THE LIBRARY AND MATHEMATICS

A Thesis

Presented to

the Department of Mathematics

Kansas State Teachers College of Emporia

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Roger L. Ginavan

August 1962

Approved for the Major Department

John M. Burger

Approved for the Graduate Council

ACKNOWLEDGMENT

The writer wishes to express his sincere appreciation to Doctor John M. Burger, Professor of Mathematics at the Kansas State Teachers College of Emporia, for his consideration, patience, help, and supervision in the preparation of this thesis.

Roger L. Ginavan

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

1.1 Statement of Problem. There is a growing desire among teachers of mathematics to broaden the student's interest and experience in the subject of mathematics courses in the secondary schools by acquainting their students with sources of material other than the text book.

This study is an attempt to emphasize the importance of the library in teaching mathematics and to give an example of how the books of the library can be used along with the text.

1.2 Purpose of the Study. Many mathematics teachers make the statement: (1) What books are available on this topic? (2) I wish I had time to make a library list.

It is the purpose of this thesis to relate to the units of work given prominence in the School Mathematics Study Group material for the second course in algebra the many books which are available in the Topeka High School Library.

1.3 Limitations. The Library available would be a big factor in determining to what extent the teacher may go in relating the topics under study to the books in the library. The larger and more up-to-date the library is, the more emphasis can be placed on it.

1.4 Organization of the Thesis. Chapter II shows why the library is important in the study of Mathematics and the many purposes for which the library can be used.

Chapter III contains an example of how different books can be correlated with the text. This correlation would serve as enrichment material for the better students and also help the teacher in the presentation of the material.

The purpose of Chapter IV is to show the student the many different books that are available in the Topeka High School library for the different topics under study.

Chapter V illustrates the many different types of reports that can be written in mathematics.

CHAPTER II

IMPORTANCE AND VALUE OF THE LIBRARY

Does the library have a place in the teaching of mathematics? Do students grow tired of continuously working exercises and solving problems? If reading is important, how much should a student read, how much weight should be placed on reports, should the reports be oral or written? These and many more questions arise in the minds of mathematics teachers.

In the past, mathematics and the library have been far removed from each other. The National Education Association research study on "Secondary School Teachers and Library Services" placed teachers of mathematics at the bottom of the scale as users of the library.[1] This should not be the case. On the contrary, the library should play as an important part in the teaching of mathematics as in any other subject.

Each teacher can profitably exploit school library facilities to the satisfaction of himself and his students. Curriculum enrichment through the school library is possible in the most traditional setting as well as the most experimental. All that is needed is a measure of interest and a few guiding precepts.[2]

---

[1] "Math Teachers and the Library," Library Journal, November, 1959, pp. 3610-11.

[2] Martin Rossoff, The Library in High School Teaching, p. 8.

Ruth A. Davies states that "Information beyond the textbook is necessary if each child is to receive an optimum education in each subject. No textbook can develop adequately a subject or unit in its entirety. No textbook can meet adequately the ability and interest range of each class nor satisfy the needs of each child in a class. A textbook can generalize but cannot individualize instruction. Learning can be extended, fortified, and individualized through the timely, planned, and guided use of library materials."[3]

The use of the library by mathematics classes is very important especially for students with ability. Book reviews, oral or written reports, and projects can enliven a mathematics class and be a welcome relief from an overdose of computation. Two or three weeks will usually be sufficient, for a longer time tends to cause students to grow tired of them. The teacher may present a list of suggested topics to the class; however, if a student prefers to select his own topic, he should be allowed this privilege. Explicit directions should be given. The student should be allowed to treat his topic in his own way; too many directions tend to curb originality and creativity.[4]

---

[3]Ruth A. Davies, "Enrich Experiences with Reading," The Instructor, November, 1961, p. 83.

[4]Allen Archer, "Use Your Library in Mathematics," National Council of Teachers of Mathematics.

2.1 Purposes for which the library is used. Historical Reports: students are always interested in how things started. Historical reports, both oral and written, are popular. These may come as an introduction to a new topic or may follow one or several topics as a summary of the work of the class. One or two short reports by good students are good for introducing a new topic. While the average or slow students are getting extra practice necessary to clinch the knowledge of an old topic, several good students may work on an oral report on the history of the next topic to be studied. When the students see how and why this particular phase of mathematics developed the stage is set for its study. Later in the term, the class may have a History Day when each student brings in a written report on the history of mathematics.[5]

Book Reviews: Book reviews may seem out of place in the teaching of mathematics, but they can be of extreme value if they are on the area under study. This gives the student an opportunity to see another author's approach which may be the thing needed to clear up or shed further light on a topic.

These reviews need not be a complete book. Due to the difficult reading, it would be better to have the report on a small section of the book.

---

[5] Ibid, p. 1.

The number of reports given during the school year will vary depending on the type of report. Oral reports would take considerable class time so should be given less frequently. Written reports could be submitted as frequently as every six weeks.

Searching for Facts: The library should be used for research in mathematics as well as in other subjects. For many questions that arise in class, it is much better to have the students search for the answers in the library than for the teacher to give the answers.[6]

Recreational Reading: There are many mathematic books written purely for recreational reading. Students need to be shown that mathematics is not all problem solving, but that it can also be fun. Teachers should introduce some of the many puzzles, and paradoxes, from time to time, in order to make the student aware of the lighter side of mathematics and also as a change of pace which is sometimes needed.

Projects: Projects are wonderful interest builders in mathematics classes. They may be assigned to individuals or to a group. The projects assigned should help students see how mathematics is related to life situations.

Even the United States Government realizes the important role the library plays in modern society. This role is stated in the

---

[6] Ibid., p. 2.

following goal. This goal--to bring to students of whatever other special talents at least an appreciation of and a modest competence in mathematics, science, and modern languages--is one toward which all can work with a whole heart, and to which librarians can make a special contribution. In fact, those pupils who have already convinced themselves that math or science or languages are "beyond them" can probably be reached effectively only through channels like reading--against which they have not closed their minds.[7]

---

[7]Daniel Melcher, "Reading to Make a Full Man under the Defense Education Act," Library Journal, February, 1959.

CHAPTER III

AN EXAMPLE OF CORRELATION

This chapter shows how reference books can be related to a text. The text used is SMSG Intermediate Mathematics.

TABLE I

	SMSG	Page	PRINCIPLES OF MATHEMATICS
1.1	Introduction		Allendoefer and Oakley
	History of Symbols 1, 2, 3, etc.	1	Chapter 2, p. 39
	What is deductive reasoning (logical system)	2	Chapter 1, p. 31
	If A, then B (symbol)	2	Chapter 1, pp. 7, 16
	Converse	3	Chapter 1, p. 25
	A if and only if B	3	Chapter 1, p. 16
1.2	Order	13	Chapter 2, pp. 48, 49, 56, 57, 96
	Closed	5	Chapter 2, pp. 40, 42
	Trichotomy	14	Chapter 2, p. 57
	Properties of natural numbers	6	Chapter 2, pp. 45, 47
	Operations (addition, multiplication)	6	Chapter 2, pp. 40, 42
	Advanced uses of properties (groups,fields)	7	Chapters 3 and 4
1.3	Proof of Theorem 1-3a (indirect)	16	Chapter 1, pp. 33-34
1.4	Additive identity	24	Chapter 2, pp. 41, 46
	Additive inverse	25	Chapter 2, p. 42
	Theorem 1-4b	27	Chapter 2, p. 46
	Theorem 1-4c	27	Chapter 2, p. 42
	Theorem 1-4e	28	Chapter 2, p. 42
1.5	Define $a<b$	31	Chapter 2, p. 57
	Absolute value	37	Chapter 2, p. 57
1.6	Rational numbers	43	Chapter, p. 51
	Theorem 1-6a	44	Chapter 2, p. 51
	Addition and multiplication	45 46	Chapter 2, p. 52
	Multiplicative inverse	48	Chapter 2, p. 43
	Restriction $b \neq o$	51	Chapter 2, p. 46

TABLE I CONTINUED

1.7 Order of the Rationals	53	Chapter 2, pp. 56, 57
1.8 Decimal representation	66	Chapter 2, p. 53
1.9 Irrational numbers	72	Chapter 2, p. 55
1.10 Complex numbers	77	Chapter 2, p. 61
1.11 Factoring	86	Chapter 2, p. 47 Chapter 7, p. 170

TABLE II

Correlation of Chapter I of SMSG Intermediate Mathematics with Insights into Modern Mathematics. The NCTM (23rd yearbook).

SMSG	Page	INSIGHTS INTO MODERN MATHEMATICS
1.1 Introduction		
Number notation	1	Chapter 2, pp. 7-9
Deductive form	2	Chapter 4
If A, then B	2	Chapter 4, p. 78
Converse	3	Chapter 4, p. 83
A if and only if B	3	Chapter 4, p. 79
1.2 The System of Natural Numbers	4	Chapter 2, pp. 7-9
Order	4,13	Chapter 2, pp. 32, 33
Closed	4	Chapter 2, p. 12
Equality	5, 6	Chapter 6, p. 155
1.3 Order in the Natural Number System	13,14	Chapter 2, pp. 13, 32-33
Cancellation	16	Chapter 5, p. 101
Theorem 1-3a	16	Chapter 2, p. 28
Basic properties	20	Chapter 5, pp. 101-105
1.4 The System of Integers		
Subtraction	24	Chapter 2, pp. 29, 32, 103
Additive Inverse	25	Chapter 6, p. 158
1.6 The Rational Number System	43	Chapter 2, pp. 11-13
Definition 1-6a	44	Chapter 2, p. 12
Definition 1-6b	46	Chapter 2, p. 12
Multiplicative Inverse	48	Chapter 5, p. 108

TABLE II CONTINUED

1.7	Order of the Rationals	53	Chapter 2, pp. 11-13
	Average	57	Chapter 2, p. 13
	Density	57	Chapter 2, p. 13
	Basic properties	63,65	Chapter 5, pp. 101-105
1.8	Decimal Representation of Rational Numbers	66	Chapter 2, pp. 16-20, 21
1.9	Infinite Decimal Expressions and Real Numbers	72	Chapter 2, pp. 13, 18
1.10	The Equation $x^n = a$	77	Chapter 2, p. 20

CHAPTER IV

BIBLIOGRAPHY BY CHAPTER

This chapter is an attempt to reference some of the books available in the Topeka High School library to the School Mathematics Study Group (SMSG) Intermediate Mathematics. This referencing should help the teacher using this text to know the books and chapters of the books which are available for any topic under study. Outside reading can easily be assigned if the students have a list of books that are available on the different chapters.

SMSG--CHAPTER 1

NUMBER SYSTEMS

Principles of Mathematics--Allendoerfer and Oakley, Chapter 2.

Fundamentals of Freshman Mathematics--Allendoerfer and Oakley, Chapter 2.

The Growth of Mathematical Ideas--NCTM (24 yearbook) Chapters 2, 8.

Insights Into Modern Mathematics--NCTM (23 yearbook) Chapters 2, 5.

An Introduction to the Foundations and Fundamental Concepts of Mathematics--Eves and Newsom, Chapter 7.

From Zero to Infinity--Constance Reid.

Fun Numbers and Facts--J. Newton Friend.

The New Mathematics--Irving Adler, Chapters 1, 5.

Mathematics for the Millions--Lancelot Hogben, Chapter 3.

Mathematics and the Physical World--Morris Kline, Chapter 4.

Mathematics Its Magic and Mastery--Aaron Bakst, Chapters 1-5.

What Is Mathematics--Courant and Robbins, Chapters 1, 2.

Number the Language of Science--Tobias Dantzig, Chapters 1, 2, 3, 5.

The River Mathematics--Alfred Hooper, Chapters 2, 4, 5, 7.

Elementary Mathematics from the Advanced Standpoint Arithmetic, Algebra, Analysis--Felix Klien, Part 1, Chapters 1, 2.

Infinity--Lillian Leiber, Chapters 3, 6, 7, 8, 15.

Take a Number--Lillian Leiber, Chapters 3-8, 10, 11, 13, 14, 19.

A Mathematician Explains--Mayme Logsdon, Chapter 2.

The Enjoyment of Mathematics--Hans Rademacher and Otto Toeplitz, Chapter 17.

Mathematics for the General Reader--E. C. Titchmarsh, Chapter 6.

Mathematics in Everyday Things--William Vergara, p. 31.

SMSG--CHAPTER 2

AN INTRODUCTION TO COORDINATE GEOMETRY IN THE PLANE

Mathematics and the Imagination--Edward Kasner and James Newman Chapter 4.

Mathematics for the Million--Lancelot Hogben, Chapter 9.

Mathematics and the Physical World--Morris Kline, Chapter 10.

Mathematics in Western Culture--Morris Kline, Chapter 12.

Mathematics Its Magic and Mastery--Aaron Bakst, Chapter 35.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapter 5.

What is Mathematics--Courant and Robbins, Chapter 2.

The River Mathematics--Alfred Hooper, Chapter 11, 14.

The Education of T. C. Mits--Lillian Leiber, Chapters 9, 18, 19.

Infinity--Lillian Leiber, Chapter 4.

A Mathematician Explains--Mayme Logsdon, Chapter 5.

Popular Mathematics--Denning Miller, United We Stand.

SMSG--CHAPTER 3

THE FUNCTION CONCEPT AND THE LINEAR FUNCTION

Principles of Mathematics--Allendoerfer and Oakley, Chapters 6, 7, 10.

Fundamentals of Freshman Mathematics--Allendoerfer and Oakley, Chapters 7-10, 14, 15.

The Growth of Mathematical Ideas--NCTM (24 Yearbook), Chapter 3.

Insights into Modern Mathematics--NCTM (23 Yearbook), Chapters 3, 8.

Mathematics and the Imagination--Edward Kasner and James Newman, Chapter 3.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapters 5, 6.

What is Mathematics--Courant and Robbins, Chapter 6.

The River Mathematics--Alfred Hooper, Chapters 7, 14.

Popular Mathematics--Denning Miller, United We Stand.

Mathematics for the General Reader--E. C. Titchmarsh, Chapter 12.

SMSG--CHAPTER 4

QUADRATIC FUNCTIONS AND EQUATIONS

Mathematics and the Imagination--Edward Kanser and James Newman, Chapter 3.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapters 5, 9, 15.

A Mathematician Explains--Mayme Logsdon, Chapter 3.

SMSG--CHAPTER 5

COMPLEX NUMBER SYSTEMS

The New Mathematics--Irving Adler, Chapter 7.

Mathematics and the Imagination--Edward Kasner and James Newman, Chapter 3.

Mathematics for the Million--Lancelot Hogben, Chapter 7,

Algebra--Book Two--Welchons,Krickenberger,Pearson, Chapter 8.

What Is Mathematics--Courant and Robbins, Chapter 2.

Number The Language of Science--Tobias Dantzig, Chapter 10.

Elementary Mathematics from the Advanced Standpoint Arithmetic--Algebra--Analysis, Felix Klein, Chapter 4.

A Mathematician Explains--Mayme Logsdon, Chapter 2.

Fun with Mathematics--Jerome S. Meyer π , i, e, and Log.

Mathematics for the General Reader--E. C. Titchmarsh, Chapter 10.

SMSG--CHAPTER 6

EQUATIONS OF THE FIRST AND SECOND DEGREE IN TWO VARIABLES

Principles of Mathematics--Allendoerfer and Oakley, Chapter 10.

Fundamentals of Freshman Mathematics--Allendoerfer and Oakley, Chapter 14.

Mathematics for the Million--Lancelot Hogben, Chapter 9, Appendix 2.

Mathematics and the Physical World--Morris Kline, Chapters 8, 10, 14.

Mathematics in Western Culture--Morris Kline, Chapter 12.

Mathematics, Its Magic and Mastery--Aaron Bakst, Chapters 24, 36.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapters 9, 12.

What Is Mathematics--Courant and Robbins, Chapter 2.

Infinity--Lillian Leiber, Chapter 4.

A Mathematician Explains--Mayme Logsdon, Chapter 5.

Fun with Mathematics--Jerome S. Meyer--Curves that Control our Lives.

Popular Mathematics--Denning Miller--One Big Happy Family.

Mathematics in Everyday Things--William Vergara--What are Inequalities?

SMSG--CHAPTER 7

SYSTEMS OF EQUATIONS IN TWO VARIABLES

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapters 6, 12.

SMSG--CHAPTER 8

SYSTEMS OF FIRST DEGREE EQUATIONS
IN THREE VARIABLES

Mathematics in Western Culture--Morris Kline, Chapter 12.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapter 6.

School Mathematics Study Group (SMSG)

Intermediate Mathematics Part II

SMSG--CHAPTER 9

LOGARITHMS AND EXPONENTS

Principles of Mathematics--Allendoerfer and Oakley, Chapter 9.

Fundamentals of Freshman Mathematics--Allendoerfer and Oakley,
Chapters 5, 11.

Mathematics for the Million--Lancelot Hogben, Chapter 10.

Mathematics, Its Magic and Mastery--Aaron Bakst, Chapter 18.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapter 10.

The River Mathematics--Alfred Hooper, Chapter 8.

Take A Number--Lillian Leiber, Chapter 11.

A Mathematician Explains--Mayme Logsdon, Appendix B.

Fun with Mathematics--Jerome S. Meyer--π, i, e, and Logarithms.

Mathematics for the General Reader, E. C. Titchmarsh, Chapter 7.

SMSG--CHAPTER 10

INTRODUCTION TO TRIGONOMETRY

Principles of Mathematics--Allendoerfer and Oakley, Chapter 8.

Fundamentals of Freshman Mathematics--Allendoerfer and Oakley, Chapter 12.

Mathematics for the Million--Lancelot Hogben, Chapter 6.

Mathematics and the Physical World--Morris Kline, Chapter 7.

Mathematics in Western Culture--Morris Kline, Chapter 5, 19.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapter 11.

The River Mathematics--Alfred Hooper, Chapter 12.

A Mathematician Explains--Mayme Logsdon, Chapter 4.

Fun with Mathematics--Jerome S. Meyer--Birds-eye View of Plane Trigonometry.

Popular Mathematics--Denning Miller--The Eternal Triangle.

Surveying Instruments (NCTM) 19th Yearbook--Edmond Kelly.

Mathematics for the General Reader--E. C. Titchmarsh, Chapter 11.

Mathematics in Everyday Things--William Vergara, p. 90.

SMSG--CHAPTER 11

THE SYSTEM OF VECTORS

Introduction to Finite Mathematics--Kemeny, Snell, Thompson, Chapter 5.

The New Mathematics--Irving Adler, Chapter 6, 7.

The River Mathematics--Alfred Hooper, Chapter 7, 10.

The Education of T. C. Mits--Lillian Leiber, Chapter 16.

A Mathematician Explains--Mayme Logsdon, Chapter 5.

SMSG--CHAPTER 12

POLAR FORM OF COMPLEX NUMBERS

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapter 20.

The River Mathematics--Alfred Hooper, Chapter 7.

SMSG--CHAPTER 13

SEQUENCE AND SERIES

Principles of Mathematics--Allendoerfer and Oakley, Chapter 11.

Insights into Modern Mathematics--NCTM (23 yearbook), Chapter 7.

The New Mathematics--Irving Adler, Chapter 5.

Mathematics and the Imagination--Edward Kasner and James Newman, Chapter 2.

Mathematics for the Million--Lancelot Hogben, Chapter 6.

Mathematics and the Physical World--Morris Kline, Chapter 5.

Algebra--Book Two--Welchons, Krickenberger, Pearson, Chapters 8, 13, 20.

Mathematical Recreations and Essays--Walter Ball, Chapter 1.

What is Mathematics--Courant and Robbins, Chapters 1, 2.

Number the Language of Science--Tobias Dantzig, Chapter 8.

The River Mathematics--Alfred Hooper, Chapter 7.

The Education of T. C. Mits--Lillian Leiber, Chapter 2.

Infinity--Lillian Leiber, Chapter 17.

Fun with Mathematics--Jerome S. Meyer--Fibonacci Numbers.

The Enjoyment of Mathematics--Hans Rademacher and Otto Toeplitz, Chapter 15.

Mathematics for the General Reader--E. C. Titchmarsh, Chapter 8.

Mathematics in Everyday Things--William Vergara, pp. 49, 111.

SMSG--CHAPTER 14

PERMUTATIONS, COMBINATIONS AND THE BINOMIAL THEOREM

Principles of Mathematics--Allendoerfer and Oakley, Chapter 13.

The Growth of Mathematical Ideas--NCTM (24 Yearbook), Chapters 6, 7.

Insights into Modern Mathematics--NCTM (23 Yearbook), Chapter 11.

Introduction to Finite Mathematics--Kemeny, Snell, Thompson, Chapter 3.

Mathematics and the Imagination--Edward Kasner and James Newman, Chapter 7.

Mathematics for the Million--Lancelot Hogben, Chapters 5, 6, 7, 10, 12, 13, Appendix 3.

Mathematics in Western Culture--Morris Kline, Chapter 23.

Mathematics, Its Magic and Mastery--Aaron Bakst, Chapters 20, 21.

Algebra--Book Two--Weldons, Krickenberger, Pearson, Chapters 14, 20.

Mathematical Recreations and Essays--Walter Ball, Chapters 1, 2, 9.

What is Mathematics--Courant and Robbins, Chapter 1.

The River Mathematics--Alfred Hooper, Chapter 7.

The Enjoyment of Mathematics--Hans Rademacher and Otto Toeplitz, Chapter 8.

Mathematics in Everyday Things--William Vergara, p. 40.

SMSG--CHAPTER 15

ALGEBRAIC STRUCTURES

Principles of Mathematics--Allendoerfer and Oakley, Chapters 3, 4.

Insights into Modern Mathematics--NCTM (23 Yearbook), Chapter 5.

An Introduction to the Foundations and Fundamental Concepts of Mathematics--Eves and Newsom, Chapter 5.

The New Mathematics--Irving Adler, Chapters 3, 5, 6, 7.

BOOKS WHICH COULD BE USED THROUGHOUT THE COURSE

A History of Mathematics--F. Cajori.

Math is Fun--Joseph Degrazia.

The Magic and Oddities of Numbers--William F. Gilles.

The History of Mathematics--Joseph E. Hofmann.

History of Mathematics, Volumes I and II, David E. Smith.

Mathematical Recreations and Essays--W. W. Ronse Ball.

Mathematics in Fun and in Ernest--Nathan Court.

Number the Language of Science--Tobias Dantzig.

Mathematics for the Million--Lancelot Hogben, Chapters 1, 2, 5-7.

Mathematics and the Imagination--Edward Kasner and James Newman, Chapters 1-6.

Mathematics and the Physical World--Morris Kline, Chapters 1-9.

A Short Account of the History of Mathematics--Walter Ball.

Mathematical Puzzles and Pastimes--Aaron Bakst.

Mathematics: Its Magic and Mastery--Aaron Bakst.

Numbers: Fun and Facts--John Friend.

The Wonderful World of Mathematics--Lancelot Hogben.

Makers of Mathematics--Alfred Hooper.

Fun with Mathematics--Jerome Meyer.

Mathematical Puzzles for Beginners and Enthusiasts--Mott, Smith, Geoffrey.

Surveying Instruments--NCTM.

A Short History of Mathematics--Vera Sanford.

Mathematical Snapshots--Hugo Steinhous.

Men of Mathematics--Eric Bell.

CHAPTER V

DIFFERENT TYPES OF REPORTS

What can I write my report on? I have no idea of where to start or what to do.

Many students need help in deciding what to write on. The answer "anything will be all right" or "you can find something if you will look" is not sufficient to the average or below average student.

Mathematics teachers should have the many different topics on which the student can write.

The following lists appeared in an article on How to Use Your Library in Mathematics.[8]

5.1 Topic for Historical Reports

1. Achilles Paradox
2. Ahmes Papyrus
3. Bernoulli's Theorem
4. Boolean Algebra
5. Cartesian Geometry
6. Calculation of π or e
7. Copernican Theory
8. Curves--Catenary, Cycloid, Ellipse, Hyperbola, Parabola
9. De Moivre's Theorem

---

[8]Allen Archer, "Use Your Library in Mathematics," National Council of Teachers of Mathematics.

10. Egyptian Level

11. Fourth Dimension

12. Golden Section

13. History of Algebra, Arithmetic, and Geometry

14. History of Numbers--Arabic, Babylonian, Chinese, Egyptian, Greek, Hebrew, Hindu, Roman

15. Imaginary Numbers

16. Magic Squares

17. Metric System

18. Natural Logarithms

19. Non-Euclidean Geometry

20. Spirals

21. Squaring the Circle

22. Trisection of an Angle

(The following references are from the Mathematics Teacher)

23. Angular Measurement (October, 1953, pp. 419-426)

24. Binary System (December, 1953, pp. 575-577)

25. Calendar (May, 1952, pp. 336-339)

26. Calculation of Logarithms (February, 1954, pp. 115-116)

27. Complex Numbers (February, 1954, pp. 106-114; April, 1954, pp. 257-263; May, 1954, pp. 340-345)

28. Duodecimal System (May, 1955, pp. 332-333)

29. Finger Reckoning (March, 1955, pp. 153-157)

30. Irrational Numbers (February, 1956, pp. 123-127; March, 1956, pp. 282-285; October, 1956, pp. 469-472; November, 1956, pp. 541-543)

31. Nine-Point Circle (January, 1957, pp. 53, 54)

32. Recent Discoveries in Babylonian Mathematics, (February, 1957, pp. 162-163)

5.2 Things to Make

1. Church Windows (18th Yearbook, pp. 86, 87; The Mathematics Teacher, November, 1952, pp. 518-521)

2. Curve Stitching (18th Yearbook, pp. 82-85)

3. Hypsometer, Angle Mirror and Clinometer (18th Yearbook, pp. 182-193; Bakst, Aaron, Mathematics, Its Magic and Mastery; D. Van Nostrand Company, pp. 434-439 and pp. 450-452)

4. Linkages (18th Yearbook, pp. 117-129)

5. Models for Illustrating Locus Problems (18th Yearbook, pp. 109-116)

6. Models for Illustrating Mathematical Concepts (18th Yearbook, pp. 369-406)

7. Models to Show Conic Sections (18th Yearbook, pp. 212-223, pp. 273-279; The Mathematics Teacher, October, 1953, pp. 428-429)

8. Magic Squares (Bragdon, Claude, The Frozen Fountain)

9. Napier's Rods (The Mathematics Teacher, November, 1954, pp. 482-487; Bakst, Aaron, Mathematics, Its Magic and Mastery, D. Van Nostrand Company, pp. 117-121)

10. Nomographs (18th Yearbook, pp. 164-181; The Mathematics Teacher, May, 1956, pp. 391-392)

11. Paper Folding (18th Yearbook, pp. 154-159; Yates, Robert C., Geometrical Tools, Educational Publishers, pp. 54-65)

12. Peaucellier's Cell (Yates, Robert C., Geometrical Tools, Educational Publishers, pp. 84-90)

13. Tesseract (18th Yearbook, pp. 246-250)

14. An A-Shaped Level (The Mathematics Teacher, January, 1953, p. 41)

15. Angle Mirror (The Mathematics Teacher, February, 1954, pp. 71-72)

16. Curve Stitching in Space (The Mathematics Teacher, November, 1956, pp. 560-561)

17. Golden Section Compasses (The Mathematics Teacher, May, 1954, pp. 338, 339)

18. Probability Board (The Mathematics Teacher, April, 1953, pp. 274-277)

19. Telemeter (The Mathematics Teacher, November, 1955, pp. 473-475)

20. Three Dimensional Graphing (The Mathematics Teacher, May, 1953, pp. 339-340)

21. Trigtractor (The Mathematics Teacher, January, 1956, pp. 28-29)

5.3 Great Mathematicians

1. Appolonius--Conics
2. Archimedes--Area of a circle, mechanics, infinite series
3. Bolyai--non-Euclidean geometry
4. Brahe, Tycho--astronomy
5. Briggs, Henry--logarithms with base ten
6. Cardan--cubic equations
7. Copernicus--trigonometry, astronomy
8. Descartes, Rene--exponents, analytic geometry
9. Diophantus--algebraic symbolism
10. Einstein, Albert--relativity

11. Euclid--geometry

12. Euler--symbolism for algebra and trigonometry

13. Fermat, Pierre--Probability

14. Ferrari, Lodovico--biquadratic equation (4th degree)

15. Galileo--proportional compasses, physics, astronomy

16. Gauss, Karl--positive and negative square roots, imaginary numbers, normal curve of probability

17. Hipparchus--trigonometry

18. Jacobi, Carl--elliptical functions

19. Kepler, Johann--application of conics to astronomy

20. Lagrange, Joseph--theory of numbers, elliptical functions

21. Laplace, Pierre--theory of least squares

22. Legendre, Adrian Marie--geometry

23. Liebniz--calculus

24. Leonardo da Vinci--geometry, mechanics

25. Lobachevsky--non-Euclidean geometry

26. Napier, John--logarithm, Napier's rods

27. Newton, Isaac--binomial theorem, physics, calculus

28. Omar Khayyam--algebra

29. Pascal, Blaise--binomial theorem, probability

30. Plato--geometry

31. Ptolemy--symbol for zero

32. Pythagoras--geometry, right triangle

33. Rabbi ben Ezra--magic squares, calendar, theory of numbers

34. Riemann--non-Euclidean geometry

35. Stevin--decimal fractions, quadratic equation

36. Thales, geometry

37. Wallis, graphs, negative and fractional exponents, algebraic symbolism, complex numbers.

5.4 Famous Quotations about Mathematics

1. All scientific education which does not commence with mathematics is, of necessity, defective at its foundation--Comte.

2. The advance and the perfecting of mathematics are closely joined to the prosperity of the nation--Napoleon.

3. God made the integers; all the rest is the work of man--Kronecker.

4. God ever arithmetizes--Jacobi.

5. God ever geometrizes--Plato.

6. Geometry that held acquaintance with the stars, and wedded sould to soul in purest bond of reason, undisturbed by space or time--Wordsworth.

7. The invention or discovery of symbols in doubtless by far the single greatest event in the history of man--John Dewey.

8. Mathematics is the exciting structure of our existence and not just something for the specialist.

9. Mathematics is stability beyond question; it is honesty beyond any possibility of compromise, and it is beauty with a purity that can be found only in the most rare moments upon this earth.

10. A mathematical point is the jost indivisible and unique thing which art can present--John Donne.

11. Mathematics accomplishes the very thing whose achievement has been denied me.--Goethe.

12. A mathematician who is not also something of a poet will never be a complete mathematician--Weierstrass.

13. Mathematics is the most marvelous instrument created by the genius of man for the discovery of truth--Laisant.

14. Mathematics is the gate and key of the sciences. Neglect of mathematics works injury to all knowledge--Roger Bacon.

15. Mathematics is the Queen of the Sciences, and Arithmetic the Queen of Mathematics--Gauss.

16. Mathematics is the rock upon which the arts and sciences of the world rest--D. E. Smith.

17. Mathematics is the glory of the human mind--Leibniz.

18. Mighty are numbers, joined with art resistless--Euripedes.

19. Nature's great book is written in mathematical symbols--Galileo.

20. Number rules the universe--The Pythagoreans.

21. The right angle approach to any proposition is the try-angle.

22. Round numbers are always false--Samuel Johnson.

23. A science is exact only insofar as it employs mathematics --Kant.

24. The sine and cosine are the natural alphabet of all periodic change--Eric T. Bell.

25. There is no royal road to geometry--Menaechmus.

26. To measure is to know--Kepler.

27. To see what is general in what is particular and what is permanent in what is transitory is the aim of modern science--Alfred North Whitehead.

28. The triumph of mathematics is the logic behind it.

29. We do not listen with the best regard to the verses of a man who is only a poet, nor to his problems if he is only an algebraist; but if a man is at once acquainted with the geometric foundation of things and with their festal splendor, his poetry is exact and his arithmetic is musical--Ralph Waldo Emerson.

30. What science can there be more noble, more excellent, more useful for men, more admirably high and demonstrative, than this of the mathematics?--Franklin.

31. When you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science, whatever the matter may be--Lord Kelvin.

32. Why is simplifying a fraction like powdering the nose? Because it improves the appearance without changing the value.

33. Without enthusiasm no mathematics--Novalis.

34. Measures tell how Nature behaves and how to control her mighty forces in the service of man--Henry D. Hubbard.

35. Perfect measurement is perfect truth, and sets man free--Henry D. Hubbard.

36. Man is the measure of all things--Protagoras.

37. Let no one ignorant of geometry enter my doors--Plato.

38. An, but my computations, people say
Reduced the year to better reckoning? Nay
'Twas only striking from the calendar
Unborn tomorrow and dead yesterday. Omar Khayyam

BIBLIOGRAPHY

BIBLIOGRAPHY

Archer, Allen. "Use Your Library in Mathematics," National Council of Teachers of Mathematics.

Davies, Ruth A. "Enrich Experiences with Reading," The Instructor, November, 1961, p. 83.

Melcher, Daniel. "Reading to Make a Full Man Under the Defense Education Act," Library Journal, February, 1959, pp. 617-618.

National Education Association Research Study. "Math Teachers and the Library," Library Journal, November, 1959, pp. 3610-11.

Rossoff, Martin. The Library in High School Teaching, New York, Wilson, 1955, p. 124.