buyer is not able to settle his account in full but prefers to make a partial payment in order to take advantage of a cash discount on that portion of the payment. In such cases, it is necessary to find the amount covered by such a payment. For example, Hugh Aiken buys merchandise on terms 3/10, n/30. Within 10 days he decides to make a partial payment of $300 on his $750 purchase. It was agreed that he was to receive the discount on the part payment. After the payment has been made, how much does he still owe? 100% less 3% = 97%, percentage remitted.

For each 97 cents of remittance, $1.00 of the debt will be cancelled. For example:

\[
\frac{309.278}{.97} = \frac{360.000}{291}
\]

\[
\begin{align*}
900 \\
873 \\
270 \\
194 \\
760 \\
679 \\
810 \\
776 \\
34
\end{align*}
\]

$750 less $309.28 = $440.72

If there is freight involved in a partial payment problem, the freight has to be paid first. To accomplish this, the amount of the freight should be subtracted from the amount of the partial payment. The percentage remitted then would be divided into that amount, and then the freight added back on to get the final figure.

For example, if in the above illustrative problem $5, of the $750 had been freight, then the .97 would have been divided into $295, and the amount of the quotient would have
been added on to the $5. It is important to remember that the first thing that is considered and paid is the freight and the discount is figured on the balance that remains.

**TRADE DISCOUNTS**

Manufacturers and dealers have a fixed price list for their merchandise. When the prices change due to market fluctuations, instead of changing the price list, which would lead to the continuous reprinting of price lists, the rate of trade discount is changed.

A plan that is used by many manufacturers is to issue catalogues giving the list prices and then provide a discount sheet which takes care of the fluctuations in prices.

The trade discount may be a single discount, or it may be a series of discounts. Where the trade discount is a single discount, it is handled just as a simple percentage problem.

When there is a series of discounts, as 20%, 10%, and 5%, they are calculated on a decreasing basis. The first is figured on the original list price, while the second is figured on the amount that is left after the first discount has been subtracted. Then the third discount is figured on the result after the second discount has been figured. For example, an article is listed at $100 less 20% and 10%.

\[
\begin{align*}
$100 \times 20\% &= $20 \text{ first discount} & $80 \times 10\% &= $8 \text{ second discount} \\
$100 \text{ less } $20 &= $80 & $80 \text{ less } $8 &= $72 \text{ net price}
\end{align*}
\]

Another method of calculating the net price is by working on the basis of 100%, or the whole number 1, and then applying the net price in per cent to the amount of money:

\[
\begin{align*}
1.00 \times 20\% &= .20 \text{ first discount} & .80 \times 10\% &= .08 \text{ second discount} \\
1.00 \text{ less } .20 &= .80 & .80 \text{ less } .08 &= .72 \text{ net price}
\end{align*}
\]

Probably the best and shortest method for figuring a series of trade discounts is to find the equivalent discount, and instead of multiplying each discount separately, use the equivalent discount rate instead. The rule is: From the sum of the two discounts, subtract their product; the result will be a single discount equivalent to the two.
The method is applied as follows:

\[ 20\% + 10\% = 30\% \quad \text{and} \quad 20\% \times 10\% = 2\% \]

(subtract) \quad 28\% = \text{the equivalent rate} \quad \$100 \times 28\% = \$28 \quad \text{and} \quad \$100 \text{ less } \$28 = \$72

To find the equivalent discount rate for a series of three discounts, the third discount is used with the equivalent of the first two discounts, and the result will be a single discount equivalent to the three discounts. Find the equivalent discount rate for 20\%, 10\%, and 5%.

\[ 20\% + 10\% = 30\% \quad \text{and} \quad 28\% + 5\% = 33\% \]

20\% \times 10\% = 2\% \quad 28\% \times 5\% = 1.4\%

(subtract) \quad 28\% \text{ equivalent for } 20\% \text{ and } 10\%

(subtract) 31.6\% \text{ equivalent for } 20\%, 10\% \text{ and } 5\%
LESSON 26

CASH DISCOUNT PROBLEMS

A. Find the cash discount, and the net amount of each of the following bills assuming that the cash discount was taken on each bill.

<table>
<thead>
<tr>
<th>Amount of Bill</th>
<th>Terms</th>
<th>Cash Discount</th>
<th>Net Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>$865.00</td>
<td>3/10, n/30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$695.00</td>
<td>2/10, n/60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$1,430.00</td>
<td>6/10, n/60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$468.59</td>
<td>5/10, n/30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$89.56</td>
<td>8/10, n/60</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Find the amount due in each of the following bills:

<table>
<thead>
<tr>
<th>List Price</th>
<th>Terms</th>
<th>Date of Inv.</th>
<th>Date Paid</th>
<th>Cash Discount</th>
<th>Amount Paid</th>
</tr>
</thead>
<tbody>
<tr>
<td>$875.65</td>
<td>2/10, n/30</td>
<td>Jan. 1</td>
<td>Jan. 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$99.48</td>
<td>3/10, n/60</td>
<td>Feb. 12</td>
<td>Feb. 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$932.12</td>
<td>6/10, 3/30, n/60</td>
<td>Apr. 15</td>
<td>May 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$285.13</td>
<td>5/10, n/30</td>
<td>Mar. 1</td>
<td>Mar. 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$56.86</td>
<td>4/10, n/60</td>
<td>May 30</td>
<td>June 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$865.99</td>
<td>5/10, 2/30, n/60</td>
<td>Aug. 28</td>
<td>Sep. 27</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$991.19</td>
<td>3/20, n/90</td>
<td>Sep. 19</td>
<td>Sep. 30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Totals........
C. Solve the following problems:

1. Find the amount paid for the following bill of goods bought by the Quincy Retail Store, terms 6/10, 4/30, n/60, if the purchase was made September 28, and paid October 22.

   \[
   \begin{align*}
   28 \text{ tennis rackets} & @ \$6.79 \\
   32 \text{ fielders gloves} & @ \$4.92 \\
   18 \text{ tennis nets} & @ \$6.89 \\
   58 \text{ tennis balls} & @ \$0.59 \\
   18 \text{ beach balls} & @ \$3.59 \\
   \end{align*}
   \]

   Total: 
   Cash discount. 
   Amount paid...

2. The Achilles Company whose terms are 3/10, n/30, received a check for $189.56 from a customer for a bill of goods purchased nine days before. How much discount did the customer deduct?

3. A certain invoice dated May 19 was paid July 3. The amount paid was $96.12. If the terms of the invoice were 8/10, 5/10, n/90, the amount of the invoice was.

4. Allen's invoice amounting to $78.20, terms 8/10, n/30, was dated March 25 and paid April 2. $ was the amount paid.

5. A certain invoice amounted to $1,640, and dated Aug. 1, and was paid Aug. 11. On Aug. 5, $18 worth of goods was returned. What was the amount paid?

6. Find the amount paid in each of the following cases, if the cash discounts are taken:

   (a) Terms 3½/10, n/60
   Total amount of invoice, including freight $965.76
   Returned merchandise, $35.60
   Freight, $7.34
   Amount paid $

   (b) Terms 3/10, n/30
   Total amount of invoice, including freight, $195.75
   Returned merchandise, $8.95
   Freight, $3.49
   Amount paid $
LESSON 27

CASH DISCOUNT AND PARTIAL PAYMENT PROBLEMS

1. The Brannon Department Store purchased merchandise that amounted to $5,865.40. The terms of the invoice were November 3, 2/10, 1/30, n/60. The Brannon Department Store could not pay the amount in full by the 13th of November, but sent a check for $1,500 to apply as part payment. On December 1 another check was sent for $2,000. If discount was granted on the partial payments,

(a) How much credit was given on the check sent November 13th?

(b) How much credit was given on the check sent December 1st?

(c) What was the amount of the check sent by the Brannon Department Store on December 2nd, in settlement of the balance owed on their account?

2. Mr. Buford Brooks bought goods that totaled $236.42 on June 20, 1947. Terms of the invoice were 2/10, n/30. Of the total amount of the invoice, $3.50 was for freight. On June 25, he sent a check for $150. How much was still due on July 30?

3. Mr. H. O. Brown purchased merchandise amounting to $365.75 on terms 3/10, n/30. The invoice was dated January 1, and five days later Brown returned $7.80 worth of merchandise. Of the $365.74, $3.60 was for freight. Mr. Brown sent a check for $200 on January 9, as partial payment of his account. How much did he still owe when the invoice became due?

4. Farmer Cook, who desires to buy a farm truck for cash, has had the following offer: In the first town, he is offered the truck for $1,800, terms 3/10, n/90. In the second town the same kind of truck was offered for 4/10, 3/30, n/90. Which of the two was the better offer? How much better?
5. Complete the following form to find out how much will be due on June 30, 1947.

JOHN DILLINGER

Chicago, Illinois

June 1, 1947

Sold to G. E. Christian

Evenston, Illinois

Terms 3/10, n/30

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pairs hedge shears</td>
<td>18</td>
<td>$3.29</td>
</tr>
<tr>
<td>Garden hoes</td>
<td>12</td>
<td>1.09</td>
</tr>
<tr>
<td>Grass shears</td>
<td>8</td>
<td>1.98</td>
</tr>
<tr>
<td>Grass slicers</td>
<td>9</td>
<td>.98</td>
</tr>
<tr>
<td>Spray sprinkler</td>
<td>11</td>
<td>3.19</td>
</tr>
<tr>
<td>Sprinkler hoses</td>
<td>5</td>
<td>3.69</td>
</tr>
<tr>
<td>Ventilating fans</td>
<td>7</td>
<td>18.95</td>
</tr>
<tr>
<td>Kitchen sinks</td>
<td>3</td>
<td>31.50</td>
</tr>
<tr>
<td>Medicine cabinets</td>
<td>8</td>
<td>14.69</td>
</tr>
<tr>
<td>Lavatories</td>
<td>6</td>
<td>18.60</td>
</tr>
</tbody>
</table>

Less 10% and 7%

Less 15% and 5%

Less 20% and 10%

Total of invoice

Less cash discount

Net amount paid

LESSON 28

CASH AND TRADE DISCOUNT PROBLEMS

Many articles are advertised at a certain price, but the retailer is allowed a discount, which represents his margin of gross profit if the list price and the retailer's sale price are the same.

A. On the following compute the net price and the gross profit.

<table>
<thead>
<tr>
<th>Advertised Price</th>
<th>Dealer’s Discount</th>
<th>Net Price</th>
<th>Gross Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$34.45</td>
<td>25%</td>
<td>$25.84</td>
<td>$8.61</td>
</tr>
<tr>
<td>16.69</td>
<td>35%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>84.68</td>
<td>33 1/3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>161.60</td>
<td>40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>76.59</td>
<td>22%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>359.84</td>
<td>38%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Find the net price for the following articles:

<table>
<thead>
<tr>
<th>Article</th>
<th>Price</th>
<th>Trade Discount</th>
<th>Net Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innerspring mattress</td>
<td>$34.77</td>
<td>20% and 25%</td>
<td></td>
</tr>
<tr>
<td>Dinette set</td>
<td>72.95</td>
<td>25% and 35%</td>
<td></td>
</tr>
<tr>
<td>Kitchen cabinet</td>
<td>23.48</td>
<td>15% and 40%</td>
<td></td>
</tr>
<tr>
<td>Electric fan</td>
<td>21.95</td>
<td>20% and 33 1/3%</td>
<td></td>
</tr>
<tr>
<td>Console radio</td>
<td>159.50</td>
<td>40% and 30%</td>
<td></td>
</tr>
</tbody>
</table>

If the terms had been 3/10, n/60 and payment had been made within 10 days, how much would be required to pay the total?

C. What is the net price of a living room suite listed at $286.50 less 30% and 10%? Net price __________. Trade discount __________
D. In the following problems, find the equivalent rate of discount, the amount of the discount, and the net amount.

<table>
<thead>
<tr>
<th>Gross Amount</th>
<th>Discounts</th>
<th>Equivalent Discount</th>
<th>Amount of Discount</th>
<th>Net Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $860</td>
<td>15% and 25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. 535.40</td>
<td>25% and 10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 875.80</td>
<td>40% and 25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 1,765</td>
<td>15%, 10%, and 5%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 967.58</td>
<td>28%, 12%, and 4%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 3,863</td>
<td>33 1/3% and 6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. 467.03</td>
<td>16 2/3% and 10%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. 56.44</td>
<td>13% and 21%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. 189.34</td>
<td>32% and 3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. 1,457</td>
<td>15%, 12%, and 41%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E. Compute the following discounts:

<table>
<thead>
<tr>
<th>List Price</th>
<th>Discount Per Cent</th>
<th>Trade Discount</th>
<th>Net Price</th>
<th>Terms</th>
<th>Date of Invoice</th>
<th>Date Paid</th>
<th>Cash Disc t</th>
<th>Net Cash Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$865</td>
<td>15%, 5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>349</td>
<td>20%, 20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>742</td>
<td>25%, 10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>569</td>
<td>163/4%, 14%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>965</td>
<td>30,20,10%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>25,15,5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>312</td>
<td>20,161/2,1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
F. Solve the following problems:

1. On June 12 the Davis Clothing Company purchased merchandise amounting to $4,560 from a wholesaler who gives a trade discount of 25%, 15%, and 5%. Terms of the purchase were 4/10, 3/30, n/90. September 23 a check for $1,500 was sent. Another check for $1,000 was sent on October 8. How much credit was given on the $1,500 check? How much credit was given on the $1,000 check? At the end of the 90-day period, what was the balance due?

2. Mr. Couch purchases merchandise listed in the wholesale catalog at $654. The wholesaler allows a trade discount of 25%, 20%, and 5%. What must Mr. Couch pay for the merchandise?

3. On January 15 a merchant bought goods, the total of which was $500 on terms 3/10, n/60. Of the amount $4.00 was for freight. The next day the merchant returned merchandise and received credit for $11.40. Six days later he sent a check for $200. How much credit was given on the $200 check? What was the balance due after he received credit for the check?

4. Which of the series of discounts is the more advantageous to the buyer, 20, 10, 5, or 20, 15, 10? By how much?

5. The catalog price of a chair is $35. If this price is subject to discounts of 16 2/3% and 10%, what is the net price?

6. Find the amount due on merchandist invoiced at $1,350 subject to discounts of 35%, 25%, and 5%.

7. A local dry goods store buys and sells merchandise for cash only. If goods listed at $1,960 were bought at a trade discount of 25% and 20%, terms 8/10, n/30, and sold for $1,560 subject to a trade discount of 15% and 5%, and a cash discount of 5%, find the profit on the merchandise.

8. The net cost of a certain invoice of goods is $4,300 and the rates of discount are 10% and 2%. Find the list price.
UNIT X
MARKED PRICE

LESSON 29

After goods have been purchased, the price at which they are to be offered for sale must be determined. Most generally, markup is based on the selling price, but occasionally it is based on the cost. Figuring the selling price when the percentage of markup is based on the cost is very simple. The cost is always known, so the per cent of gain is multiplied times the cost and then the result is added to the cost to determine the selling price.

Below are detailed instructions for finding the selling price when the profit is based on different figures.

To find the selling price when the profit is figured on sales:

An article costing $5.60 is marked to gain 30% on sales. What must be the selling price?

100%, sales price, less 30%, profit = 70%, cost price
$5.60, cost ÷ .70 = $8.00, selling price
Proof: $8.00 x .30 = $2.40, profit. $8.00 less $2.40 = $5.60

To find the selling price when profit is figured on cost:

An article costing $5.60 is marked to gain 30% on cost. What must be the selling price?

$5.60, cost x .30 = $1.68, profit
$5.60, cost + $1.68 = $7.28, selling price

To find the per cent of gain or loss based on sales:

Goods that cost $24 were sold for $30. What was the per cent of profit on sales?

$30, sales price - $24, cost = $6.00, profit
$6, profit ÷ $30 = 20%, rate of profit

To find the per cent of gain or loss based on cost:

Goods that cost $25 were sold for $30. What was the per cent of profit on cost?

$30, selling price - $25, cost = $5, profit
$5, profit ÷ $25, cost = 20%, rate of loss
Whether there is a profit or a loss on the sale, the divisor is always the cost if based on the cost, and always the selling price if based on the selling price.

Some students find it difficult to understand and apply the rules for finding the selling price when profit is figured on sales and cost. The following illustrations might present a somewhat clearer picture. At least they will offer a method of checking work against other methods.

\[
\frac{\text{Rate on selling price}}{100\% \text{ less rate on selling price}} = \text{rate on cost}
\]

\[
\frac{\text{Rate on cost}}{100\% \text{ plus rate on cost}} = \text{rate on selling price}
\]

Explanation of the above formulas is as follows: The rate on the selling price divided by 100% less the rate on the selling price will give the rate that is based on the cost. For example:

Find the selling price of goods costing $60 that are marked to gain 20% on sales.

\[
\frac{20\%}{100\% - 20\%} = \frac{20\%}{80\%} = 25\%, \text{ rate based on the cost.}
\]

\[25\% \times 60 = 15, \text{ profit + } 60, \text{ cost } = 75, \text{ the selling price.}\]

Other method; \[60, \text{ cost } \div .80 = 75, \text{ the selling price.}\]

Find the selling price of goods costing $60 that are marked to gain 25% on cost.

\[
\frac{25\%}{100\% + 25\%} = \frac{25\%}{125\%} = 20\%, \text{ rate based on the selling price.}
\]

The rate of 25% based on the cost is the same as 20% based on the selling price. This should somewhat simplify the process of finding the selling price when based on either the cost or the selling price.
MARKUP PROBLEMS

A. Solve the following problems, finding the amount of gain or loss and the selling price, if the per cent of gain or loss is based on the cost price.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Gain</th>
<th>Loss</th>
<th>Amount of Gain</th>
<th>Amount of Loss</th>
<th>Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$640</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$356</td>
<td></td>
<td>33 1/3%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$89.62</td>
<td>22 1/2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$197.50</td>
<td></td>
<td>17%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$775</td>
<td>37 1/2%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$324.58</td>
<td></td>
<td>16 2/3%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Solve the following problems, finding the amount of gain or loss and the cost price, if the per cent of gain or loss is based on the selling price.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Gain</th>
<th>Loss</th>
<th>Amount of Gain</th>
<th>Amount of Loss</th>
<th>Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8%</td>
<td></td>
<td></td>
<td></td>
<td>$689.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13%</td>
<td></td>
<td></td>
<td>$536.95</td>
</tr>
<tr>
<td></td>
<td>33 1/3%</td>
<td></td>
<td></td>
<td></td>
<td>$465.32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18%</td>
<td></td>
<td></td>
<td>$97.46</td>
</tr>
<tr>
<td></td>
<td>12%</td>
<td></td>
<td></td>
<td></td>
<td>$1,342.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16 2/3%</td>
<td></td>
<td></td>
<td>$887.47</td>
</tr>
</tbody>
</table>
LESSON 30
PROBLEMS DEALING WITH MARKED PRICE

A. Solve the following problems, finding the amount of gain or loss, and the per cent of gain or loss based on the cost price.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Per Cent of Gain</th>
<th>Per Cent of Loss</th>
<th>Amount of Gain</th>
<th>Amount of Loss</th>
<th>Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$760.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$840.</td>
</tr>
<tr>
<td>$260.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$180.</td>
</tr>
<tr>
<td>$369.45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$420.90</td>
</tr>
<tr>
<td>$816.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$742.06</td>
</tr>
<tr>
<td>$985.75</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,435.85</td>
</tr>
</tbody>
</table>

B. Solve the following problems, finding the amount of gain or loss, and the per cent of gain or loss based on the selling price.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Per Cent of Gain</th>
<th>Per Cent of Loss</th>
<th>Amount of Gain</th>
<th>Amount of Loss</th>
<th>Selling Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$595.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$654.</td>
</tr>
<tr>
<td>$876.40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$749.30</td>
</tr>
<tr>
<td>$543.69</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$439.27</td>
</tr>
<tr>
<td>$897.43</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$1,324.45</td>
</tr>
<tr>
<td>$87.65</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$125.50</td>
</tr>
<tr>
<td>$436.78</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$647.20</td>
</tr>
</tbody>
</table>
C. Solve the following problems:

1. A second-hand radio was sold at 1/8 of the original cost. If the radio was sold for $28.50, what was the original cost?

2. A number increased by 6% of itself is equal to 360.4. What is the number?

3. A number decreased by 6% of itself is equal to 367.54. What is the number?

4. Last Sunday 4,300 people attended church. This was 85% of the church membership. What is the total membership?

5. John bought 3/8 interest in a business, paying $3,800. What is the entire value of the business at this rate?

6. Fifteen pounds of imitation pepper which cost 37¢ a pound was mixed with twelve pounds of pure pepper which cost 49¢ per pound. At what price must the mixture be sold to make a profit of 16 2/3% on the transaction?

7. A certain machine sold for $95.50. What must have been the cost if a profit of 25% on the cost of the machine was made?

8. A grocer bought 300 pounds of lemons for $21. If 15% of the lemons were deteriorating and could not be sold, what would the balance have to be sold for to make the grocer a profit of 25% on the entire purchase?

9. A certain bicycle can be manufactured for $18.00. The manufacturer wishes to make a profit of 20%, the wholesaler a profit of 25%, and the retailer a margin of 30%. How much will the retailer have to charge the customer for the bicycle?

10. Jackson invests $1,500 in the stock of a certain company. The following year he receives dividends amounting to $450. What rate of income did he make on his investment?
LESSON 31

PRACTICAL Markup PROBLEMS

1. Solve the following:

(a) What must be the marked price of an article costing $8.00 in order to gain 18% on sales?

(b) What must be the marked price of an article costing $8.60 in order to gain 22% on the cost?

(c) Goods costing $25 were sold at auction for $19. What was the per cent of gain or loss figured on cost?

(d) Goods costing $55 were sold for $90. What was the per cent of profit based on sales?

(e) What must have been the cost of merchandise if by selling for $300, a gain of 30% of the cost is made?

2. $55 was paid for a record player after 20% was deducted from the marked price. What was the marked price?

3. During one year, Davis sold $20,500 worth of merchandise which cost him $16,750. How much profit did he make? His profit was what per cent of the selling price?

4. Bill Dodd sold a truck for $2,800, which was 28% more than it had cost him. What did he originally pay for the truck?

5. Mr. Everett sells goods at an advance of 20% on the cost, and then discounts the bill 5% for cash payments. Find the cost of goods if Mr. Everett's profit is $59.60.

6. Carroll Hodges sold 65 cows for $5,525, which was 8% less than he paid for them. For how much per head should they have been sold in order for him to make a profit of 18%?

7. Robert Howard purchased straight razors at $50 per dozen, and retails them at $7.50 each. How many will he have to sell to make a profit of $72.50?
8. Kennedy bought used tires for $5.00 each. The cost of getting them ready for sale was $1.36 each. At what price must he sell the tires in order to make a net profit of 18% on the first cost?

9. Cedar chests were purchased by a distributor for $40.00 less 15% and 5% each, buying expenses $1.35 and are marked to gain 20% of the net sales after allowing the retailer a 15% discount. What was the marked price?

10. Based on the cost price, what per cent of profit is made on an article that sells for $8.75 and on which a profit of $1.75 was made?

11. A cigarette case costs $5.20, the profit based on the selling price was 16 2/3%. What must have been the selling price?

12. Mr. Kirkham sold an article for $35.50 after discounts of 25% and 10% were deducted from the marked price. The marked price of the article is __________.

13. John Lindsey sells a typewriter for $90, less 15% discount, and makes a profit of 20% on the sale. If the dealer receives a 20% discount from the manufacturer, find the manufacturer's marked price. __________

14. A pressure cooker was purchased by a distributor for $22.00, less 15% and 5%, buying expenses were $1.15, and is marked to gain 25% of the selling price after allowing the retailer a 20% discount. Find the selling price. __________

15. Mr. Lyles purchased wrench sets at $8.90, less 20% and 15%. At what price should he mark them to gain 25% on the net sales after allowing the consumer a discount of 20%?

16. Certain goods were listed by a manufacturer at $23.00, less 16 2/3% and 10%. At what price must the dealer who retails the goods sell them to make a profit of 33 1/3% of the cost?

17. At what price should an article costing $45 be marked so as to allow a 10% discount for cash and still gain 15% on the selling price?

18. At what price should an article costing $45 be marked so as to allow a 10% discount for cash and still gain 15% of the net cash received?
Commission and Brokerage

Commission is compensation allowed an agent or a broker for services rendered, either a flat amount, or a percentage of the amounts handled.

Brokerage is merely the commission charged by brokers for doing business. The broker does not handle the merchandise, but just negotiates the sale of goods. Persons who perform such services are also known as commission merchants, or agents.

Some terms that are commonly used in commission sales are as follows: The principal is the person for whom the agent works. A shipment sent from the producer to the commission merchant is called a consignment. The person who sends the shipment is the consignor, the person to whom it is sent is the consignee.

When the commission merchant has sold the goods, he sends to the consignor a statement of sales, or an "account sales." Below is an example of an account sales.

<table>
<thead>
<tr>
<th>Sold by</th>
<th>ACCOUNT SALES</th>
<th>No. 87654</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIMMS &amp; SONS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>San Diego, Calif.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales for the account of</td>
<td>George Meyers &amp; Company</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oakland, California</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Charges</th>
<th>Amount</th>
<th>Date</th>
<th>Sales</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>10 23</td>
<td></td>
<td>June</td>
<td>11 18</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Freight</td>
<td>10 95</td>
<td></td>
<td>40 boxes tomatoes @ $7.50</td>
<td>300 00</td>
</tr>
<tr>
<td></td>
<td>Commission 4%</td>
<td>18 00</td>
<td></td>
<td>1000 lbs. potatoes @ $.03</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Net proceeds</td>
<td>421 05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>450 00</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

148
When the commission merchant purchases goods for the principal, the price he pays is known as the prime cost and is entered on the account sales. His commission is usually a certain per cent of the prime cost. Other charges might be a certain per cent, or just a flat rate. The prime cost plus the charges gives the gross cost, which is the amount the principal pays.

An account purchase is a detailed statement rendered by the commission merchant, verifying the cost of certain goods bought, with a list of other charges. Below is a typical account purchase.

**ACCOUNT PURCHASE**

<table>
<thead>
<tr>
<th>No.</th>
<th>2936</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>June 23, 1947</td>
</tr>
<tr>
<td>Bought on consignment for</td>
<td>Charles Moore</td>
</tr>
<tr>
<td>Houston, Texas</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Charges</th>
<th>Amount of Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 20</td>
<td>1,500 bu. corn @ $1.85</td>
<td>2,775.00</td>
</tr>
<tr>
<td>June 20</td>
<td>Commission 4% Freight</td>
<td>111 00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>129 50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,904 50</td>
</tr>
</tbody>
</table>

**SALES COMMISSIONS**

Sales departments usually sell either through sales persons, or traveling salesmen. Some are paid on straight salary basis, while others are paid by a commission on their sales. This is an incentive system on the part of the employer to get more from his salesmen. These commissions may be on a straight commission basis or on the graduated commissions. Either way it gives the salesmen an incentive to work harder and sell more merchandise.
For example: Straight commission method. One salesman receives a straight commission of 5% on all sales. He sells $5,000 worth of merchandise this month. What is his commission?

5% x $5,000 = $250, month's commission

The graduated commission can be of several types, but usually the rate of commission increases with the increase of sales.

PROPERTY TAXES

Property taxes, real and personal, are calculated on the basis of the assessed valuation of the property by the state or local tax assessor. The amount of property assessment is called the assessed valuation. The property tax is expressed in either so many mills on the dollar valuation, or so many dollars on the hundred dollar valuation. The tax rate of a town or government unit can be determined by dividing the amount of the tax to be raised by the total assessed valuation. For example, the city of Podunk has an assessed valuation of $4,800,000. The amount of tax to be raised by taxation the following year is $120,000. The tax rate is found as follows:

$120,000 ÷ $4,800,000 = .025, which is 2.5%.

The above tax rate can now be read as 25 mills on the dollar of valuation, or $2.50 on the hundred dollar valuation.

DISTRIBUTION OF OVERHEAD

To the cost of manufacturing products must be added the costs of material and labor, and also a proportion of the overhead expenses of the plant. This overhead expense must be proportioned among the departments of the plant. Possibly the best way of doing this is by dividing the expense according to the number of square feet of floor space that is occupied by each department. For example:

There are 5 departments in the Pittman Department Store, and the rent for the entire store was $900. If the floor space of the store was divided as follows, A, 1,675 sq. ft.; B, 1,450 sq. ft.; C, 1,395 sq. ft.; D, 845 sq. ft.; and E, 435 sq. ft., how much rent would be charged each department?
1,875 square feet
1,450 " "
1,395 " "
845 " 
435 " "

6,000 = total number of square feet in building

$900 = cost of rent

$900 ÷ 6,000 sq. ft. = $ .15, cost per square foot

1,875 sq. ft. x $.15 = $281.25 cost for Department A
1,450 sq. ft. x $.15 = 217.50 cost for Department B
1,395 sq. ft. x $.15 = 209.25 cost for Department C
845 sq. ft. x $.15 = 126.75 cost for Department D
435 sq. ft. x $.15 = 65.25 cost for Department E

$900.00 total cost of rent
LESSON 33

COMMISSION AND BROKERAGE

A. Prepare an account sales for the following problem:

Johnson and Jones, commission merchants located at Dallas, Texas, received from John Adams, Galveston, Texas, 40 boxes of tomatoes weighing 40 pounds each. Freight charges were 30¢ per hundred; drayage charges, 5¢ per box; and storage, 2¢ per box. The tomatoes were sold for $3.75 a box. Johnson and Jones deduct their commission of 8% of gross proceeds. Prepare an account sales showing the net proceeds.

<table>
<thead>
<tr>
<th>ACCOUNT SALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
</tr>
<tr>
<td>19</td>
</tr>
<tr>
<td>Sales for the account of ______________________</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date</th>
<th>Charges</th>
<th>Amount</th>
<th>Date</th>
<th>Sales</th>
<th>Amount</th>
</tr>
</thead>
</table>

B. Prepare an account purchase for the following problem:

Sid Smith & Sons, commission merchants of Tulsa, Oklahoma, bought the following for the McCutcheon Feed Store, Ardmore, Oklahoma: 500 bushels of wheat at $2.10 per bushel; 1,000 bushels of corn at $1.95 per bushel, and 300 bushels of barley at $1.90 per bushel. Commission charges were 3%, cartage $50, and miscellaneous charges, $8.65.
Using present date, fill out the below account purchase showing the gross cost.

ACCOUNT PURCHASE

No.______

19

Bought on consignment for

<table>
<thead>
<tr>
<th>Date</th>
<th>Charges</th>
<th>Amount of Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

C. Solve the following problems:

1. An agent received a $35 commission on a sale. If he received 8% on the sale, the sale amounted to ________.

2. A landlord received $860 as a net rental of a house after the agent had paid $64 for repairs and $185.50 for taxes and had deducted his commission of 4% of the gross rental. How much was the gross rental? ________

3. Find the gross cost on an account purchase of 220 bags of sugar, 100 pounds to the bag, @ 8.25 cents a pound, if the charges were: commission 4%; freight and other charges, $57. ________

4. Spelding's commission amounts to $3,234, which is 6% of the gross sales. What was the amount of the gross sales? ________ Find the net proceeds of the sale if other expenses amount to $917.74. ________
5. An automobile costs the dealer $1,000. What must he sell it for to get a commission of 25% on the selling price?

6. The sales of Mr. Witherspoon amounted to $5,635 this month. If he receives a straight commission of 5%, what are his earnings for the month?

7. Miss Springfield works for a company that pays a straight salary of $75 per month and 3 3/4% on all sales over $2,000. Her sales for the month of June amounted to $5,365.50. What were her total earnings?

8. James Whitaker, a typewriter salesman, receives a monthly commission of $2.50 on each of the first 10 sales, $3.50 on the next 10, and $5.00 on all additional sales. If Mr. Whitaker sold 4q typewriters in a month, what would be his commission?

9. Find the tax rate for the following town: The assessed valuation is $1,235,000, and the tax to be raised is $162,000.

10. Find the tax rate in mills for the city of Gallop if the assessed valuation is $136,520,000, and the tax to be raised is $3,276,480.

DISTRIBUTION OF OVERHEAD

11. Distribute the rent and the cost of lighting to departments A, B, and C according to the number of square feet in each department and the number of lamps. The cost of rent is $300, and the light bill amounted to $22.

<table>
<thead>
<tr>
<th>Department</th>
<th>Square Feet</th>
<th>Lamps</th>
<th>Rent Cost</th>
<th>Light Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>250</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>1,750</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>1,000</td>
<td>30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. The production hours for a certain business are as follows: Department A, 1,850 square feet; Department B, 1,800 square feet; Department C, 1,235 square feet; Department D, 1,115 square feet; and Department E, 920 square feet. A salary of $800 is distributed according to department space. How much is charged to each department? A __________, B __________, C __________, D __________, E __________
UNIT XII

CREDIT INSTRUMENTS AND BANK DISCOUNT

LESSON 34

Of all the credit instruments used in business, the promissory note and the trade acceptance are most commonly used. A negotiable promissory note is an unconditional promise in writing, made by one person to another, signed by the maker, engaging to pay on demand or at a fixed time a sum to order or to the bearer. The amount written on the note is called the face value of the note. The face value plus the interest is called the maturity value. If the note is a non-interest bearing note, the value designated as face value would also be the maturity value.

\[ \text{Milwaukee, Wisconsin, May 8, 1947} \]

\[ \text{\$450.00} \]

\[ \text{Thirty days after date} \]

\[ \text{Pay to the} \]

\[ \text{Order of James B. Splawn} \]

\[ \text{Four hundred and fifty and no/100-- Dollars} \]

\[ \text{Payable at First Wisconsin National Bank, Milwaukee} \]

\[ \text{Value received with interest at 6 \%} \]

\[ \text{No. 25 Due June 7, 1947} \]

\[ \text{Harold L. Anderson} \]

If the note should state, with interest, and not state the amount of interest, the legal rate of interest is charged, and that rate varies from state to state. The promissory note is usually the result of accounts that come due and the debtor, being unable to pay the account, signs a promissory note agreeing to pay on a future date plus interest. The holder of the note can then take it to the bank and discount it to get his money.

TRADE ACCEPTANCES

The trade acceptance is a negotiable instrument quite similar to the promissory note, the main difference being the
method of origin and use. The trade acceptance shows on its face that it has arisen out of a purchase of goods by the acceptor. Since a trade acceptance results from a purchase of goods by the acceptor, it ordinarily represents a current obligation that can be paid when the goods purchased have been sold.

An example of the trade acceptance is as follows:

TRADE ACCEPTANCE

No. 58
Milwaukee, Wisconsin, June 24, 1947

To The Moran Hardware Co., Racine, Wisconsin

On July 24, 1947 Pay to the order of Ourselves

Six hundred eighty-seven and 50/100 Dollars, $687.50

The obligation of the acceptor hereof arises out of the purchase of goods from the drawer. The drawee may accept this bill payable at any bank, banker, or trust company in the United States which he may designate.

Accepted at Milwaukee on June 26, 1947 By Blackman & Cook
Payable at Milwaukee State Bank

(Signature of Accepting Co.)

By J. C. Jones, By Anderson

In the above trade acceptance, Blackman and Cook of Milwaukee, Wisconsin, sell $687.50 worth of merchandise to the Moran Hardware Co. of Racine, Wisconsin, on terms of a thirty-day trade acceptance. Blackman and Cook draw up the above trade acceptance, and the Moran Hardware Company accepts the instrument and returns it to the firm of Blackman and Cook with necessary signatures. Blackman and Cook can hold the acceptance for thirty days and take it to the bank and collect the full amount, or they may discount the trade acceptance and the holder collects from the Moran Hardware Company.
BANK DISCOUNT

Bank discount is simple interest paid in advance by the maker or holder of negotiable paper, who sells or transfers it before maturity to a bank for cash. Or, it is the simple interest paid in advance to the bank by a borrower, who gives his own note for cash.

Bank discount arises from transactions, in which the maker or holder of notes and time drafts sells or transfers them at a discount before maturity to realize cash, and the bank buys them before maturity and holds them to the date of maturity to make a profit.

TERMS

Below is a list of terms that are frequently used in dealing with bank discount, and the discounting of commercial paper:

Date of note is the date of issue of the note.
Date of maturity is the date the note falls due.
Time of a note is the interval for which it runs, that is, the interval between the date of the note and the date of maturity of the note.
Date of discount is the date the holder of the note sells or transfers it to a bank at a discount.
Term of discount is the interval between the date of discount of the note and the date of maturity of the note.
Face value of a note is the sum written on the note.
Rate of interest is the rate at which the face of the note draws interest.
Rate of discount is the rate at which discount is to be calculated.
Maturity value of a note is the face of a non-interest bearing note. The maturity value of an interest-bearing note is the face value plus the interest.
Proceeds of a note are the difference between the maturity value of the note and the bank discount, or in case the bank incurs a charge for collection, the difference between the maturity value of the note and the total of the bank discount and collection charge.

DISCOUNTING COMMERCIAL PAPER

When a business man is in need of immediate funds, he may make a short-term loan from a commercial bank on his own note, or if he is in possession of promissory notes or trade acceptances of his customers, he may sell these notes. This procedure is known as discounting notes.
Jack Cox owned a 90-day trade acceptance for $630 dated June 23. On July 8 he discounted the acceptance at the bank. The bank charged discount at the rate of 5%. Since this is a non-interest bearing note, the $630 is both the face value and the maturity value.

First, determine the maturity date of the trade acceptance.

The bank is to hold the acceptance from July 8 until September 21, or 75 days, which is the term of discount.

To determine the amount of discount: Time -- 75 days, maturity value -- $630, and discount rate -- 5%, is equal to $6.56 (amount of discount).

Final step is to find the proceeds, $630 (maturity value) less $6.56 (discount) equals $623.44 (proceeds).

If the promissory note or trade acceptance is an interest-bearing instrument, the same procedure is used only the interest must be found first and added to the face value to find the maturity value of the instrument.
**LESSON 35**

**DISCOUNTING NOTES**

A. Using the ordinary-interest method, find the proceeds for the following non-interest bearing notes.

<table>
<thead>
<tr>
<th></th>
<th>1.</th>
<th>2.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of note</td>
<td>June 24</td>
<td>Aug. 19</td>
</tr>
<tr>
<td>Time to run</td>
<td>3 months</td>
<td>45 days</td>
</tr>
<tr>
<td>Date of maturity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date discounted</td>
<td>July 9</td>
<td>Date discounted</td>
</tr>
<tr>
<td>Term of discount</td>
<td></td>
<td>Term of discount</td>
</tr>
<tr>
<td>Due at maturity</td>
<td>$640</td>
<td>Due at maturity</td>
</tr>
<tr>
<td>Rate of discount</td>
<td>5%</td>
<td>Rate of discount</td>
</tr>
<tr>
<td>Discount</td>
<td></td>
<td>Discount</td>
</tr>
<tr>
<td>Proceeds</td>
<td></td>
<td>Proceeds</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>3.</th>
<th>4.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of note</td>
<td>Jan. 26</td>
<td>Date of note</td>
</tr>
<tr>
<td>Time to run</td>
<td>90 days</td>
<td>Time to run</td>
</tr>
<tr>
<td>Date of maturity</td>
<td></td>
<td>Date of maturity</td>
</tr>
<tr>
<td>Date discounted</td>
<td>Feb. 19</td>
<td>Date discounted</td>
</tr>
<tr>
<td>Term of discount</td>
<td></td>
<td>Term of discount</td>
</tr>
<tr>
<td>Due at maturity</td>
<td>$345.50</td>
<td>Due at maturity</td>
</tr>
<tr>
<td>Rate of discount</td>
<td>8%</td>
<td>Rate of discount</td>
</tr>
<tr>
<td>Discount</td>
<td></td>
<td>Discount</td>
</tr>
<tr>
<td>Proceeds</td>
<td></td>
<td>Proceeds</td>
</tr>
</tbody>
</table>
B. Using the ordinary-interest method, find the proceeds for the following interest-bearing notes.

<table>
<thead>
<tr>
<th>Date of note</th>
<th>Aug. 1</th>
<th>Date of note</th>
<th>Jan. 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to run</td>
<td>60 days</td>
<td>Time to run</td>
<td>4 months</td>
</tr>
<tr>
<td>Rate of interest</td>
<td>9%</td>
<td>Rate of interest</td>
<td>5%</td>
</tr>
<tr>
<td>Face of note</td>
<td>$300</td>
<td>Face of note</td>
<td>$485</td>
</tr>
<tr>
<td>Interest</td>
<td></td>
<td>Interest</td>
<td></td>
</tr>
<tr>
<td>Amt. due at maturity</td>
<td></td>
<td>Amt. due at maturity</td>
<td></td>
</tr>
<tr>
<td>Date of discount</td>
<td>Aug. 21</td>
<td>Date of discount</td>
<td>Feb. 25</td>
</tr>
<tr>
<td>Term of discount</td>
<td></td>
<td>Term of discount</td>
<td></td>
</tr>
<tr>
<td>Rate of discount</td>
<td>8%</td>
<td>Rate of discount</td>
<td>6%</td>
</tr>
<tr>
<td>Discount</td>
<td></td>
<td>Discount</td>
<td></td>
</tr>
<tr>
<td>Proceeds</td>
<td></td>
<td>Proceeds</td>
<td></td>
</tr>
</tbody>
</table>

3.

<table>
<thead>
<tr>
<th>Date of note</th>
<th>Mar. 18</th>
<th>Date of note</th>
<th>June 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to run</td>
<td>120 days</td>
<td>Time to run</td>
<td>5 months</td>
</tr>
<tr>
<td>Rate of interest</td>
<td>51%</td>
<td>Rate of interest</td>
<td>6%</td>
</tr>
<tr>
<td>Face of note</td>
<td>$545.65</td>
<td>Face of note</td>
<td>$679.79</td>
</tr>
<tr>
<td>Interest</td>
<td></td>
<td>Interest</td>
<td></td>
</tr>
<tr>
<td>Amt. due at maturity</td>
<td></td>
<td>Amt. due at maturity</td>
<td></td>
</tr>
<tr>
<td>Date of discount</td>
<td>May 29</td>
<td>Date of discount</td>
<td>Aug. 5</td>
</tr>
<tr>
<td>Term of discount</td>
<td></td>
<td>Term of discount</td>
<td></td>
</tr>
<tr>
<td>Rate of discount</td>
<td>4%</td>
<td>Rate of discount</td>
<td>4 1/4%</td>
</tr>
<tr>
<td>Discount</td>
<td></td>
<td>Discount</td>
<td></td>
</tr>
<tr>
<td>Proceeds</td>
<td></td>
<td>Proceeds</td>
<td></td>
</tr>
</tbody>
</table>
C. Fill in the missing information on the note that were brought to the bank on June 24, 1946, by the Bob Duncan Seed Company, to be discounted at 5%.

<table>
<thead>
<tr>
<th>Face Value</th>
<th>Term</th>
<th>Rate</th>
<th>Maturity Value</th>
<th>Date Due</th>
<th>Discount Term</th>
<th>Bank Discount</th>
<th>Proceeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,450</td>
<td>90 da</td>
<td>6%</td>
<td></td>
<td>Ap.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>595</td>
<td>60 da</td>
<td>7%</td>
<td></td>
<td>May15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>654</td>
<td>90 da</td>
<td>8%</td>
<td></td>
<td>Ap.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>895</td>
<td>60 da</td>
<td>5%</td>
<td></td>
<td>May17</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,436</td>
<td>90 da</td>
<td>4½%</td>
<td></td>
<td>Ap.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>269</td>
<td>3 mo.</td>
<td>6%</td>
<td></td>
<td>Ap.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>459</td>
<td>60 da</td>
<td>7%</td>
<td></td>
<td>Je.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LESSON 36

PRACTICAL DISCOUNT PROBLEMS

1. On March 5, 1946, Ira Ellis, an implement dealer, takes a non-interest bearing note for $1,500 for 90 days in payment for a piece of farm machinery. On the same day Ellis discounts this note at 5%. What does he actually get for his machinery?

2. John Smith's 60-day note dated June 20 for $2,800 was discounted by the bank on June 25th at the rate of 5%. If Mr. Smith's note was a 4% interest-bearing note, what would be the amount of the discount? What would be the proceeds?

3. James Whittaker's 45-day note dated January 22 for $956.50 was discounted by the bank on February 1 at the rate of 8%. If Mr. Whittaker's note was a 4½% interest-bearing note, what would be the amount of the discount? What would be the proceeds?

4. J. H. Evans, a cattle rancher, sells a load of calves for $2,575. He received a 90-day note dated May 16 for the amount of the sale. On June 20 he discounts the note to his banker at 6%. How many days were left for the note to run? What is the amount of the discount?

5. Find the proceeds of the following note: Face $1,780, dated March 15, and due June 23.
   (a) If discounted March 25 at 5½%
   (b) If discounted April 11 at 6 1/4%
   (c) If discounted May 8 at 7%

6. Find the discount and proceeds of a 3-month note for $1,365.50, dated Sept. 3, 1946, and discounted October 15, 1946, at 5%.

7. Everett gives Fowler a $750, 5% note for one year. Four months after receiving the note Fowler discounts it for 7%. What are the proceeds?

8. What would have been the proceeds in the above problem if Fowler had held the note for 8 months before discounting it?
9. A note for $760 at 7% interest, dated June 11, 1945, and due March 11, 1946, was discounted at the bank January 8, 1946, to realize $800.83. What is the rate of the bank discount?

10. A note for $3,300 maturing July 31, 1945, is discounted June 16, 1945. If it is a non-interest bearing note and the holder realizes $3,269.06, what is the rate of discount?

11. A note for $2,000, without interest, falls due Sept. 24, 1946. When should the holder of the note discount it at 6% to realize $1,965.60?

CASH DISCOUNT COMPARED WITH BANK DISCOUNT

As has already been stated, the main reason for cash discount is to encourage cash payment as promptly as possible by the purchaser. It is interesting to compare the cash discount with interest on the same amount.

A bill of goods amounting to $650 was sold to the C. A. Hamilton Company on June 1, terms 3/10, n/30. The cash discount would equal to $19.50, hence he would only have to pay $630.50 at the end of 10 days, or $650 at the end of 30 days.

If the Hamilton Company should borrow the money from the bank to take advantage of the discount, would it be profitable? It would be necessary to borrow $630.50 for 20 days, that is from June 11, to June 30. The bank rate is 6%. As is indicated below, the savings for the C. A. Hamilton Company would be $17.40, if the money had been borrowed from the bank to take advantage of the cash discount.

$650, total amount due - $19.50, amount of cash discount = $630.50, the amount necessary to borrow. Thus the problem is set up, principal $630.50, time 20 days, interest 6%.

$19.50 total cash discount
2.10 interest on $630.50 for 20 days at 6%

$17.40 amount saved by borrowing money from the bank to take advantage of the cash discount.
A. Find the amount that can be saved on each of the following accounts if money is borrowed from the bank to take advantage of the cash discount.

<table>
<thead>
<tr>
<th>Amount of Account</th>
<th>Terms</th>
<th>Interest Rate</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $2,345</td>
<td>2/10, n/30</td>
<td>6%</td>
<td></td>
</tr>
<tr>
<td>2. $1,960.50</td>
<td>3/10, n/60</td>
<td>5½%</td>
<td></td>
</tr>
<tr>
<td>3. $921.46</td>
<td>1/15, n/60</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>4. $5,690</td>
<td>2/20, n/90</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>5. $1,581.67</td>
<td>3/30, n/60</td>
<td>7%</td>
<td></td>
</tr>
</tbody>
</table>
UNIT XIII

COMPOUND INTEREST AND OTHER INTEREST VARIABLES

LESSON 37

When capital is invested profitably, it earns an income. The invested capital and the earned income are usually expressed in the same unit of money. In transactions involving simple interest, as we have just covered, the principal remains unchanged during the term of the loan. In other investment transactions it is agreed that the interest earned at the end of each period of time shall be added to the principal to make a new principal during the next period. Compound interest means that interest for each period is added to the principal before interest is calculated for the next period. The following example illustrates the meaning of compound interest:

<table>
<thead>
<tr>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5.00</td>
<td>principal first year</td>
</tr>
<tr>
<td>.03</td>
<td>rate of interest</td>
</tr>
<tr>
<td>.150000</td>
<td>interest first year</td>
</tr>
<tr>
<td>$5.00</td>
<td>principal, beginning first year</td>
</tr>
<tr>
<td>$5.150000</td>
<td>amount at end of first year</td>
</tr>
<tr>
<td>.03</td>
<td>rate of interest</td>
</tr>
<tr>
<td>.154500</td>
<td>interest second year</td>
</tr>
<tr>
<td>$5.15</td>
<td>principal at beginning of second year</td>
</tr>
<tr>
<td>$5.304500</td>
<td>amount at end of second year</td>
</tr>
<tr>
<td>.03</td>
<td>rate of interest</td>
</tr>
<tr>
<td>.159135</td>
<td>interest third year</td>
</tr>
<tr>
<td>$5.3045</td>
<td>principal at beginning of third year</td>
</tr>
<tr>
<td>$5.463635</td>
<td>amount at end of third year</td>
</tr>
</tbody>
</table>

Thus the compound interest amounts to $ .46 and the compounded amount, $5.46.

Compound interest tables have been developed to save time in computing interest. We are primarily concerned, though, in the mathematics of compound interest.

Interest may also be computed on a semi-annual, quarterly, or monthly basis. If an investment is made for a period of three years at the rate of 4%, compounded semi-annually, there are two interest periods each year, or a total of 6 (the number of years multiplied by the number of interest periods each year). Since the interest rate is stated on a yearly basis, the semi-annual rate is one half of the 4%, or 2%. In other words, in calculating interest compounded semi-annually, one half of the yearly interest and twice the number of periods
are used. For interest compounded quarterly, it is four times the number of periods, and one fourth of the yearly rate.

The following are terms that the student should become familiar with in dealing with compound interest:

Conversion period is the period of time at the end of which the interest earned during the period is added to the corresponding principal. The most common conversion periods are the year, the half-year, the quarter, and the month.
Term is the number of years required for a principal to accumulate to the compound amount.
Compound amount is the accumulated amount at the end of a specified number of years.
Compound interest is the difference between the compound amount and the original principal.

A. Find the compound amount and the compound interest on the following problems. Carry the interest to 6 decimal places.

1. $10 invested for 3 years at 2% compounded annually.
   Compound amount_______  Compound interest_______

2. $320 invested for 2 years at 3½% compounded annually.
   Compound amount_______  Compound interest_______

3. $530 invested for 2½ years at 6% compounded quarterly.
   Compound amount_______  Compound interest_______

4. $365 invested for 3 years at 5% compounded semi-annually.
   Compound amount_______  Compound interest_______
B. Solve the following problems:

1. Find the amount of $3 invested for 4 years at 4%.

2. To what will $12 amount in 5 years if it is invested at 6%?

3. Determine the difference between the compound interest and the simple interest on $300 for 4 years at 6%.

   Compound interest amount

   Simple interest amount

   Difference

4. A deposit of $175 was made on July 1, 1945, in a bank which credited interest at 3% convertible semi-annually. What was the amount of the deposit on January 1, 1947?

5. If $200 is invested at 4%, convertible annually, and $100 is added every year, what will be the total accumulation at the end of 5 years?
OTHER INTEREST VARIABLES

It is sometimes necessary to determine some factor other than the interest. As long as there are any three of the variables -- principal, time, interest, and rate -- given, the fourth one may be computed. We are now interested in three formulas. The fourth, \( I = Prt \), has been covered in previous assignments. The formulas are as follows:

What is the principal if the interest is \$2,\) the time 90 days, and the rate 5%?

\[
P = \frac{I}{rt} \quad \text{Substituting } P = \frac{\$2 \text{ (interest)}}{.05 \text{ (rate)} \times \frac{90}{360} \text{ (time)}} = \$160 \text{ principal}
\]

Find the rate, if the interest is \$4.50, the principal \$600, and the time 90 days.

\[
r = \frac{I}{P} \quad \text{Substituting } r = \frac{\$4.50 \text{ (interest)}}{\$600 \text{ (principal)} \times \frac{90}{360} \text{ (time)}} = .03 \text{ or } 3\%
\]

What is the time, if the interest is \$6.30, the principal \$600, and the rate 7%?

\[
t = \frac{I}{Pr} \quad \text{Substituting } t = \frac{\$6.30 \text{ (interest)}}{\$600 \text{ (principal)} \times .07 \text{ (rate)}} = .15, \text{ or } \frac{15}{100} \text{ of one year, which equals } \frac{15}{100} \text{ of } 360 \text{ days, or } 54 \text{ days.}
\]

Upon examination of the above formulas it can be observed that in each of the formulas the interest or \( I \) is the numerator of the fraction. This will simplify the matter of remembering the formulas. Just put the letter for the missing factor followed by an equals sign, and the interest will be the numerator of the fraction and the remaining two variables will be the denominator. After the formula has been decided upon, it is just a matter of substituting for the formula and solving for the unknown.
A. Solve for the missing factor in each of the following problems:

<table>
<thead>
<tr>
<th>Principal</th>
<th>Rate</th>
<th>Time</th>
<th>Interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. $684</td>
<td>7%</td>
<td></td>
<td>$ 8.60</td>
</tr>
<tr>
<td>2. ______</td>
<td>6%</td>
<td>45 days</td>
<td>$10.50</td>
</tr>
<tr>
<td>3. $899.90</td>
<td>______</td>
<td>90 days</td>
<td>$ 5.65</td>
</tr>
<tr>
<td>4. $1,500</td>
<td>5 1/2%</td>
<td></td>
<td>$ 8.75</td>
</tr>
<tr>
<td>5. ______</td>
<td>4%</td>
<td>72 days</td>
<td>$15.40</td>
</tr>
<tr>
<td>6. $655.43</td>
<td>______</td>
<td>75 days</td>
<td>$11.55</td>
</tr>
<tr>
<td>7. $1,756.35</td>
<td>8%</td>
<td></td>
<td>$12.45</td>
</tr>
<tr>
<td>8. ______</td>
<td>4 3/4%</td>
<td>60 days</td>
<td>$13.95</td>
</tr>
<tr>
<td>9. $56.12</td>
<td>______</td>
<td>36 days</td>
<td>$ 2.45</td>
</tr>
</tbody>
</table>
UNIT XIV

INSTALLMENT BUYING, COMPUTING INTEREST ON
UNPAID BALANCES, ARITHMETIC PROGRESSIONS,
PERSONAL LOANS, AND INSTALLMENT PLANS

LESSON 39

Computing Interest on Unpaid Balances.

Another method of purchasing goods at retail, besides the cash and credit methods, is buying on the installment plan. When goods are bought on the installment plan, the buyer makes a down payment at the time of purchase, and the remainder is paid in weekly or monthly payments.

The installment price includes the cash price plus a carrying charge, which is actually the interest charged the customer for using the installment plan. This interest gives the seller a monthly return for the use of his money. It includes the cost of bookkeeping, and collection, and provides for losses on uncompleted payments.

The seller should make a reasonable rate of interest on his money, but the buyer should be able to detect, and avoid paying too high interest rates. The first thing to be determined is whether or not the interest is computed on the total debt, or on the unpaid balances. The buyer should realize that carrying charges, insurance rates, handling charges, collection charges, and bonuses are just other words for interest.

Loan companies operate on the same principle as the installment plan. They make loans that are to be repaid in equal monthly installments.

The following is an example of such a loan:

James Hudson borrowed $1,200 from a loan company, with interest at 8%, and paid $96 as interest. The amount plus the interest was to be repaid in 12 equal monthly installments of $108 each, of which $100 was considered to be payment of principal and $8 payment of interest. The loan company advertised the loan at 8% or $96, but this amount is the interest on $1,200 for a full year. In this loan Mr. Hudson has use of the full $1,200 for only one month since $100 of the principal is paid each month. At the end of the twelfth month the entire amount is to be paid back. Now we know that the advertised rate of the loan was not 8% but much more.

The following is a plan for determining the actual interest that Mr. Hudson paid. The computation will be greatly
simplified if we work on the basis of 12% a year, or one per cent a month. If we can find the amount of interest at the rate of 12%, then we can find the amount actually charged on the advertised 8%, $1,200 loan.

Find the interest on $1,200 at 12% a year or 1% a month.

<table>
<thead>
<tr>
<th>Payment</th>
<th>Interest Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1,200</td>
<td>$12</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$1,100</td>
<td>$11</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$1,000</td>
<td>$10</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$900</td>
<td>$9</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$800</td>
<td>$8</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$700</td>
<td>$7</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$600</td>
<td>$6</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$500</td>
<td>$5</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$400</td>
<td>$4</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$300</td>
<td>$3</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$200</td>
<td>$2</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>$100</td>
<td>$1</td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>xxx</td>
<td></td>
</tr>
</tbody>
</table>

Interest cost if money is borrowed @ 12% a year, or 1% a month............................. $78

At 1% a month, or 12% a year, the interest was $78. The actual cost of the loan was $96. How many times greater was this actual cost than $78? This may be found by dividing $96 by $78, as follows:

$$
\frac{96}{78} = 1.231 \times 12\% = 14.77\%
$$

The amount actually paid was 1.231 times greater than the amount would have been if the rate were 12% a year. Hence, $96 is interest at 14.77% instead of interest at 8%, as was advertised to Mr. Hudson.

After finding the interest at 12%, the actual interest that was being charged can be found easily by setting up a proportion. The proportion would read as follows:
\$78 : 12\% :: \$96 : x

78x = 1,152

\[ x = \frac{1,152}{78} = 14.77\% \]

which is the actual interest that was charged.
LESSON 40

ARITHMETIC PROGRESSIONS

The actual interest on unpaid balances may be computed by a shorter method by using arithmetic progressions formulas. An arithmetic progression is a series of numbers in which the difference between every two consecutive terms, taken in the same order, is constant. The constant difference is called the common difference, and may be either positive or negative. Examples of arithmetic progressions are as follows:

1, 2, 3, 4, 5, 6;
1, 3, 5, 7, 9;
8, 7\frac{1}{2}, 7, 6\frac{1}{2}, 6 are arithmetic progressions.

The sum of an arithmetic progression is found by using the following principle: "The sum of the terms of an arithmetic progression is equal to the product of half the sum of the first and last terms multiplied by the number of terms."

\[
\text{Sum} = \frac{\text{Number of terms} \times (\text{first term plus last term})}{2}
\]

There are five terms in the progression 1, 3, 5, 7, and 9. Substituting the above formula:

\[
\text{Sum} = \frac{5 \times 10}{2} = 25, \text{ the sum of the progression.}
\]

In the illustration of Mr. Hudson's $1,200 loan to be paid on the basis of $100 per month, with the interest $12 for the first month, $11, second month, etc., the progression was 12, 11, 10, 9, ..., with a common difference of 1. Since the loan was to be repaid in 12 payments, the actual number of terms in the progression is 12, or rather 13, if we assume that the last number is 0. Thus the sum of the progression would be found as follows:

\[
\text{Sum} = \frac{13 \times ($12 \text{ plus 0})}{2}
\]

\[
\text{Sum} = 13 \times \frac{12}{2} = 78\text{ or } 13 \div 2 \times $12 = $78.
\]

For practical purposes since the last term is 0, this method may be illustrated in the following manner:
$12.00 interest for the first month
\times 13 \quad \text{one more than the number of payments}

\begin{array}{c}
2) 156.00 \\
\hline
78.00 \quad \text{discount on the loan of $1,200 at 12\% a year}
\end{array}

Another illustration of the arithmetic progression formula is as follows: What is the amount of interest on $450 to be repaid in eight equal monthly installments with interest at 6%?

\begin{array}{c}
2) 2.25 \\
\hline
10.125 \quad \text{interest on the loan at 6%}
\end{array}

\begin{array}{c}
\frac{2.25}{x 9} \quad \text{number of payments plus 1}
\hline
20.25
\end{array}

In finding the interest at 12\% a year or 1\% a month, all that has to be done is move the decimal two places to the left in the principal. In finding the interest on 6\% a year, which is the same as 1/2\% per month, move the decimal two places to the left in the principal and divide by two. These short cuts facilitate speed and accuracy in the working of arithmetic progression problems.

**PERSONAL LOANS**

Short term loans are made on the basis of character, salary, or chattel mortgage from banks, commercial, or personal loan companies. It is no doubt best to borrow from banks if at all possible, but in many instances individuals are unable to do so. Some loan companies charge rather exorbitant interest rates, and that is the main reason for the borrower to make sure of the rate that he is paying, and the terms of the contract he signs. Often the rate sounds reasonable, but upon thorough investigation the total cost of such loans is extremely high.

A certain loan company advertised a $250 loan that could be paid back in 12 monthly installments of $22.85 each, which means that the total amount repaid would be $274.20 ($22.85 \times 12), so the interest would amount to $24.20. What would be the rate of interest charged on the basis of unpaid balances? Assuming the interest rate to be 6\%, the interest on the unpaid balances would be $8.125.

\begin{array}{c}
\frac{2) 1.25}{x 13} \quad \text{number of payments plus 1}
\hline
16.25
\end{array}

\begin{array}{c}
\frac{16.25}{\text{interest on unpaid balances at 6\%}}
\end{array}
If $8.125 is the interest on unpaid balances at 6%, what rate is being paid if $24.20 is charged?

\[
\frac{24.20 \times 0.06}{8.125} = 0.17868 \text{ or } 17.87 \text{ per cent}
\]
LESSON 41

INSTALLMENT PLANS

An essential part of the financial program of many families consists of payments on articles purchased on installment plans. Prior to 1940 more than 50% of the automobiles purchased were purchased on some type of installment plan. The same was true with refrigerators, washing machines, furniture, radios, pianos, and many other articles.

An installment plan conducted wisely and within the bounds of reason has an important place in our economy, for the benefit of people who do not have sufficient funds available at the time to pay, but will have at a later date. Installment plans are abused by many concerns by charging exorbitant interest rates, and also by customers who make payments difficult to collect.

The concern making installment sales must make a reasonable rate of interest to take care of additional costs and risks that result.

A certain dealer decides to make sales on the installment plan as a means of increasing his sales. He would like to make 6% on the unpaid balances, and decides to charge $2 to cover insurance and carrying charges. The terms are to be 10% as a down payment and the balance to be paid in 12 equal monthly payments. How would the dealer determine the amount of the equal monthly payments on a combination radio and record player selling for $260?

$260.00 selling price
26.00 deduct 10% cash down payment
$234.00 balance to be paid in 12 equal monthly installments

$1.17 interest on $234 for 1 month at 6%  
\[ \times \frac{1}{12} \text{ number of payments plus 1} \]

$15.21 interest

$7.61 interest on the unpaid balances of $234.00 at 6%.

$2.00 carrying charge and insurance
12 \[ \frac{243.61}{20.30} \]
total amount to be collected

1/12, amount of each payment, because of the 1/12 cent, one payment will be for $20.31, and eleven payments at $20.30.
Computing the amount by which the installment price exceeds the cash price: The difference between the installment price, found by adding the sum of the installment payments to the down payment, and the cash price is the extra cost of merchandise purchased on the installment plan. If there is a carrying charge, or other similar charge, that amount will also be added to the sum of the installment payments.

For example: A radio may be purchased for $65 cash, or on the installment plan by paying $15 down and $10 a month for six months. Find the amount by which the installment price exceeds the cash price.

Solution:

Installment price:
Down payment ............... $15
Monthly payments (6 x $10) 60 $75
Plus carrying charges, etc.
Cash price ......................... 65
Amount greater ..................... $10

It is found that the total cost of the radio on the installment plan is $75 or $10 more than the cash purchase price. The interest on the unpaid balances of $50 ($65 cash price less $15 down payment) for 6 months if the rate is 12% amounts to $1.75, as shown below. If interest at 12% is equal to $1.75, then $10 is equal to 68.57%, which is a rather high rate of interest to be paying for the privilege of installment buying.

\[
\begin{align*}
0.50 & \times 7 \\
\underline{\times 3.50} & \\
1.75 & \quad \text{interest on unpaid balances of}$50\text{ for 6 months at 12%}
\end{align*}
\]

\[
\begin{align*}
1.75 : 12\% & :: 10 : x \\
1.75x = 120
\end{align*}
\]

\[x = 68.57\%\]

This illustration shows the actual necessity of figuring the cost of an installment plan before entering into contract.
ARITHMETIC PROGRESSION PROBLEMS

A. Solve the following problems:

1. The first term of an arithmetic progression is 9, the common difference is 4, and the number of terms is 7. Find the last term. 

2. The first term of an arithmetic progression is 15, the common difference is -6, and the number of terms is 9. Find the last term.

3. Find the sum of 10 terms of the arithmetic progression whose first term is 2, and last term is 32.

4. Find the sum of 13 terms of the arithmetic progression whose eighth term is 60, and the eleventh term is 156.

5. Find the sum of the first 9 odd numbers beginning with 1.

6. Find the sum of the first 15 odd numbers beginning with 1.

7. Find the sum of 6, 6½, 7, etc., to 12 terms.

8. Find the sum of the series 1/16, 1/8, 3/16, 1/4, 5/16, 3/8, 7/16, 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8, 15/16, and 1.

9. Find the twelfth term of the progression 4, 9, 14, 19, 24, etc.

10. If a clock strikes the hours only, how many times does it strike in 12 hours? How many times would it strike in 36 hours?

11. What are the total points in a pool game where each ball counts the number it is marked and the 15 balls are numbered consecutively from 1 to 15?

12. A man agrees to pay $7,000 for a house by paying $50 on the principal at the end of each month and the interest due at 6% on the unpaid balances for that month. How much interest does he pay in discharging the debt?
B. Solve the following installment problems showing detailed outline of work.

1. Warren Majors wishes to borrow $1,000. What would be the actual interest on the $1,000 if it were to be repaid on the basis of $125 per month for eight months with interest of 6% on the unpaid balances? What rate of interest would be paid if the interest charged was $37.50?

2. If Mr. Smith borrowed $350 from a personal loan company and agreed to pay 10 equal installments of $38.50 each, what rate of interest would he be paying?
3. Joe McLeod bought a used car and agreed to pay $900. He was to make a down payment of $300 and the balance in 8 monthly payments of $75 each with interest at 6% on the unpaid balances. He also agreed to pay a $12.50 service charge. How much more did he pay by this method than he would have paid in cash? Considering the carrying charges as part of the interest, what actual rate of interest did he pay?

4. The cash price of a radio is $75. It can be purchased on the installment plan for $15 down and the balance with interest at 6% on the unpaid balances in 4 equal monthly installments. What would be the regular monthly payments? If the 4 monthly payments in the above problem are set by the retailer at $17 each, what would be the rate of interest charged?
5. Sears, Roebuck and Company advertised a Coldspot Freezer for $235 cash. Their easy term price was ($70 down, $12 a month) $250. What was the interest charged on the basis of unpaid balances?

6. Mr. George Nelms purchased an automobile on May 1 from the Johnson Motor Company for $1,050. He paid $300 in cash and the balance in 5 equal monthly installments of $150, with interest at 6% on the unpaid balance. Each installment, plus the interest, was paid on the first day of each month. Compute the interest due with each payment.

First payment
Second payment
Third payment
Fourth payment
Fifth payment
7. A kitchen cabinet may be purchased for $68, less 5% for cash; or, on the installment plan, payable in 10 equal monthly payments, for $68, plus 5% carrying charges. What is the difference between the cash price and the installment price? If purchased on the installment plan, what would be the monthly payments?

8. Jack Nichols wished to buy a house that sold for $5,500. He had $1,000 in cash to be used as a down payment. How much did the house cost him if he borrowed the additional amount from the bank for two years at 6%? How much did the house cost him if he made a down payment of $1,000 and paid the balance in 18 equal monthly payments of $280 each? What rate of interest did he pay by the installment method?
9. An automobile costing $1,250 is partly paid for with a car whose trade-in value is $350. If insurance on the car costs $48, find the finance charge and the monthly payment if the car is to be paid for in one year.

10. A finance company advertises that it will loan $100 to be paid back in 6 equal monthly payments of $18.20 each. Find the finance charge and the approximate rate of interest charged. Finance charge__________, Interest charged__________
Q. Compute the extra cost of installment buying. Find the amount by which the installment price exceeds the cash price in each of the following problems. Also find the interest rate.

<table>
<thead>
<tr>
<th>Article</th>
<th>Down Payment</th>
<th>Amount</th>
<th>No. of Payments</th>
<th>Installment Price</th>
<th>Cash Price</th>
<th>Amount Greater</th>
<th>Interest Rate - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerator</td>
<td>$86.00</td>
<td>$8.95</td>
<td>10</td>
<td></td>
<td>$160</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio........</td>
<td>15.00</td>
<td>4.40</td>
<td>12</td>
<td></td>
<td>58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Piano...........</td>
<td>85.00</td>
<td>45.00</td>
<td>11</td>
<td></td>
<td>500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bed...............</td>
<td>25.00</td>
<td>15.00</td>
<td>5</td>
<td></td>
<td>85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Books...........</td>
<td>12.50</td>
<td>5.25</td>
<td>7</td>
<td></td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing machine..</td>
<td>24.50</td>
<td>12.50</td>
<td>12</td>
<td></td>
<td>160</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
UNIT XV

SQUARE ROOT, LOGARITHMS, AND SIMPLE
EQUATIONS IN TWO UNKNOWNS

LESSON 44

The square of a number is the product obtained by multiply ing that number by itself. Thus, 64 is the square of 8, since \(8 \times 8 = 64\); 16 is the square of 4, since \(4 \times 4 = 16\); etc.

The square root of a number is one of the two equal factors that produce that number. Thus, 6 is the square root of 36, since 6 is contained 6 times in 36.

The radical sign \(\sqrt{\phantom{0}}\) when placed over a number indicates that the square root of that number is to be found. Thus, \(\sqrt{144}\) is read, "the square root of 144."

Illustrative problem: Find the square root of 117,649.

Solution:

\[
\begin{array}{c}
117,649 \\
\hline
276 \\
\hline
276 \\
\hline
256 \\
\hline
2049 \\
\hline
2049 \\
\hline
0
\end{array}
\]

Beginning at the units figure, or first number on the right, separate the number 117,649 into groups of two figures each. The largest perfect square in the left-hand group, 11, is 9. The square root of 9 is 3, and this number is the first figure of the root. To the remainder of 2, bring down the group 76 to get the dividend 276. The root, 3, multiplied by 20 equals 60, the trial divisor. 60 is contained 4 times in 276. 4 is the next figure in the root. Add 4 to 60 and multiply the result 64 by the quotient 4, making 256. Multiply 20 times 34 and get 680 for the new trial divisor. Subtract 256 from 276 and the remainder is 20, and the next two numbers are brought down, making 2049. 680 will divide into 2049 3 times, so 3 is added to the trial divisor and the result multiplied by 3, the result being 2049. Since there is no remainder, the number 117,649 is a perfect square whose root is 343.

The following are instructions as to how the square root of a whole number is found:

1. Beginning at the units figure, separate the number into groups of two figures each.
2. The square root of the largest square in the left-hand group is the first figure of the required root.
3. Subtract the largest perfect square in the left-hand group from this group, and to the remainder bring down the next group for a dividend.

4. Divide this dividend by the product found by multiplying the part of the root already found by 20.

5. The quotient found in step 4 should be placed as the next figure of the root, and should be added to the trial divisor just used to obtain the real divisor.

6. Multiply the real divisor so found by the last root figure. Subtract this product from the dividend to get the first figure or figures for the new dividend for the next step.

7. Continue in a similar fashion until all the groups have been used. The roots obtained will be the square root of the number.

If the number is not a perfect square, the roots should be carried to at least three decimal places. All that is necessary to do this is to annex zeroes to the right of the decimal point.

There should be as many numbers or figures in the square root of a number as there are groups in the original number.

A. Find the square root of the following whole numbers:

1. 529

2. 6,724

3. 9,801

4. 13,456

5. 18,225

6. 1,628,176
LESSON 45

B. Find the square root of the following numbers containing decimals.

Divide the number into groups of two figures each by beginning at the decimal point and pointing off both to the right and to the left. If the right-hand group in the decimal has but one figure, annex a cipher. There must be two figures in each decimal group. The following work is the same as in finding the square root of a whole number.

1. 25.6036

2. 0.007396

3. 454.243969

4. 0.038809

5. 0.321489

6. 23.04
C. Find the square root of the following fractions.

There are two rules for finding the square root of a fraction that should be considered.  
1. If the numerator and denominator of the fraction are perfect squares, find the square root of the numerator for the numerator of the root, and the square root of the denominator for the denominator of the root.  
2. If the numerator and denominator are not perfect squares, change the fraction to its decimal equivalent, and find the square root of the decimal.  
To insure a reasonable amount of accuracy, the root should be found to three decimal places.

1. $\frac{3}{4}$  
2. $\frac{7}{10}$  

3. $\frac{136}{184}$  
4. $\frac{159}{295}$  

5. $\frac{4}{49}$  
6. $\frac{1651}{2739}$
LESSON 40

LOGARITHMS

Logarithms are a vital aid to computation. By their use complicated arithmetical processes may be reduced to simpler ones, with a consequent saving of time and labor and a lessening of the chances for error.

John Napier invented the logarithmic method of computation and his tables of logarithms appeared in 1614. By means of these tables, the operation of multiplication is reduced to addition; that of division is reduced to subtraction; raising to any power is reduced to one multiplication; and the extracting of a root is reduced to a single division.

Because of the lack of time to devote to logarithms, we will only be able to scratch the surface in this broad field.

Logarithms are exponents and therefore are based upon the same principles as exponents. The system to be used in this unit is known as the Briggs system in which the logarithm of a number is the exponent of 10 that will produce the number. As is illustrated by the following table:

Since \(10^4 = 10,000\), \(\log 10,000 = 4\)
" \(10^3 = 1,000\), \(\log 1,000 = 3\)
" \(10^2 = 100\), \(\log 100 = 2\)
" \(10^1 = 10\), \(\log 10 = 1\)
" \(10^0 = 1\), \(\log 1 = 0\)
" \(10^{-1} = .1\), \(\log .1 = -1\)
" \(10^{-2} = .01\), \(\log .01 = -2\), and so on.

From the above table it is evident that the logarithm of a number between 100 and 1,000 must be between 2 and 3, or in other words, 2 plus a decimal.

Every logarithm has two parts, an integer and a decimal. The integer is called the characteristic, and the decimal part is called the mantissa.

Finding the characteristic. When a number is greater than 1, the characteristic of the logarithm is positive. If the number is less than 1, the characteristic of the logarithm is negative.
Every number between 1 and 10 has one digit to the left of the decimal point, and from the preceding the characteristic of the logarithm of such numbers is 0. Every number between 10 and 100 has two digits to the left of the decimal point, and the characteristic of the logarithm is 1, etc. This may be summarized in the following rule:

The first rule of the characteristic: When the number is greater than 1, the characteristic is positive and is one less than the number of places to the left of the decimal point.

The second rule of the characteristic: When the number is less than 1, the characteristic is negative and is numerically one more than the number of zeroes immediately to the right of the decimal point.

Illustrations:  
$\log 781 = 2$ plus a decimal 
$\log 78.1 = 1$ plus a decimal 
$\log 7.81 = 0$ plus a decimal 
$\log 0.781 = -1$ plus a decimal 
$\log 0.0781 = -2$ plus a decimal

Finding the mantissa. The law of mantissa is the same for all numbers made up of the same series of digits, no matter where the decimal point may be.

Finding logarithms from tables: There are two steps in finding logarithms of numbers --

Step 1. Determine the characteristic by use of the above rules for finding the characteristic.

Step 2. Look up, in a table, the mantissa of the series of digits in the number, disregarding the position of the decimal point.

### Table of Logarithms of Numbers 700-706

<table>
<thead>
<tr>
<th>N</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>84</td>
<td>510</td>
<td>516</td>
<td>522</td>
<td>528</td>
<td>535</td>
<td>541</td>
<td>547</td>
<td>553</td>
<td>559</td>
</tr>
<tr>
<td>701</td>
<td>572</td>
<td>578</td>
<td>584</td>
<td>590</td>
<td>597</td>
<td>603</td>
<td>609</td>
<td>615</td>
<td>621</td>
<td>628</td>
</tr>
<tr>
<td>702</td>
<td>634</td>
<td>640</td>
<td>646</td>
<td>652</td>
<td>658</td>
<td>665</td>
<td>671</td>
<td>677</td>
<td>683</td>
<td>689</td>
</tr>
<tr>
<td>703</td>
<td>696</td>
<td>702</td>
<td>708</td>
<td>714</td>
<td>720</td>
<td>726</td>
<td>733</td>
<td>739</td>
<td>745</td>
<td>751</td>
</tr>
<tr>
<td>704</td>
<td>757</td>
<td>763</td>
<td>770</td>
<td>776</td>
<td>782</td>
<td>788</td>
<td>794</td>
<td>800</td>
<td>807</td>
<td>813</td>
</tr>
<tr>
<td>705</td>
<td>819</td>
<td>825</td>
<td>831</td>
<td>837</td>
<td>844</td>
<td>850</td>
<td>856</td>
<td>862</td>
<td>868</td>
<td>874</td>
</tr>
<tr>
<td>706</td>
<td>880</td>
<td>887</td>
<td>893</td>
<td>899</td>
<td>905</td>
<td>911</td>
<td>917</td>
<td>924</td>
<td>930</td>
<td>936</td>
</tr>
</tbody>
</table>
If a number consists of three digits, it is found in the left-hand column of the table. If it consists of four digits, the first three are found in the left-hand column, and the fourth found to the right of the letter N.

Illustrations:

\[
\begin{align*}
\log 700 & = 2.84510 \text{ (characteristic 2, mantissa .84510)} \\
\log 701 & = 2.84572 \\
\log 706 & = 2.84880 \\
\log 701.1 & = 2.84578 \\
\log 7058 & = 3.84868 \\
\end{align*}
\]

If a number consists of five or more figures, the mantissa may not be read directly from the table but may be found by interpolation as in the following example:

Find the \( \log 704.45 \)

\[
\begin{align*}
\log 704.6 & = 2.84794 \\
\log 704.56 & = ? \\
\log 704.5 & = 2.84788 \\
\end{align*}
\]

Since \( 704.56 \) is between \( 704.6 \) and \( 704.5 \), its logarithm must be between \( 2.84788 \) and \( 2.84794 \).

Then, since \( 704.56 \) is .6 of the way from \( 704.50 \) to \( 704.60 \), the logarithm of \( 704.56 \) will be about .6 of the way from \( 2.84788 \) to \( 2.84794 \). .6 of 6 is equal to 3.6 or 4 to the nearest whole number. Hence, we add 4 to the last digit of \( 2.84788 \), giving \( 2.84792 \) as the logarithm of \( 704.56 \).

If a number consists of more than five figures, we round it off to the nearest fifth figure when working with a five-place table. Likewise, mantissas are carried to exactly five places when a five-place table is used.

A. Find the logarithms of the following numbers:

1. 703_________________________  6. 7059_________________________
2. 7068_________________________  7. 705.46_______________________
3. 702_________________________  8. 701.54_______________________
4. 704.3_______________________  9. 703.36_______________________
5. 706.4_______________________  10. 700.9_____________________
Finding antilogarithms. If \( \log 70.42 = 1.84770 \), then 70.42 is called the antilogarithm of 1.84770.

In general, a number corresponding to a logarithm is called its antilogarithm and is written antilog.

For example: Find the number whose logarithm is 2.84776. The characteristic 2 tells us only that there must be three places to the left of the decimal point in the number.

From the table we see that the series of digits corresponding to the mantissa 84776 is 7043, and by considering the characteristic, we see that the number is 704.3. That is, antilog \( 2.84776 = 704.3 \).

Something to remember is that the series of digits is determined by the mantissa, and the position of the decimal point is determined by the characteristic.

If the mantissa is not found exactly from the table, then four figures of the antilogarithm may be found directly from the table and the fifth digit found by interpolation. The interpolation is handled the same as in finding the logarithm.

B. Find the antilogarithm of the following:

1. 2.84528
2. 1.84603
3. 3.84782
4. 2.84917
5. 1.84868
6. 3.84844

MULTIPLICATION AND DIVISION WITH LOGARITHMS

To multiply numbers, add their logarithms, and find the antilogarithm of the sum. This will be the required product.

To divide numbers, subtract the logarithm of the divisor from the logarithm of the dividend, and find the antilogarithm of the difference. This will give the required quotient.

C. Solve the following problems:

1. Multiply 687 by 24.5 by use of logarithms, and check by actual multiplication.
2. Multiply 876 by 22.4 by use of logarithms, and check by actual multiplication.
3. Divide 26.68 by 2.48 using logarithms and check by actual division.
4. Divide 48.96 by 3.36 using logarithms and check by actual division.
LESSON 47

SIMPLE EQUATIONS IN TWO UNKNOWNS

TERMS

Indeterminate equation. An equation containing two or more unknown numbers that can be satisfied by an indefinite number of sets of values of the unknowns is an indeterminate equation. For example, the equation \( x + y = 6 \) is satisfied by an unlimited number of pairs of values whose sum is 6.

<table>
<thead>
<tr>
<th>Assume ( x ) equal to</th>
<th>Then ( y ) must be equal to</th>
<th>Since ( x + y ) is equal to</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>-4</td>
<td>10</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>-6</td>
<td>6</td>
</tr>
<tr>
<td>etc.</td>
<td>etc.</td>
<td>etc.</td>
</tr>
</tbody>
</table>

\( x + y = 6 \) is an indeterminate equation. The unknowns in an indeterminate equation are called variables -- variables being numbers that do not retain a fixed value through a given discussion, but assume different value in value according to the conditions imposed upon them. The numbers .6, .66, .666 are successive values of a variable which approaches the constant 2/3. Variables are usually represented by the last letters in the alphabet, as \( x, y, z \), etc.

Elimination, as used in solving a system of simultaneous equations, is the process employed in deriving from the given equations new equations containing a less number of unknowns than the given equation.

METHOD OF SOLUTION

The three kinds of elimination that are generally put to use are elimination by addition or subtraction, elimination
by substitution, and elimination by comparison. This unit takes up primarily elimination by addition and subtraction.

A. Elimination by Addition or Subtraction.

Rule for elimination by addition or subtraction is as follows:
Reduce the given equations, if necessary, to the standard form, $ax + by = c$.
Choose the unknown to be eliminated, and find the L. C. M. of the absolute values of the coefficients of the unknown.
Multiply the given equations by the respective quotients of the L. C. M. divided by the absolute values of the coefficients of the unknown to be eliminated.
Add or subtract the resulting equations according as the coefficients of equal absolute value have unlike or like signs.

Example Problems

Example 1. Solve the equations

\[
\begin{align*}
    x + y &= 26 \\
    x - y &= 12
\end{align*}
\]

Solution

\[
\begin{align*}
    \text{Given} & \quad x + y = 26 \\
                   & \quad x - y = 12 \\
    \text{Eliminate } y \text{ by addition} & \quad 2x = 38 \\
                   & \quad x = 19 \\
    \text{Eliminate } x \text{ by subtraction} & \quad 2y = 14 \\
                   & \quad y = 7 \\
\end{align*}
\]

Therefore, the solution is $x = 19, y = 7$.

Example 2. Solve the equations

\[
\begin{align*}
    20 &= a + 6b \\
    12 &= 3a + 2b
\end{align*}
\]

Solution

\[
\begin{align*}
    \text{Given} & \quad 20 = a + 6b \\
                   & \quad 12 = 3a + 2b \\
    \text{Multiply first equation by } 3, \text{ and eliminate by subtraction} & \quad 60 = 3a + 18b \\
                   & \quad 12 = 3a + 2b \\
                   & \quad 48 = 16b \\
                   & \quad 16b = 48 \\
                   & \quad b = 3
\end{align*}
\]
Substitute

\[ \begin{align*}
12 & = 3a - 6 \\
3a & = 12 - 6 \\
3a & = 6 \\
a & = 2
\end{align*} \]

Therefore the solution is \( b = 3 \) and \( a = 2 \).

Example 3. Solve the equations

\[ \begin{align*}
3x + 5y &= 22 \\
4x - 3y &= 10
\end{align*} \]

Solution

Given

\[ \begin{align*}
3x + 5y &= 22 \\
4x - 3y &= 10
\end{align*} \]

Eliminate \( y \) by addition.

L. C. M. of 5 and 3, the absolute values of the coefficients of \( y \), is 15.

Multiplying by 3

\[ 9x + 15y = 66 \]

Multiplying by 5

\[ 20x - 15y = 50 \]

Adding the equations

\[ 29x = 116 \]

\[ x = 4 \]

Substituting the value of \( x \)

\[ \begin{align*}
3x + 5y &= 22 \\
12 + 5y &= 22 \\
5y &= 22 - 12 \\
5y &= 10 \\
y &= 2
\end{align*} \]

Therefore the solution is \( x = 4 \) and \( y = 2 \).

B. Solve the following problems:

1. \( x + y = 32 \)  
   \( x - y = 10 \)

2. \( x + y = 16 \)  
   \( x - y = -4 \)

3. \( 2x + 5y = 16 \)  
   \( x + y = 5 \)

4. \( 5x + y = 8 \)  
   \( x + 5y = 16 \)

5. \( 3x + y = 10 \)  
   \( 2x + 4y = 20 \)

6. \( 2x + 3y = 18 \)  
   \( x + 9y = 39 \)
7. \[7x + 2y = 28\]  \[3x + 6y = 50\]

8. \[4x + 2y = 24\]  \[9x + 4y = 50\]

9. \[7x + 6y = 38\]  \[2x + 3y = 18\]

10. \[9x - 2y = 19\]  \[2x + 4y = 20\]

11. \[8x - 5y = 14\]  \[x + 3y = 8\]

12. \[5x + 7y = 19\]  \[x - 4y = 5\]
UNIT XVI

GRAPHS, AND STOCKS AND BONDS

LESSON 48

GRAPHS

A graph is a straight line, broken line, or curve, drawn to scale, showing variations in the values of a variable. Graphs give a more vivid picture of the relationships of data, and they make it possible to determine relationships and interpretations of data at a glance and leave a more lasting impression upon the reader.

Graphs are used in the following ways:
1. To show the relation of the parts to the whole and to each other.
2. To compare a number of different items or groups of items as to some common characteristic.
3. To show frequency distribution.
4. To show variation in an item with change in time.
5. To show dependence and consequent simultaneous variations.
6. To show rate of growth or per cent of increase or decrease.

These are suggestions as to when various graphs are suitable and should be used. They are as follows:

1. The component bar and circle graphs are most frequently used for showing the relationship of parts to each other and to the whole. Examples are distribution of the tax dollar, budget distribution, earnings and expense distribution.

In producing the component bar graph we are primarily concerned with the length of the bars. The width is merely for convenience of labeling. There are three steps necessary in the making of a component bar graph:
1. Find what per cent each item is of the total.
2. Select a total length for the bar, and compute the length of each item by multiplying the total length by the per cent.
3. Lay off each section and label it in some distinctive way as to item and per cent. Each graph should have a title.

The following steps are necessary in the preparation of circle graphs:
1. Find the per cent each item is of the total.
2. In a complete circle there are 360 degrees which is equivalent to 100 per cent. Thus, 1 per cent would be equal
to 3.6 degrees, for purposes of the graph. Multiply the number of per cent found in step 1 by 3.6 to find the number of degrees to allow for each item.

3. With a protractor lay out on the circle the number of degrees for each item and label each part.

4. Check the per cents for a total of 100, and the degrees for a total of 360 degrees.

Bar graphs.

Bar graphs are used to show the relationship and comparison between items of the same kind. Examples are the expenditures for each of several years, lengths of items, areas of counties, etc. The following are steps necessary in the preparation of bar graphs:

1. If the numbers are too large, they should be rounded off.
2. Choose a scale that is convenient for the graph being made.
3. Data should be arranged in either ascending or descending order.
4. Compute the number of spaces to be covered by each item, mark, and fill the bars in solid.
5. Leave a space between each two bars that is equivalent to the width of the bar.
6. The bars should be labeled, scales should be indicated, the bars should all be of uniform width, and the graph should be titled.

Line graphs.

The line graph is used to show continuous variations along a time scale. That is one of the main advantages of a line graph, it can be carried along from day to day, or from year to year. Another advantage is that it allows several sets of data to be compared by several separate lines on the same chart.

The line graph is generally used when there is a time relationship, such as sales data for a series of years, months, or weeks. Usually the time element is plotted horizontally, and the other variable plotted vertically. Each point is found on the graph and then the points are connected by a continuous line drawn between the points.
Characteristics of a good graph.

A graph should be neat, clear, well spaced, and generally pleasing to the eye. The choice of scales is very important so as not to make the graph narrow and high or broad and low. All titles and other lettering should be printed. The data should be drawn to scale and properly located and labeled, and the graph should be simple enough so as not to confuse readers. The graph should be self-explanatory, and all axes should be labeled. The graph should be truthful and not leave any false impressions, and it should be suitable to whatever use it is to be put.

A. Prepare the following graphs:

1. From the following information prepare a line graph. The temperatures for Dallas, August 3, 1945, were as follows:

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 a.m.</td>
<td>75°F</td>
</tr>
<tr>
<td>7 a.m.</td>
<td>78°F</td>
</tr>
<tr>
<td>9 a.m.</td>
<td>81°F</td>
</tr>
<tr>
<td>11 a.m.</td>
<td>90°F</td>
</tr>
<tr>
<td>1 p.m.</td>
<td>99°F</td>
</tr>
<tr>
<td>3 p.m.</td>
<td>103°F</td>
</tr>
<tr>
<td>5 p.m.</td>
<td>98°F</td>
</tr>
<tr>
<td>7 p.m.</td>
<td>88°F</td>
</tr>
<tr>
<td>9 p.m.</td>
<td>80°F</td>
</tr>
<tr>
<td>11 p.m.</td>
<td>78°F</td>
</tr>
</tbody>
</table>

2. From the following information prepare a circle graph. The J. C. Jones Company statement of profit and loss shows that, based upon sales, cost of goods sold is equal to 68%, expenses 18%, and profit 14%.

3. From the following information prepare a bar graph. The following data reveal the sales of the six departments of a certain department store for one week.

<table>
<thead>
<tr>
<th>Department</th>
<th>Amount of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$2,500</td>
</tr>
<tr>
<td>B</td>
<td>1,250</td>
</tr>
<tr>
<td>C</td>
<td>3,800</td>
</tr>
<tr>
<td>D</td>
<td>4,500</td>
</tr>
<tr>
<td>E</td>
<td>1,500</td>
</tr>
<tr>
<td>F</td>
<td>2,950</td>
</tr>
</tbody>
</table>
LESSON 49

STOCKS AND BONDS

STOCKS

A corporation may issue several classes of capital stock, each embodying different terms and carrying different privileges. The amount of capital stock that can be issued by a corporation depends upon its charter.

A corporation obtains money by selling its stock for what it can get for it. The stock may have an original value which is known as par value, or it may be no-par-value stock. State laws govern the amount stocks can be sold for, and the rules governing par and no-par-value stock.

The most common classification of stock is that of common stock and preferred stock. Common stock has no preference over any other stock of the company as to dividends or assets, but carried with it the right to participate in the management of the corporation by voting at stockholders' meetings. Preferred stock has some kind of preference over the ordinary, or common stock. It is always preferred as to the distribution of profits.

The profits of a corporation may be divided yearly, semi-annually, quarterly, or monthly according to the discretion of the board of directors. A dividend is said to be declared when profits are divided among the stockholders. Whenever profits are distributed, the preferred stockholders will receive their share first, the common stockholders receiving the balance of the distribution. Preferred stock is sometimes given a preference as to distribution of assets in case of dissolution and liquidation of the corporation.

Sometimes the preferred stock is cumulative. If the company does not make enough profits in one year to pay the dividend on preferred stocks, a claim is set up against the earnings any year thereafter, for all or part of the dividend.

Common stock is sometimes more desirable than preferred stock. This may be true if the holders of preferred stock do not share in profits in excess of the amount of their preference.

Most purchases or sales of stocks are made through brokers who act as agents in such transactions. It is not necessary to buy or sell through a broker, but many prospective purchasers do not know where to find a seller, or vice versa. The New York Stock Exchange is an organization of brokers who are known as members. Brokers who are not members have to pay for services rendered by members of the Stock Exchange.
Individual customers are charged a brokerage fee by brokers for their service. The fee is a certain per cent of the value of stock sold, which is based on a varying schedule.

All principal newspapers publish sales of stock on the New York Stock Exchange daily. The quoted prices are generally accepted as the market value of the stock.

The following is a list of stocks traded Monday, June 30, 1947, on the New York Stock Exchange, as taken from the *Dallas Morning News*:

<table>
<thead>
<tr>
<th>Stock</th>
<th>Close</th>
<th>Ch-ge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott Lab</td>
<td>77 1/2</td>
<td>+</td>
</tr>
<tr>
<td>ACF-BrlMt</td>
<td>8 3/4</td>
<td></td>
</tr>
<tr>
<td>AcmeStl</td>
<td>47 1/2</td>
<td>+</td>
</tr>
<tr>
<td>AdamsExp</td>
<td>15 1/2</td>
<td></td>
</tr>
<tr>
<td>Admiral Cp</td>
<td>7 1/8</td>
<td>+</td>
</tr>
<tr>
<td>AirRdctn</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>Alaska Jun</td>
<td>4 3/4</td>
<td></td>
</tr>
<tr>
<td>Aldens Inc</td>
<td>25 1/4</td>
<td>-</td>
</tr>
<tr>
<td>do pf</td>
<td>98</td>
<td></td>
</tr>
<tr>
<td>AllgnyCrp</td>
<td>3 1/2</td>
<td></td>
</tr>
<tr>
<td>do pf</td>
<td>36 1/2</td>
<td>-</td>
</tr>
<tr>
<td>do prpf</td>
<td>63</td>
<td>+</td>
</tr>
<tr>
<td>Allg Lud Stl</td>
<td>35 1/2</td>
<td>+</td>
</tr>
<tr>
<td>Allen Inds</td>
<td>18 1/4</td>
<td>-</td>
</tr>
<tr>
<td>All Cmk Dye</td>
<td>177</td>
<td>+</td>
</tr>
<tr>
<td>Alln Inds</td>
<td>18 1/4</td>
<td>-</td>
</tr>
<tr>
<td>Allis Ch Mfg</td>
<td>34 3/4</td>
<td>-</td>
</tr>
<tr>
<td>Alpha PCm</td>
<td>28</td>
<td>+</td>
</tr>
<tr>
<td>Amall thr</td>
<td>6 3/4</td>
<td>-</td>
</tr>
<tr>
<td>do pf</td>
<td>48 3/8</td>
<td>+</td>
</tr>
<tr>
<td>Amered Pet</td>
<td>82</td>
<td>-</td>
</tr>
<tr>
<td>Amag Ch D</td>
<td>40 1/2</td>
<td></td>
</tr>
<tr>
<td>Am Airlines</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Am Bnk Nt</td>
<td>24</td>
<td>-</td>
</tr>
<tr>
<td>Am Bosch</td>
<td>10 3/4</td>
<td>-</td>
</tr>
<tr>
<td>Am Brok Shoe</td>
<td>43 1/2</td>
<td>+</td>
</tr>
<tr>
<td>do pr</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Am Cbl &amp; Rd</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>Am Can</td>
<td>92 1/4</td>
<td>-</td>
</tr>
<tr>
<td>do pf</td>
<td>188</td>
<td>-</td>
</tr>
<tr>
<td>Am Car &amp; Fd</td>
<td>425/8</td>
<td>+</td>
</tr>
<tr>
<td>Am Ch &amp; Cbl</td>
<td>21 1/4</td>
<td></td>
</tr>
<tr>
<td>Am Cyst 1 S</td>
<td>20 1/2</td>
<td>-</td>
</tr>
<tr>
<td>Am Distill</td>
<td>30</td>
<td>-</td>
</tr>
</tbody>
</table>
In the stock market report, on the preceding page, the "close" is the closing price of the market. The last column, "change," indicates either an increase or decrease of the last price today over yesterday's last price.

**Taxes on the Buying and Selling of Stocks.**

The laws governing the transfer of stocks differ with the different states. In the State of New York the state tax is 3 cents a share on all stock, par value or no-par-value, selling under $20 a share, and 4 cents on shares selling for over $20 a share.

Federal taxes are based on the same system. Stocks selling under $20 a share pay 5 cents per $100 of par value, while no-par-value stock pays 5 cents per share. Stocks selling at $20 a share or ovdr pay 6 cents per $100 of par value, while no-par-value stock pays 6 cents per share.

The seller of stock must pay not only the federal tax but also the state tax, if there is one, on all shares of stock sold, regardless of the number.

The buyer of even 100-share lots of stock, however, is exempt from both the federal and state taxes.

**Finding the Rate of Yield.**

The rate of yield from an investment is the relation between the dividend or interest and the cost price. The cost price is made up of the price of the securities plus the brokerage charges and any other expenses that may be incurred by the purchaser.

For example, Johnson purchased 100 shares of American Can 5% Preferred at $188, brokerage 25 cents a share. What is the rate of yield?

\[ \text{$188 + .25 = $188.25 cost per share} \]
\[ \text{$175 \text{ par} \times 5\% = $8.75 annual dividend income} \]
\[ \text{$8.75 \div $188.25 = .04648 or 4.65\% rate of yield.} \]
The following are brokerage rates for buying and selling stocks on the New York Stock Exchange:

<table>
<thead>
<tr>
<th>Brokerage Per Share</th>
<th>Selling Price of Stocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>7 1/2¢</td>
<td>Under $10</td>
</tr>
<tr>
<td>12 1/2¢</td>
<td>$10 to $24 7/8</td>
</tr>
<tr>
<td>15¢</td>
<td>25 to 49 7/8</td>
</tr>
<tr>
<td>17 1/2¢</td>
<td>50 to 74 7/8</td>
</tr>
<tr>
<td>20¢</td>
<td>75 to 99 7/8</td>
</tr>
<tr>
<td>25¢</td>
<td>100 to 199 7/8</td>
</tr>
<tr>
<td>30¢</td>
<td>200 to 249 7/8</td>
</tr>
<tr>
<td>35¢</td>
<td>250 to 299 7/8</td>
</tr>
<tr>
<td>40¢</td>
<td>300 to 349 7/8</td>
</tr>
<tr>
<td>45¢</td>
<td>350 to 399 7/8</td>
</tr>
<tr>
<td>50¢</td>
<td>400 to 449 7/8</td>
</tr>
<tr>
<td>55¢</td>
<td>450 to 499 7/8</td>
</tr>
<tr>
<td>60¢</td>
<td>500 to 549 7/8</td>
</tr>
</tbody>
</table>
LESSON 50

BONDS

A bond is a written promise to pay at a specified time a certain sum of money, called the redemption value, and to pay equal periodic dividends. The dividend is determined by a specified percentage of the face value. The specified percentage is called the dividend rate. Certain property is usually pledged as security for the payment of both the principal and the interest, but bonds may be issued without being secured by a particular piece of property, or by a mortgage.

Bonds may be classified in various ways. As to the mode of interest or payment, they may be registered or coupon bonds. If registered, the interest check is made out to the registered party; if coupon, the coupon is clipped and sent in for payment. As to payment of principal, they may call for payment of a definite amount at a definite date in the future, or they may provide for payment at a time determined by lot, or they may be convertible into some other form of security at the option of the corporation or the holder.

Bonds may sometimes be sold for more than their face value. If a business has unusually high credit or offers an exceptionally high rate of interest, buyers may be willing to pay more than the face value for its bonds. A bond bought at a price above the face value is said to be bought at a premium. A bond of which the purchase price is less than the face value is said to be bought at a discount. The actual rate of interest earned on the money invested is called the investment rate, or yield.

Prices of bonds are quoted on the basis of $100. For example, a $1,000 bond quoted at 105 means that the price is $1,050. That is, $105 for each $100.

When a bond is sold between the dates of interest payments, it is usual to add to the price of the bond the accrued interest or interest from the last interest payment date to the date of sale. For example, a $1,000 bond bearing interest at 5%, payable semi-annually, on April 1 and on October 1, is sold on July 1 at 102 plus accrued interest.

10 x $102 = $1,020 market value
April 1 to July 1 = 3 months, interest accrued Interest on $1,000 for 3 months at 5% = $12.50
$1,020 + $12.50 = $1,032.50 full price

The purchaser will get the $12.50 interest back when he receives the six months' payment of interest amounting to $25.
A. Solve the following problems on stocks and bonds.

1. Compute the cost price of the following stocks, including brokerage and transfer tax on odd lots of stock. Use closing price as listed by the New York Stock Exchange for stocks traded Monday, June 30, 1947.

<table>
<thead>
<tr>
<th>No. of Shares</th>
<th>Stock</th>
<th>Stock Exchange Price</th>
<th>Brokerage</th>
<th>Cost of One Share</th>
<th>Total Tax, Odd Lots</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>365</td>
<td>AcmeStl</td>
<td>$47.50</td>
<td>$.15</td>
<td>$47.65</td>
<td>$5.85</td>
<td>$17,398.10</td>
</tr>
<tr>
<td>220</td>
<td>AirRdctn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>AlCm&amp;Dye</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td>AmAgChD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>AmAirLines</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>530</td>
<td>AmDistill</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>AmCan pf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>245</td>
<td>AmBrkShoe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>AmBnkNt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>430</td>
<td>AmCan</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Find the cost of the following bonds purchased on the interest date.

(a) Find the cost of $25,000 Acme Brick 6\%'s; cost, $89\frac{1}{2}$; commission fee, $1.75 per $1,000 par value.

(b) Find the cost of $8,000 Morrison Flour 6's; cost, $103\frac{1}{2}$; brokerage fee, $1/4$.

(c) Find the cost of $14,000 New London 5's; cost, $89 \ 1/4$; brokerage fee, $1/8$. 
BIBLIOGRAPHY


Curry, Preston E., and Rice, Ralph R., Applied Business Arithmetic, Dallas, South-Western Publishing Company, 1940.


