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INSTRUCTIONAL GUIDE FOR SENIOR MATHEMATICS.

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LOS ANGELES CITY SCHOOLS, CALIF.

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*TEACHING GUIDES, ARITHMETIC, ALGEBRA, CURRICULUM GUIDES,
GEOMETRY, GRADE 12, GENERAL EDUCATION,

SENIOR MATHEMATICS, WITH PRACTICAL EMPHASIS ON TOPICS FROM THE FIELDS OF ARITHMETIC, ALGEBRA, AND GEOMETRY, IS A ONE-SEMESTER COURSE FOR TWELFTH-GRADE STUDENTS. THE COURSE HAS TWO MAJOR OBJECTIVES--(1) PREPARING THE STUDENT FOR EMPLOYMENT BY IMPROVING HIS SKILLS IN THE BASIC PROCESSES OF MATHEMATICS, AND (2) PROVIDING THE STUDENTS WHO ARE ABOUT TO ENCOUNTER ADULT RESPONSIBILITIES WITH A PRACTICAL COURSE IN CONSUMER MATHEMATICS AND THE MATHEMATICS OF PERSONAL BUSINESS. THE PUBLICATION PROVIDES TEACHERS WITH (1) AN OUTLINE OF COURSE CONTENT, (2) A LIST OF TOPICS TO BE EMPHASIZED, (3) SPECIFIC TEACHING SUGGESTIONS, AND (4) ILLUSTRATIVE EXAMPLES. A SUGGESTED TIME SCHEDULE IS INCLUDED AS A MEANS OF INDICATING THE EMPHASIS RECOMMENDED FOR THE STUDY OF EACH UNIT. EVALUATION SECTIONS ACCOMPANYING EACH UNIT SERVE TO SUMMARIZE THE BASIC CONCEPTS, SKILLS, AND UNDERSTANDINGS WHICH THE STUDENT SHOULD HAVE ACQUIRED. (RP)

SENIOR MATHEMATICS

GRADE TWELVE

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

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AN INSTRUCTIONAL GUIDE

LOS ANGELES CITY SCHOOLS

INSTRUCTIONAL GUIDE
SENIOR MATHEMATICS

LOS ANGELES CITY SCHOOLS
Division of Instructional Services
Publication No. SC-624
1967

This publication has been developed in accordance with the Comprehensive Curriculum Policy adopted by the Los Angeles City Board of Education.

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FOREWORD

Senior Mathematics, a one-semester course for twelfth-grade students, emphasizes practical topics from the fields of arithmetic, algebra, and geometry. The course has two major objectives. First, it prepares the student for employment, through improvement of his skills in the basic processes of mathematics. Second, it provides students who are about to encounter adult responsibilities with a practical course in consumer mathematics and the mathematics of personal business. Attention is given to mathematical planning and budgeting, and the development of sensible buying habits.

This publication has been designed to aid teachers by providing an outline of course content, a list of topics to be emphasized, specific teaching suggestions, and illustrative examples. A suggested time schedule is included as a means of indicating the emphasis recommended for the study of each unit. Evaluation sections accompanying each unit serve to summarize the basic concepts, skills, and understandings which the student should have acquired.

EVERETT CHAFFEE
Associate Superintendent
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Huntington Park High School
Franklin High School
Eagle Rock High School
Beverly Boulevard Center
(formerly, Jordan High School)
North Hollywood High School
Hamilton High School
Francis Polytechnic High School
Dorsey High School
Manual Arts High School
Gardena High School
Granada Hills High School

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OBJECTIVES

Senior Mathematics is designed to reinforce the students' learning of basic concepts, as well as to provide enrichment through the presentation of new mathematical ideas and terminology. It is designed to help students succeed in the mathematically oriented adult world they are about to encounter. The course emphasizes the following:

Understanding of the basic mathematical concepts necessary to get and keep a job.

Development of computational skills, through drill practice.

Use of simple algebra to solve everyday problems.

Understanding of geometry as a practical tool.

Ability to budget, purchase, borrow, and invest wisely.

Understanding of tax sources and the types of taxes which most persons must pay.

Ability to judge the reasonableness of answers.

Ability to apply the basic concepts of ratio and proportion.

Understanding and interpretation of the mathematics used in printed materials.

Understanding of the use of percentage.

Recognition of the contribution of mathematics to all phases of life.

Preparation for effective citizenship in a technological society.

SUGGESTED TIME SCHEDULE FOR UNITS TO BE STUDIED

| <u>Unit Number</u> | <u>Title</u> | <u>Chapter Number *</u> | <u>Time in Weeks</u> |
|--------------------|------------------------------|-------------------------|----------------------|
| I: | THE SET OF INTEGERS | 1 | 2 |
| II: | THE FORMULA AND THE EQUATION | 4 | 2 |
| III: | RATIO AND PROPORTION | 11 | 2 |
| IV: | PERCENTAGE | 5 | 4 |
| V: | BUDGET AND INTEREST | 6 | 2 |
| VI: | INSTALLMENT BUYING | 10 | 1 |
| VII: | STATISTICS | 7 | 1 |
| VIII: | PLANNING FOR THE FUTURE | 8 | 2 |
| IX: | TAXATION | 14 | 1 |
| X: | GEOMETRY | 9 | 1 |
| | Review and Evaluation | | <u>1</u> |
| | | Total Number of Weeks | 19 |

*Authorized text: Potter, et al: Mathematics for Success

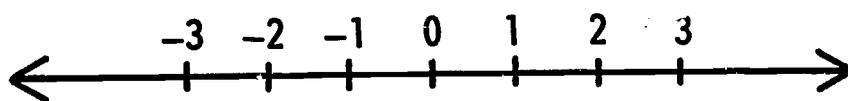
UNIT I: THE SET OF INTEGERS

A. Discovering positive and negative numbers (pp. 4-10)*

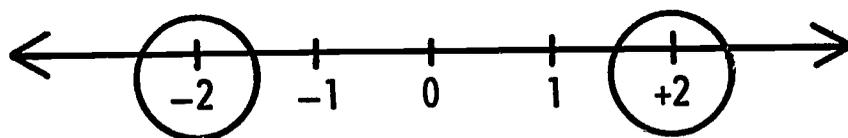
1. Discuss ways in which members of the class have used positive and negative numbers without naming them.
 - a. Point out that positive and negative numbers are used in conceptualizing such changes as the following: (pp. 4, 5)
 - 1) Gaining or losing money
 - 2) Showing temperatures above or below zero
 - 3) Gaining or losing weight
 - 4) Above and below sea level
 - 5) Going up or down in an elevator
 - b. Help students realize that the addition of natural numbers produces natural positive numbers.
 - c. Point out that the term "positive and negative numbers" is used in place of the older expression "signed numbers."
2. Show, by reference to the thermometer, the actual use of negative numbers to represent temperatures below zero. (pp. 6-8)

B. Developing the order property of the set of integers (p. 10)

1. Prepare a number line, such as the following:



- a. Point out that the set of integers includes the whole numbers, zero, and the opposites of the whole numbers.
- b. Study the number line and point out that positive 2 and negative 2 are referred to as opposites.



- 1) Provide drill to show opposites. Ask students to indicate the opposites for each of the following.

+3, +5, -3, -4, 0

*Page references throughout are to the authorized text, Potter et al: Mathematics for Success.

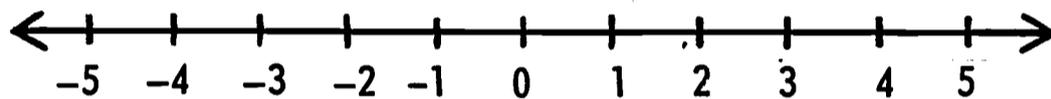
UNIT 1: THE SET OF INTEGERS

2) Give several examples of opposites.

- (up, down) (east, west) (north, south)
 (forward, backward) (right, left)
 (=, \neq) ($<$, $>$)

2. Demonstrate the order property on the number line.

a. Help students discover that any number on the number line which is to the right of another number is "greater than" that number. Consequently, any number to the left of another number is "less than" that number.

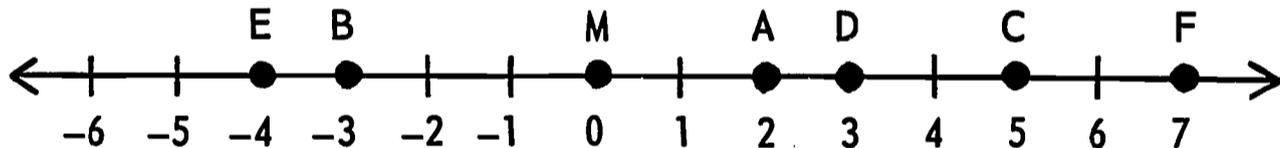


- | | | |
|----------|-----------|----------|
| $2 > 1$ | $-5 < -4$ | $-5 < 1$ |
| $2 > 0$ | $-5 < -3$ | $-5 < 2$ |
| $2 > -1$ | $-5 < 0$ | $-5 < 3$ |

Expand the concept of the order of integers by using examples on page 10 and others provided by the teacher.

C. Graphing and coordinates on the number line (pp. 11-13)

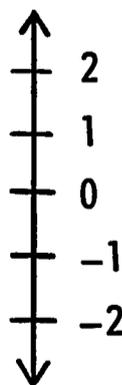
1. Show that the set of integers may be associated with points on the number line.



The coordinate of A is 2.
 The coordinate of B is -3.
 The coordinate of C is 5.

The coordinate of D is 3.
 The coordinate of E is -4.
 The coordinate of F is 7.
 The coordinate of M is 0.

2. Extend this idea by using a vertical number line

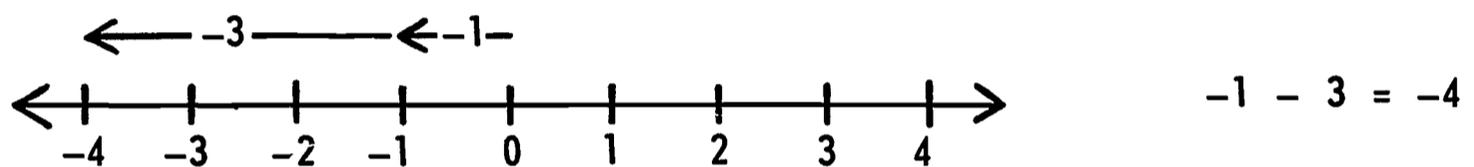
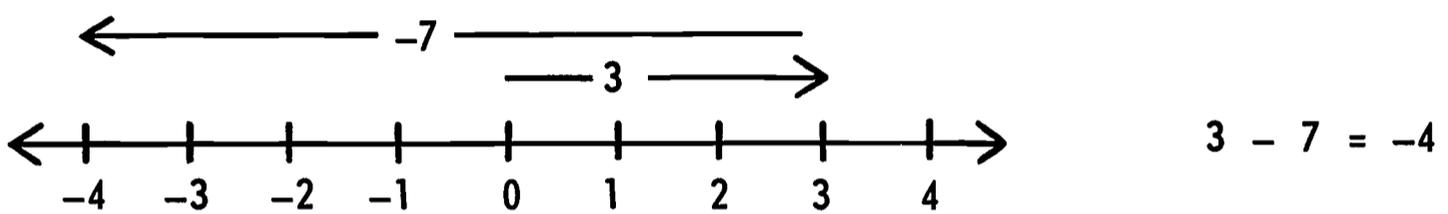
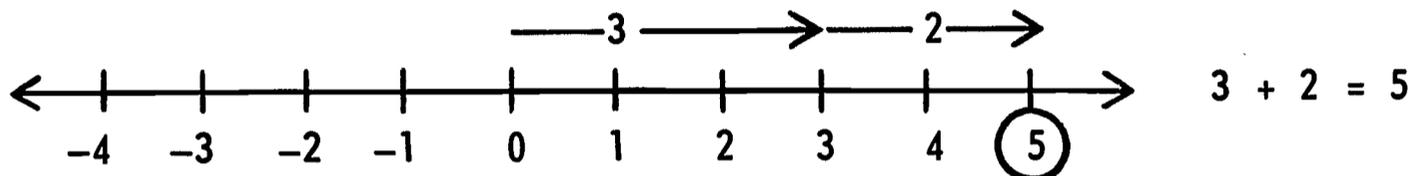


UNIT 1: THE SET OF INTEGERS

E. Adding positive and negative numbers (pp. 15-25)

1. Refer to number line. (p. 15)

a. Provide help by showing addition on the number line.



1) Point out that:

- +5 means 5 units to the right, while -5 means 5 units to the left.
- Always begin number line solutions at zero.

2. Show addition of positive and negative numbers in horizontal and vertical form. (p. 16)

| | | | |
|---|--|---|--|
| $\begin{array}{r} +5 \\ -2 \\ \hline \square \end{array}$ | $\begin{array}{l} +5 - 2 = \square \\ (+5) + (-2) = \square \end{array}$ | $\begin{array}{r} -6 \\ -2 \\ \hline \square \end{array}$ | $\begin{array}{l} -6 - 2 = \square \\ (-6) + (-2) = \square \end{array}$ |
| $\begin{array}{r} +4 \\ -5 \\ \hline \square \end{array}$ | $\begin{array}{l} +4 - 5 = \square \\ (+4) + (-5) = \square \end{array}$ | $\begin{array}{r} -7 \\ +2 \\ \hline \square \end{array}$ | $\begin{array}{l} -7 + 2 = \square \\ (-7) + (+2) = \square \end{array}$ |

3. Provide exercises that will focus the students' attention on the need to understand the rules for adding positive and negative numbers.

F. Developing and applying rules for adding positive and negative numbers (p. 17)

1. Establish rules.

- a. If two numbers have the same sign, add their absolute values. The sum has the same sign.
- b. If two numbers have different signs, find the difference in their absolute values and use the sign of the number having the greater absolute value.

(One of the most important contributions the teacher can make is to help the students understand that rules are intended only as aids in obtaining the answer.)

2. Apply the rules of addition which appear on pages 18 and 19 of the text.

G. Developing different methods of writing problems involving addition of positive and negative numbers (pp. 19-21)

1. Solve problems similar to the following:

$$\begin{array}{r} +3 \\ -4 \\ \hline \square \end{array}$$

$$+3 - 4 = \square$$

$$+3 + (-4) = \square$$

$$(+3) + (-4) = \square$$

Add +3 and -4

2. Provide additional examples using this concept. (pp. 20, 21)

UNIT 1: THE SET OF INTEGERS

H. Using positive and negative numbers to solve word problems (pp. 22, 24)

1. Discuss practical examples of some uses of positive and negative numbers.

John earned \$1.00 on Monday, \$5.00 on Tuesday and \$6.00 on Thursday; he had to pay bills of \$2.00 and \$3.00.

How much did he have left after he paid his bills?

2. Assign examples found on pages 22 and 24 of the text.

I. Evaluating achievement

It is expected that upon completion of the study of pages 4 to 25 in the textbook, the student will be able to demonstrate that he has learned to:

- Use positive and negative numbers in practical ways.
- Apply the order property of the set of integers.
- Graph ordered pairs on the coordinate plane.
- Recognize the absolute values of positive and negative numbers.
- Add positive and negative numbers.
- Provide practical applications of the rules for addition of positive and negative numbers.

UNIT II: THE FORMULA AND THE EQUATION

A. Learning about formulas

1. Develop student understanding of the need for formulas.
 - a. Ask students to suggest or bring to class formulas with which they are familiar.
 - b. Explore the formulas on page 100 of the text.
 - c. Have students make up formulas, such as the following, for themselves.

Rule: The number of points scored by a basketball team is equal to the sum of two times the number of field goals made, and the number of successful free throws.

Formula: Let T represent the total score, g the number of goals, and f the number of free throws.

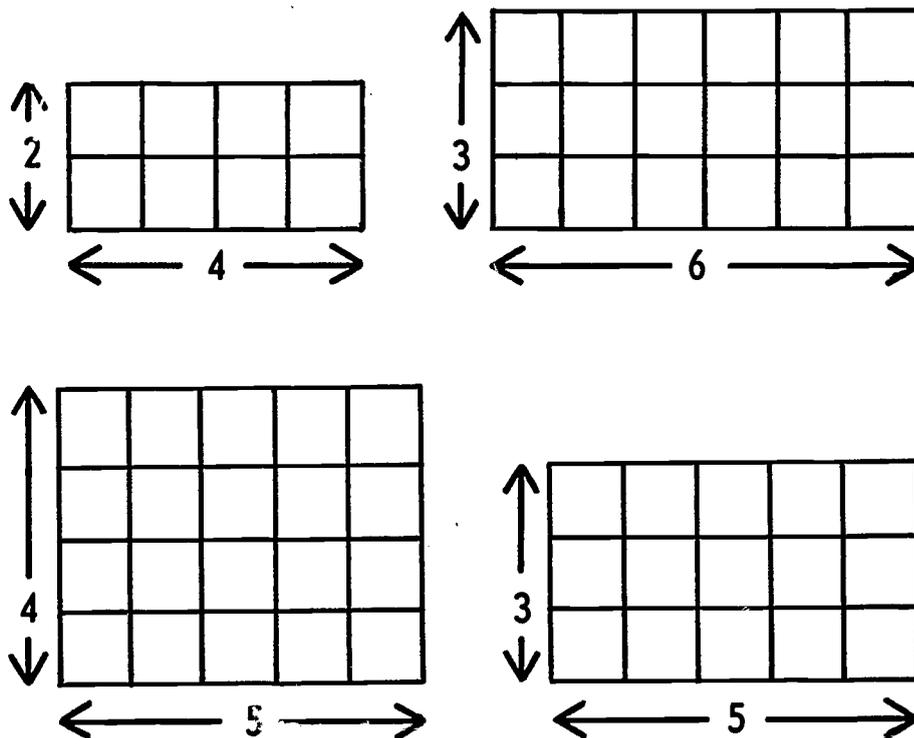
Then:

$$T = 2 \times g + f$$

Application: Give data on several games and have students use the formula to determine the scores.

- d. Develop a formula with the class. For example:

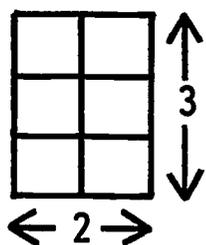
Use several rectangles, as is illustrated below, to show that the area can be determined by counting the number of squares in each rectangle. Help the students discover that, instead of counting all the squares to find the area, they might multiply the length by the width. Then, point out that by using A for area, l for length, and w for width, the formula can be written $A = l \times w$. It is suggested that graph paper be provided for this lesson.



UNIT II: THE FORMULA AND THE EQUATION

2. Practice evaluating formulas. (pp. 100, 101)*
 - a. Introduce the idea of a function.
 - 1) It might be helpful to show that, in the formula $P = 4s$, the Perimeter is a function of s , the length of a side.
 - 2) Show that if s is known, then P can be determined, and that, as s changes in value, P will change.
 - b. Allow students to evaluate the formulas, as given on page 101.
3. Develop the concept of dependence in a formula. (pp. 102-106)
 - a. Explain the meaning of constant and variable. (p. 102)
 - b. Emphasize the difference between dependent and independent variables. (p. 103)
For example:
Use a formula like $A = 20w$ and point out that A depends upon w and, therefore, is a dependent variable; w , which may change its value independently of A , is called the independent variable.
 - c. Investigate the behavior of a formula when the variables change values.
Use the formula $A = \ell w$ and see how the value of A changes when the length is doubled or the width is doubled.

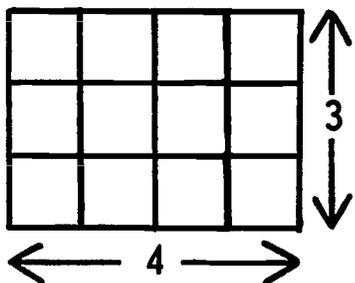
Consider the rectangle below.



$$A = 2 \times 3 = 6 \text{ square units.}$$

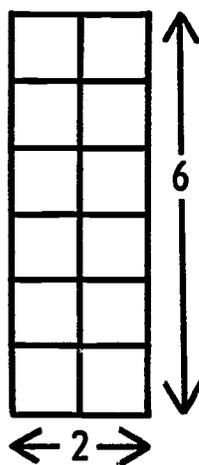
Doubling the width:

w is the independent variable



$$A = 3 \times 4 = 12 \text{ square units.}$$

Doubling the length:



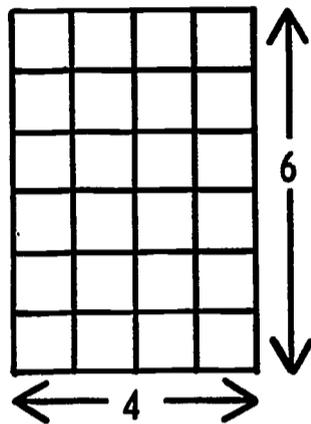
ℓ is the independent variable

$$A = 2 \times 6 = 12 \text{ square units.}$$

Conclusion: Area is doubled if the length or the width is doubled.

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

Doubling the length and the width:

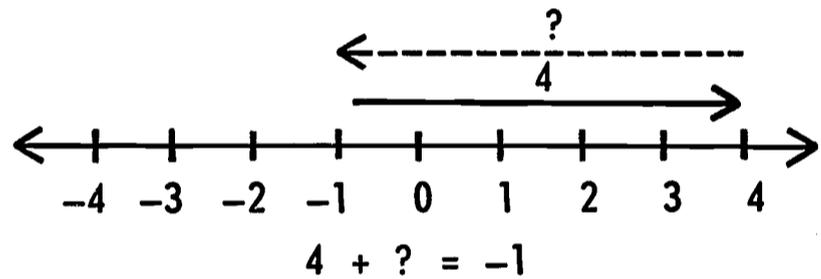
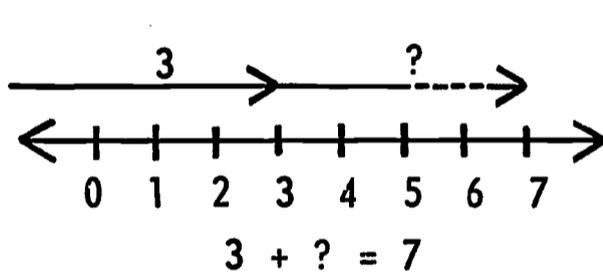


$$A = 4 \times 6 = 24 \text{ square units.}$$

Conclusion: Area is four times as large if both the length and width are doubled.

B. Studying equations

1. Interpret equations on the number line.



2. Write and solve many equations, using place holders as variables.

$$2 + \square = 5$$

$$\square = 3$$

$$8 + \square = 6$$

$$\square = 2$$

$$3 - 4 = \square$$

$$\square = -1$$

UNIT II: THE FORMULA AND THE EQUATION

3. Introduce methods of solving equations. (pp. 106-108)

a. Ask students to solve several equations by using subtraction. (pages 109-110)

$$m + 2 = 6, \quad m = 4 \quad (6 - 2 = 4)$$

$$x + 4 = 6, \quad x = 2 \quad (6 - 4 = 2)$$

$$3 + y = 7, \quad y = 4 \quad (7 - 3 = 4)$$

b. Have students solve equations by using division. (pp. 110, 111)

$$3x = 12, \quad \text{divide 12 by 3} \quad x = 4$$

$$5c = 10, \quad \text{divide 10 by 5} \quad c = 2$$

$$4y = 16, \quad \text{divide 16 by 4} \quad y = 4$$

c. Solve equations by using both subtraction and division. (pp. 112, 113)

$$2x + 4 = 12$$

$$\begin{array}{l} \text{subtract 4,} \quad 2x = 8 \\ \text{divide by 2,} \quad x = 4 \end{array}$$

d. Introduce combining of like terms to simplify expressions. (p. 114)

$$2x + 3x = 5x$$

$$5c + 2c = 7c$$

Apply this concept to the solution of equations. (pp. 115-117)

$$2x + 4x = 18$$

$$6x = 18$$

$$x = 3$$

e. Solve equations using multiplication. (pp. 117, 118)

$$\frac{x}{5} = 3, \quad x = 15$$

$$\frac{m}{2} = 4, \quad m = 8$$

f. Solve equations using addition. (pp. 120, 121)

$$h - 3 = 2, \quad h = 5$$

$$a - 2 = 7, \quad a = 9$$

4. Develop the concepts needed for solving problems using equations. (pp. 124-128)

a. Have students write several simple equations from word statements.

1) $\underbrace{\text{TOM'S AGE}}_T \text{ IS } \underbrace{\text{TWICE}}_{=2} \text{ SAM'S AGE}_S$

2) Tom worked 3 hours on Monday and 4 hours on Tuesday. How many hours did Tom work?

$$3 + 4 = \square$$

3) Bill had 75¢. He loaned some money to Joe. If Bill had 50¢ left, how much did he loan to Joe?

$$75¢ - \square = 50¢$$

b. Solve problems from pages 125 to 128 in the text.

C. Evaluating achievements

It is expected that upon completion of the study of pages 97 to 128 of the textbook, the student will be able to demonstrate that he has learned to:

- Recognize and use formulas.
- Develop formulas for himself.
- Discuss concepts of dependent and independent variables in formulas.
- Simplify equations by combining like terms.
- Solve equations.
- Solve problems using algebra.

UNIT III: RATIO AND PROPORTION

A. Introducing the concept of ratio

1. Point out that ratios are used to make comparisons. (p. 298)*
 - a. Demonstrate the use of ratio to compare quantities, such as the following:
 - 1) Sizes of different classes in the same school
 - 2) Grades on a test
 - 3) Heights of students
2. Relate the concept of ratio to previous work with fractions (rational numbers) (p. 299)
 - a. Develop an understanding of operations on fractional numbers. (p. 300)

Example:

Consider the fraction $\frac{6}{8}$

You may multiply or divide both members of a fraction by the same number without changing the value of the fraction.

$$\left\{ \begin{array}{l} \frac{6 \times 2}{8 \times 2} = \frac{12}{16} = \frac{6}{8} \\ \frac{6 \div 2}{8 \div 2} = \frac{3}{4} = \frac{6}{8} \end{array} \right.$$

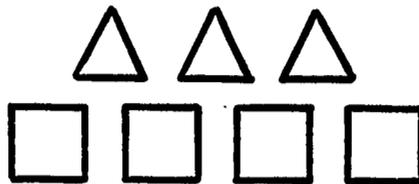
You may not add or subtract the same number without changing the value of the fraction.

$$\left\{ \begin{array}{l} \frac{6 + 2}{8 + 2} = \frac{8}{10} \neq \frac{6}{8} \\ \frac{6 - 2}{8 - 2} = \frac{4}{6} \neq \frac{6}{8} \end{array} \right.$$

*Page references throughout are to the authorized text, Potter, et al: Mathematics for Success.

UNIT III: RATIO AND PROPORTION

3. Develop the concept that a ratio may look like a fraction. (A ratio is a comparison between two quantities.)
- a. Show that ratio is a comparison between two quantities.



The ratio of the number of \triangle 's to the number of \square 's is 3 to 4, or 3 : 4.

The ratio of the number of \square 's to the number of \triangle 's is 4 to 3, or 4 : 3.

We may write 3 : 4 as $\frac{3}{4}$; 4 : 3 as $\frac{4}{3}$.

- b. Show that ratio may be associated with the idea of a pair of multipliers.

10 is to 6 as 5 is to 3

$$10 = 2 \times 5$$

$$6 = 2 \times 3$$

- c. Interpret the concept of ratio as a comparison between two sets.

B. Studying proportions (p. 304)

1. Introduce proportions by showing two equal ratios.

Show two equal ratios: $\frac{3}{5} = \frac{6}{10}$

2. Provide problems dealing with ratios set up to form a proportion. (p. 305)

Sample Problems

Tell whether each statement is true or false.

$$\frac{6}{8} = \frac{3}{4}$$

$$\frac{3}{5} = \frac{6}{10}$$

$$\frac{2}{3} = \frac{7}{5}$$

$$\frac{9}{6} = \frac{6}{4}$$

3. Discover the rules for a proportion.

a. Study the vocabulary of proportions.

- 1) Means
- 2) Extremes

b. Lead students to discover the basic concept that, in a proportion, the product of the means is equal to the product of the extremes. (pp. 305-307)

- 1) Point out that, by applying this concept, we can find the missing term of a proportion.
- 2) Give examples that will illustrate this operation.

$$\frac{3}{6} = \frac{1}{x}$$

$$\begin{aligned} 3 \cdot x &= 6 \cdot 1 \\ 3x &= 6 \\ x &= 2 \end{aligned}$$

3 and x are called extremes. 6 and 1 are called means.

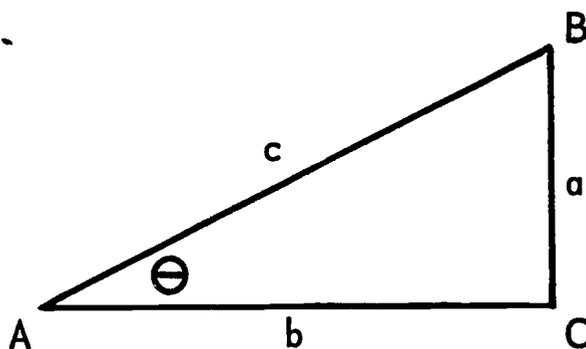
(The text refers to this as cross-multiplying.) (p. 306)

c. Apply the concept of proportion to work the problems on pages 308 to 311 in the textbook.

C. Enriching material

1. For the more able students, the idea of an inverse proportion might be developed. (pp. 311-315)
2. It may be possible to introduce the sine and tangent functions of a right triangle.

Example:



$$\text{Sine } \angle A = \frac{a}{c}$$

$$\text{Tangent } \angle A = \frac{a}{b}$$

UNIT III: RATIO AND PROPORTION

D. Evaluating achievement

It is expected that, upon completion of the study of pages 298 to 311 of the textbook, the student will be able to demonstrate that he has learned to:

- Apply the meaning of ratio and proportion.
- Distinguish between a ratio and a proportion.
- Solve a proportion for the missing term.
- Perform operations with fractions.
- Apply rules and concepts of proportion to solve practical problems.

UNIT IV: PERCENTAGE

A. Exploring per cent (pp. 135-143)*

1. Develop the basic concept of per cent.

a. Per cent means "per hundred."

b. Cent comes from the word centum, meaning hundred.

Examples:

100 cents in \$1.00

100 years in 1 century100 centimeters in 1 meter

2. Relate ratio to per cent. (p. 139)

a. Bring printed materials to the classroom and have students find uses of per cent in practice.

b. Show that per cent is a ratio that compares a number to 100.

| | | | |
|-----------------|------------------|------------------|------------------|
| $\frac{5}{100}$ | $\frac{20}{100}$ | $\frac{60}{100}$ | $\frac{85}{100}$ |
| 5 : 100 | 20 : 100 | 60 : 100 | 85 : 100 |
| 5 to 100 | 20 to 100 | 60 to 100 | 85 to 100 |

c. Develop the idea that the symbol % means $\frac{1}{100}$ $\frac{25}{100}$ means $25/100 = .25$ or simply 25%

$$\begin{aligned}\frac{25}{100} &= 25 \cdot \frac{1}{100} \\ &= 25\%\end{aligned}$$

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

UNIT IV: PERCENTAGE

B. Learning to express concepts of per cent correctly.

1. Provide drill in changing decimal to per cent. (p. 138)

$$.18 = 18\% \longrightarrow .18 = \frac{18}{100} = 18 \cdot \frac{1}{100} = 18\%$$

$$.5 = 50\% \longrightarrow .50 = \frac{50}{100} = 50 \cdot \frac{1}{100} = 50\%$$

$$.01 = 1\% \longrightarrow .01 = \frac{1}{100} = 1 \cdot \frac{1}{100} = 1\%$$

- a. Develop understanding for the proper location of the decimal point. Encourage students to discover the general rule, that to change a decimal to a per cent, the decimal point is moved two places to the right and the % sign is added.

(Remember that the decimal point in a numeral is understood to follow the last whole number digit.)

2. Introduce the concept that either a decimal or a fraction may name the same number. (p. 139)

$$.17 = \frac{17}{100} \qquad .75 = \frac{3}{4}$$

- a. Illustrate this concept by the use of money symbols.

$$\$ \frac{1}{2} = \$.50$$

$$\$ \frac{1}{4} = \$.25$$

$$\$ \frac{1}{5} = \$.20$$

- b. Demonstrate changing $\frac{1}{4}$ to .25 by division.

$$\frac{1}{4} = 4 \overline{) 1}$$

$$4 \overline{) 1.00}$$

=

$$4 \overline{) \overset{\circlearrowleft}{.25} 1.00}$$

$$\frac{1}{4} = .25$$

- c. Provide practice in changing fractions to per cents. (p. 139)

It is suggested that, at first, only fractions be used that can be divided without

a remainder $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{3}{4}$, $\frac{4}{5}$, $\frac{2}{5}$, $\frac{1}{10}$.

- d. Help students become aware of the need to become acquainted with the most frequently used fractions and their decimal equivalents. Have students prepare a table of equivalents.

- e. Discuss changing numbers expressed in per cent to decimal form. (pp. 140, 141)

Encourage students to discover generalizations.
(To change a per cent to a decimal, move the decimal point two places to the left and drop the per cent sign.)

$$20\% = .20 \text{ or } .2$$

C. Solving problems using per cent

(The text presents solving per cent problems as Case I, Case II, and Case III. The teacher should strive to have students understand the problems, rather than mechanically solve the problems by rote.)

1. Solve problems in finding the following:

- a. Per cent of a given number (pp. 143-147)

Find 5% of 60.

- b. Discounts and series of discounts (pp. 148, 149)

Find 50% discount of \$300.

- c. What per cent one number is of another (pp. 150-152)

12 is what per cent of 3?

- d. Per cent of profit (p. 153)

A coat cost the dealer \$40. and he sold it for \$50.

What was his per cent of profit?

- e. A number, when a per cent of it is known (pp. 154-157)

Find the number, if 20% of that number is 8.

D. Evaluating achievements

It is expected that upon completion of the study of pages 135 to 147, the student will be able to demonstrate that he has learned to:

--Interpret the meaning of per cent.

--Show the relationship of ratio to per cent.

--Change a decimal to per cent, a fraction to a decimal, a fraction to per cent, and a per cent to a decimal.

--Solve problems using the concept of per cent.

UNIT V: BUDGET AND INTEREST

A. Discovering the meaning of "budget"

1. Define budget as "making a plan for using money."
2. Help students discover the importance of budgeting wisely. (p. 162)*
 - a. Develop a budget with the class, using hypothetical amounts.

For example:

Have the class members list items that should be included in their budget.

| | | |
|-------------|-----------------|--------------------------------|
| | Food | (snacks, lunch) |
| necessities | School supplies | (paper, folders,) |
| | Entertainment | (shows, school affairs, . . .) |
| supplement- | Personal needs | (tooth brush, haircuts, . . .) |
| tary items | Clothing | |
| | Savings | |

Set up a budget, using \$10.00 as a weekly amount.

| | |
|--------|-----------------|
| \$3.20 | Food |
| .60 | School supplies |
| 2.00 | Entertainment |
| 3.20 | Personal needs |
| 1.00 | Savings |

Have students compute what per cent of the \$10.00 total is being spent on each item.

\$3.20 is what per cent of \$10.00

$$\frac{3.20}{10.00} = \frac{3.20 \times 10}{10.00 \times 10} = \frac{32}{100}$$

3. Extend the concept of budget to include a family budget. (pp. 163-168)
 - a. List factors which must be considered in making a family budget.
 - 1) Total income
 - 2) Number of persons in the family
 - b. Point out that a single man or woman usually will budget differently than a married person with a family to support.

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

UNIT V: BUDGET AND INTEREST

- c. Discuss general guidelines for budget making. (p. 165)
 - 1) Rent 25%
 - 2) Food 20% to 50%, depending on income
 - 3) Entertainment 10% to 15%
 - 4) Savings 10%
- d. Prepare a budget for a specific income and family, as is discussed on pages 166 to 167.

B. Studying interest as a means of making money and using money

1. Point out the ways to "put money to work."
 - a. Savings (bank or savings and loan)
 - b. Real estate
 - c. Government bonds
 - d. Stocks and bonds
 - e. Money lending

Discuss the functions of the above type of investment, but keep the discussion on a level that will be realistic to the students.

2. Develop and interpret the interest formula. (pp. 172-182)

$$i = p r t$$

Point out that i represents interest, p the principal, (total amount of money considered involved), r the rate of per cent, and t the time in years.

3. Apply the interest formula in various ways.
 - a. Knowing p, r, t; find i.
 - b. Knowing i, r, t; find p.
 - c. Knowing i, p, t; find r.
 - d. Knowing i, p, r; find t.

4. Relate this formula to the finding of the unknown in an equation.

1st type: $i = prt$
 $p = \$500, r = 6\%, t = 1 \text{ year}$
 $i = 500 \times .06 \times 1$

2nd type: $i = prt$
 $i = \$36, r = 4\%, t = 1 \text{ year}$
 $36 = .04 \times 1 \times p$
 $36 = .04 p$

$$\frac{36}{.04} = p \qquad p = \underline{\underline{\$900}}$$

3rd type: $i = prt$
 $i = \$40, p = \$600, t = 3 \text{ years}$
 $40 = 600 \times 3 \times r$
 $40 = 1800 r$

$$\frac{40}{1800} = r \qquad \frac{2}{90} \qquad \frac{1}{45}$$

$$.022 = r$$

$$2.2\% = r$$

$$\begin{array}{r} .022 \\ 45 \overline{) 1.00} \\ \underline{90} \\ 100 \end{array}$$

4th type: $i = prt$
 $i = \$50, p = \$700, r = 3\%$
 $50 = 700 \times .03 \times t$
 $50 = 21 t$

$$\frac{50}{21} = t$$

$$\frac{2.38}{1} = t$$

$$\begin{array}{r} 2.38 \\ 21 \overline{) 50.00} \\ \underline{42} \\ 80 \\ \underline{63} \\ 170 \\ \underline{168} \\ 2 \end{array}$$

UNIT V: BUDGET AND INTEREST

5. Explore the concept that "time" in the interest formula is represented as years. What adjustment must be made when time is given in months.

$$3 \text{ months} = \frac{3}{12} \text{ year}$$

$$8 \text{ months} = \frac{8}{12} \text{ year}$$

$$30 \text{ days} = \frac{30}{360} \text{ year}$$

$$90 \text{ days} = \frac{90}{360} \text{ year}$$

It is not recommended that Compound Interest (p. 182) be studied by the entire class.

C. Evaluating achievement

It is expected that upon completion of the study of pages 161 to 182 of the textbook, the student will be able to demonstrate that he has learned to:

- Recognize the need for a budget.
- Prepare a personal and family budget.
- Select judicious ways to invest money.
- Apply the interest formula to find interest, principal, rate, or time.

UNIT VI: INSTALLMENT BUYING

A. Learning what installment buying means (pp. 282, 283)*

1. Introduce the terms "installment" and "installment buying." Discuss their meanings with the class.

Installment: one of the parts into which a debt is divided when payment is made at intervals (Webster's Seventh New Collegiate Dictionary. Springfield, Mass.: G. and C. Merriam, 1963. p. 438)

2. Discuss published advertisements to increase understanding of installment buying.

B. Comparing installment buying and cash buying (pp. 284, 285)

1. Point out differences in total amounts expended when paying cash or buying on the installment plan.
2. Make charts of information gathered from printed materials. Show the differences in the total payment between cash or installment buying. Be selective in your choice of ads to bring out this interesting comparison.

| Total Cost | Car | Television Set | Washing Machine | Items of Clothing | House |
|------------------|-----|----------------|-----------------|-------------------|-------|
| Cash plan | | | | | |
| Installment plan | | | | | |

3. Have the class members list the advantages and the disadvantages of buying on the installment plan.
4. Recognize the fact that the cost of interest, or payment for the use of the money, must always be considered when buying on the installment plan. (p. 285)
5. Study the word "usury" and its legal meaning.

Usury is considered the interest in excess of a legal rate charged to a borrower for the use of money. In California, the maximum legal rate is 10 per cent.

* Page references throughout are to the authorized text, Potter, et al: Mathematics for Success.

UNIT VI: INSTALLMENT BUYING

C. Using the interest formula in installment buying (pp. 285-295)

For example:

A television set may be purchased either for \$150 cash or on the installment plan with a \$60 down payment and four monthly installments of \$25 each.

1. Find the amount of interest. (pp. 287, 288)

$$\$60 \text{ (down payment)} + (4 \times \$25) = \$160$$

$$\$160 - \$150 = \$10$$

Amount of interest: \$10

2. Find the actual principal on which the real rate of interest can be computed. (pp. 288-291)

$$\text{Amount due before first installment} = \$100$$

$$\text{Amount due before second installment} = 75$$

$$\text{Amount due before third installment} = 50$$

$$\text{Amount due before fourth installment} = \underline{25}$$

This is equivalent to owing \$250 for one month.

3. Find the true rate of interest. (pp. 291-295)

Using $i = prt$

$$i = \$10$$

$$p = \$250$$

$$t = \text{one month or } \frac{1}{12} \text{ of a year}$$

$$10 = 250 \cdot r \cdot \frac{1}{12}$$

$$10 = \frac{250}{12} \cdot r$$

$$\frac{12}{250} \cdot 10 = r$$

$$\frac{12}{250} = 25 \overline{) 12.00} \begin{array}{r} .48 = 48\% \\ 100 \\ 200 \\ 200 \end{array}$$

D. Evaluating achievement

It is expected that upon completion of the study of pages 281 to 296 in the textbook, the student will be able to demonstrate that he has learned to:

- Appreciate the implications of installment buying.
- Recognize the advantages and the disadvantages of cash buying and of installment buying.
- Make judicious choices between cash and installment buying in specific situations.
- Compute the total cost of an item purchased on an installment plan.

UNIT VII: STATISTICS

A. Understanding the meanings of basic statistical concepts

1. Point out that statistics are collections of facts which are used to arrive at generalizations.
2. Illustrate the practical uses of statistics for finding the following:
 - a. Average grades in school
 - b. Average speed of a car
 - c. Average yards gained in each play in a football game
 - d. Average number of points scored by a basketball player

B. Finding the average

1. Find the mean. (pp. 190-192)*
 - a. Show how to find the average (mean) from collected data. To find an average (mean) add all items and divide by the number of items.
 - b. Work problems in finding averages, as presented on page 191.

2. Find the median. (pp. 192-196)

Collect data and arrange items in order, from largest to smallest. Count the items listed and find the middle item, which is the median.

61, 52, 51, 53, 54

61
54
53 ← The middle item, 53, is the median.
52
51

3. Find the mode. (pp. 196-198)

Show that the number which occurs the most frequently in the group of numbers considered is the mode.

Example:

32, 45, 32, 46, 31, 62, 32

The most frequently repeated number is 32.

Thirty-two is called the mode.

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

UNIT VII: STATISTICS

4. Establish a basis for deciding when it is preferable to use the average, the median, or the mode as the measure of central tendency. (pp. 199, 200)
 - a. Gather data and find the average, the median, and the mode. Discuss the advantages of having knowledge of each.
 - b. Draw some general conclusions as to when more benefit can be gained by use of one measure of central tendency, rather than another.

C. Evaluating achievement

It is expected that upon completion of the study of pages 190 to 202 in the textbook, the student will be able to demonstrate that he has learned to:

--Gather data.

--Interpret data.

--Find the average.

--Find the median.

--Find the mode.

--Decide in each circumstance whether to use the average, the median, or the mode.

UNIT VIII: PLANNING FOR THE FUTURE

A. Exploring ways to save money (p. 204)*

1. Discuss with students the reasons for planning the future, such as:
 - a. To be financially able to make the down payment on the purchase of a home.
 - b. To provide adequately for a family.
 - c. To prepare for secure retirement.
 - d. To demonstrate that, as individuals in a free enterprise society, they have the right and privilege to provide for themselves and their families.
2. Discuss and review the meanings of such terms as "bonds," "interest," "principal," and "value at maturity."

Obtain free literature about United States Savings Bonds from banks and savings institutions.
3. Point out that, when a person borrows money, he pays back not only the amount borrowed, but also a certain amount for the use of the money.

Point out also that, when a person invests his money, he expects not only the return of his money, but also some additional money in the form of interest.
4. Have students make a list of ways to save money, such as:
 - a. Investment in United States Savings Bonds (pp. 204-214)
 - b. Deposit in savings and loan associations (pp. 210-214)
 - c. Qualifications for Social Security benefits

B. Learning about social security (pp. 216-223)

1. Emphasize the importance of having a Social Security card.
2. Encourage all students to obtain a Social Security card, if they have not already done so.

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

UNIT VIII: PLANNING THE FUTURE

3. Discuss the advantages of joining and contributing to Social Security and receiving benefits such as the following:
 - a. Disability
 - b. Old age
 - c. Privilege – case of death
 - d. Survivor benefits
4. Explore new additions to Social Security laws, including the following:
 - a. Medicare
 - b. Expanded coverage for self-employed people
 - c. Coverage for farmers

C. Studying insurance (pp. 228-233)

1. Explore casualty insurance.
 - a. Show that casualty insurance provides coverage when a person is injured.
 - b. Point out that many schools require athletes to carry casualty insurance for coverage for injuries which may be incurred while participating in sports offered within the school program.
2. Automobile insurance.
 - a. Discuss reasons why the purchase of automobile insurance is more expensive for younger drivers.
 - b. Study the various types of insurance coverage for automobiles.
 - 1) Bodily injury liability
 - 2) Property damage liability
 - 3) Fire and theft
 - 4) Collision

D. Evaluating achievement

It is expected that upon completion of the study of pages 204 to 236 of the textbook, the student will be able to demonstrate that he has learned to:

- Utilize various ways of saving money.
- Establish eligibility for the benefits of Social Security.
- Use, for his own benefit, information concerning recent developments in Social Security laws.
- Make intelligent choices in the purchase of casualty insurance.
- Make intelligent choices in the purchase of various types of automobile insurance.

UNIT IX: TAXATION

A. Discovering reasons for taxes

1. Point out that taxes are collected from citizens for the operation of the government at local, state, and federal levels.
2. Make a list of some functions of the local government for which taxes are required.
 - a. Salaries for mayor and other city officials
 - b. Police services
 - c. Street department services
 - d. Fire department services
 - e. Health department services
 - f. Educational services

B. Studying types of taxes collected (pp. 364-371)*

1. Discuss property taxes.
 - a. Point out that property (real estate or personal) consists of that which one owns.
 - b. Show how tax rates are computed.

Formula - - - - - The tax rate = $\frac{\text{the amount needed}}{\text{the assessed valuation}}$
 - c. Discuss such words as "real value," "tax rate," "personal property tax," and "real estate tax."
 - d. Show ways in which real estate taxes may be expressed, as:
 - 1) Per cent of valuation
 - 2) So many dollars per \$1,000.00 assessed valuation
 - 3) So many mills per \$1.00 assessed valuation

*Page references throughout are to the authorized text, Potter, et al:
Mathematics for Success.

UNIT IX: TAXATION

C. Learning about federal income tax (pp. 371-374)

1. Discuss the fact that Federal Income Tax declarations must be filed by every individual who earns more than \$600 in a year.
2. Show that the amount of income tax paid by individuals or businesses each year depends upon how much money is earned.
3. Obtain tables from the post office for use in class discussions to show the per cent of various incomes that is paid in taxes.
4. Practice figuring income taxes.

D. Evaluating achievement

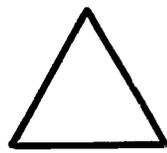
It is expected that upon completion of the study of pages 364 to 375 in the textbook, the student will be able to demonstrate that he has learned to:

- Recognize the need for paying taxes.
- Identify the types of taxes he may be expected to pay.
- Figure the assessed valuation on his property tax bill.
- Prepare an income tax return.
- Analyze the changes in his property tax.
- Interpret intelligently the provisions of the federal income tax laws.

UNIT X: GEOMETRY

A. Recognizing geometric names of common shapes (pp. 238-242)*

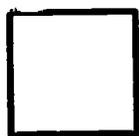
1. Review and study such geometric terms as "point," "line," "angle," "ray," "parallel lines," and "perpendicular lines."
2. Recognize the basic plane and solid geometric figures, such as the following:



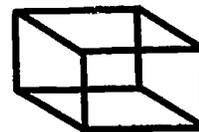
Triangle



Trapezoid



Square



Rectangular Solid



Rectangle



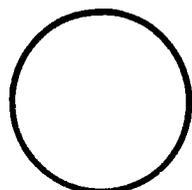
Cone



Parallelogram



Cylinder



Circle



Sphere

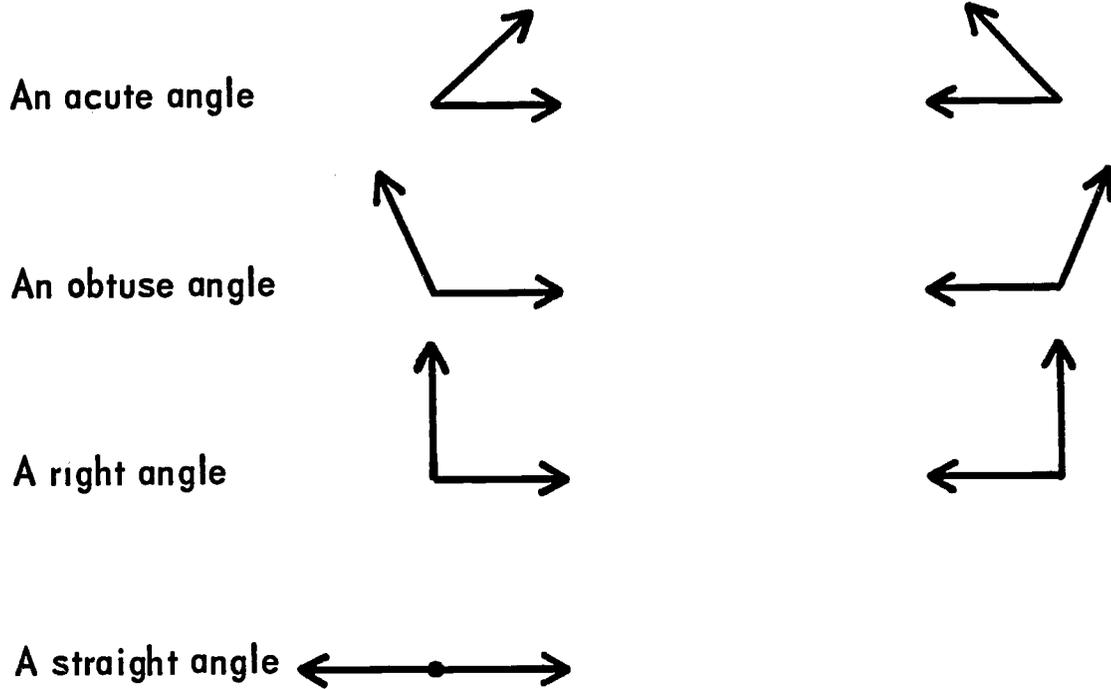
*Page references throughout are to the authorized text, Potter, et al:
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UNIT X: GEOMETRY

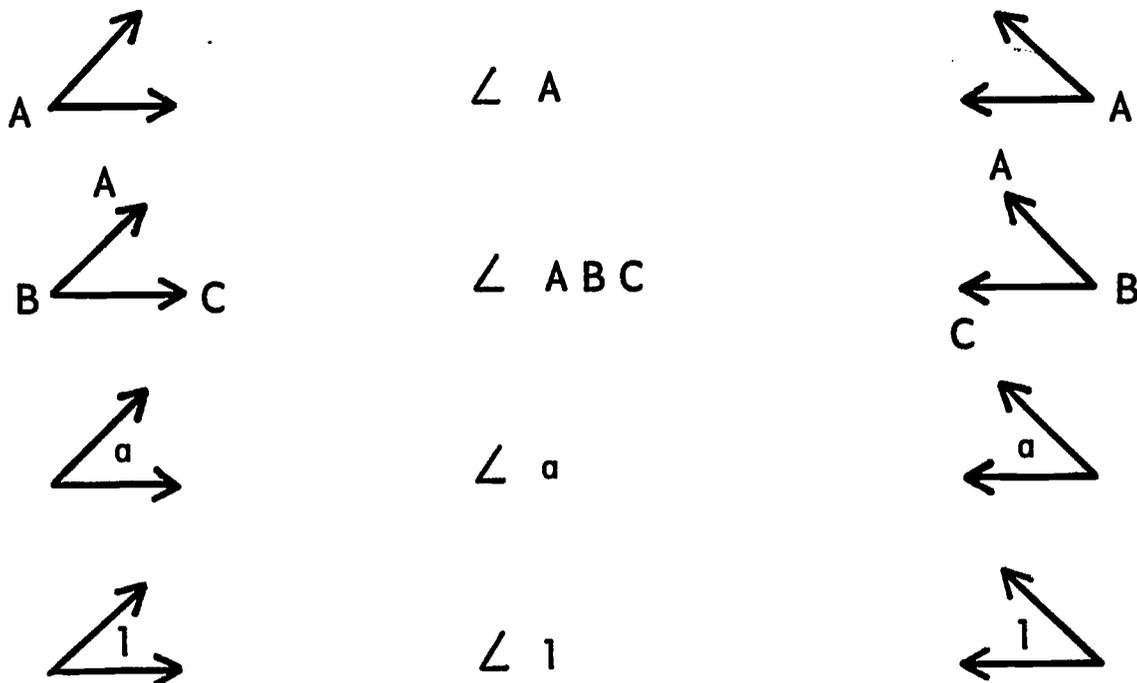
3. Discuss kinds of angles.

An angle is a geometric figure formed by two rays having a common endpoint, called a vertex.

a. List and discuss the kinds of angles.



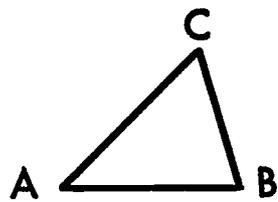
b. Study various ways of naming angles.



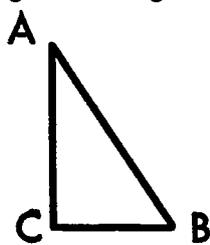
4. Study and identify types of triangles.

a. Name triangles according to kinds of angles.

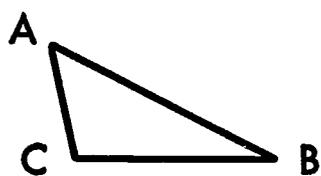
1) An acute triangle



2) A right triangle

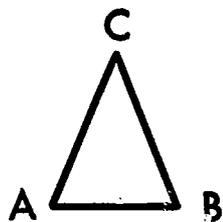


3) An obtuse triangle

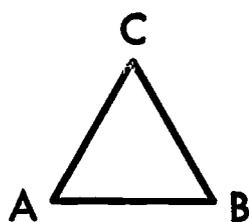


b. Name triangles according to lengths of sides.

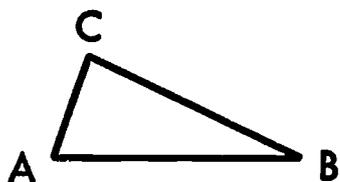
1) An isosceles triangle



2) An equilateral triangle



3) A scalene triangle



UNIT X: GEOMETRY

B. Constructing geometric figures (pp. 243-249)

It is recommended that the class study only simple geometric constructions, such as measuring a line, bisecting a line, bisecting an angle, and constructing an equilateral and an isosceles triangle.

1. Acquaint the students with the compass and its use.
2. Allow time to demonstrate constructions using a board compass. Supervise the use of compasses in practicing constructions.

C. Evaluating achievement

It is expected that upon completion of the study of this unit on geometry, the student will be able to demonstrate that he has learned to:

- Identify geometric figures and shapes.
- Identify special characteristics of specific geometric figures.
- Identify specific angles and triangles.
- Use the compass effectively.
- Make simple geometric constructions, using the straight edge and the compass.