BASIC LIBRARY LIST

January 1965

TABLE OF CONTENTS

INTRODUCTION

One of the many channels by which the Mathematical Association of America offers advice and guidance to colleges is the Committee on the Undergraduate Program in Mathematics. A project of this Committee has been an attempt to define a minimal college mathematics library. Preliminary versions of the accompanying list have been used to improve mathematics libraries.

This list of some 300 books, from which approximately 170 are to be chosen to form a basic library in undergraduate mathematics, is intended to do the following:

1. Provide the student with introductory material in various fields of mathematics which he may not previously have encountered

2. Provide the student, whose interest has been aroused by his teachers, with reading material collateral to his course work

3. Provide the student with reading at a level beyond that ordinarily encountered in his undergraduate curriculum

4. Provide the faculty with reference material

5. Provide the general reader with elementary material in the field of mathematics

The list is minimal and is not intended to provide anyone with the grounds of an argument that a particular library is complete, and hence cannot be improved. On the contrary, the list is basic in that it provides a nucleus for a library whose further acquisitions should be dictated by student and faculty interests. There has been a concerted effort to keep the list small, in the exercise of which many books of merit have had to be excluded; several equally attractive areas sometimes have been combined into one group from which one book is to be selected. In many cases similar books are suggested as alternate choices so that a library may exploit its present holdings.

The Advisory Group on Communications of CUPM has prepared this list over a period ending in 1964; hence, recently published books do not appear on the list.

BASIC LIBRARY LIST

I.   Background and Orientation

The volumes listed here offer a variety of topics which must have representation in any basic library. Of the three books on the history of mathematics, Men of Mathematics can be read with enjoyment

by students at any level. Equally readable are What is Mathematics?, Number, the Language of Science, and The Enjoyment of Mathematics. Symmetry, An Introduction to Mathematics, and Mathematical Snapshots are well-known classics, while the books on finite mathematics (1.10) bring numerous modern topics to the freshman level.

1.1   Bell, Eric T. Development of Mathematics, 2nd ed. New York, McGraw-Hill Book Company, 1945.

1.2   Bell, Eric T. Men of Mathematics. New York, Simon and Schuster, Inc., 1937.

1.3   Courant, R. and Robbins, H. What is Mathematics? New York, Oxford University Press, Inc., 1941.

1.4   Dantzig, Tobias. Number, The Language of Science, 4th rev. and augm. ed. New York, The Macmillan Company, 1954; New York, Doubleday and Company, 1956.

1.5   Rademacher, Hans and Toeplitz, Otto. The Enjoyment of Mathematics. (translated by H. Zuckerman) Princeton, New Jersey, Princeton University Press, 1957.

1.6   Steinhaus, H. Mathematical Snapshots, 2nd ed., rev. and enl. New York, Oxford University Press, Inc., 1960.

1.7   Struik, Dirk Jan. A Concise History of Mathematics, 2nd rev. ed. New York, Dover Publications, Inc., 1948.

1.8   Weyl, Hermann. Symmetry. Princeton, New Jersey, Princeton University Press, 1952.

1.9   Whitehead, Alfred North. An Introduction to Mathematics, rev. ed. New York, Oxford University Press, Inc., 1959.

1.10 At least one of the following: (a-c)

      1.10a   Kemeny, John G.; Snell, J. Laurie; Thompson, Gerald L. Introduction to Finite Mathematics. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1957.

      1.10b   Kemeny, John G.; Mirkil, H.; Snell, J. Laurie; Thompson, Gerald L. Finite Mathematical Structures. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1959.

      1.10c   Kemeny, John G.; Snell, J. Laurie; Thompson, Gerald L.; Schleifer, Arthur. Finite Mathematics with Business Applications. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1962.

1.11 At least one of the following: (a-b)

      1.11a   James, Glenn and Robert C., eds. Mathematical Dictionary. New York, Van Nostrand Reinhold Company, 1959.

1.11b Karush, William. The Crescent Dictionary of Mathe-
       matics. New York, The Macmillan Company, 1962.

II. Algebra

       For reference and for systematic study, a basic library should
contain general treatments of abstract algebra at successive levels
(2.15, 2.7, 2.2, 2.4, 2.9). Because of the tremendous importance of
the basic structures, models, and tools of linear algebra, there
should be introductions emphasizing linear transformations (2.11)
and also emphasizing matrices (2.10). For the casual reader there
should be attractive elementary approaches to modern algebra via
special topics such as groups (2.16), rings (2.6), and other sub-
jects (2.5). For the serious student there should be more advanced
works in a few key special fields, e.g., group theory (2.17), linear
algebra (2.12, 2.13), fields and Galois theory (2.1). The uniquely
useful book 2.3 provides for a transition from linear algebra towards
the theory of Hilbert space. Connections between linear algebra and
geometry deserve attention (2.14).

2.1   Artin, Emil. Galois Theory, 2nd rev. ed. (edited by Arthur
       Milgram) Notre Dame, Indiana, University of Notre Dame Press,
       1946.

2.2   Birkhoff, Garrett and MacLane, Saunders. A Survey of Modern
       Algebra, rev. ed. New York, The Macmillan Company, 1965.

2.3   Halmos, Paul R. Finite-dimensional Vector Spaces, 2nd ed.
       New York, Van Nostrand Reinhold Company, 1958.

2.4   Herstein, I. N. Topics in Algebra. New York, Blaisdell Pub-
       lishing Company, 1963.

2.5   MAA Studies in Mathematics, vol. II. Studies in Algebra.
       (edited by A. A. Albert) Englewood Cliffs, New Jersey,
       Prentice-Hall, Inc., 1963.

2.6   McCoy, Neal H. Rings and Ideals (Carus Monograph No. 8).
       Chicago, Illinois, The Open Court Publishing Company, 1948.

2.7   Mostow, George D.; Sampson, J. H.; Meyer, J. P. Fundamental
       Structures of Algebra. New York, McGraw-Hill Book Company,
       1963.

2.8   Uspensky, J. V. Theory of Equations. New York, McGraw-Hill
       Book Company, 1948.

2.9   At least one of the following: (a-b)

       2.9a   Jacobson, Nathan. Lectures in Abstract Algebra,
              vols. I, II, III. New York, Van Nostrand Reinhold

Company. Vol. I, Basic Concepts, 1951; Vol. II, Linear Algebra, 1953; Vol. III, Theory of Fields and Galois Theory, 1964.

2.9b   van der Waerden, Bartel L. _Modern Algebra_, vols. I, II. (translated by Fred Blum) New York, Frederick Ungar Publishing Company. Vol. I, rev. ed., 1953; Vol. II, 1950.

2.10 At least one of the following: (a-e)

2.10a   Aitken, Alexander C. _Determinants and Matrices_, 8th ed. New York, Interscience, 1956.

2.10b   Hohn, Franz Edward. _Elementary Matrix Algebra_, 2nd ed. New York, The Macmillan Company, 1964.

2.10c   MacDuffee, Cyrus C. _Vectors and Matrices_ (Carus Monograph No. 7). Chicago, Illinois, The Open Court Publishing Company, 1943.

2.10d   Murdoch, D. C. _Linear Algebra for Undergraduates_. New York, John Wiley and Sons, Inc., 1957.

2.10e   Perlis, Sam. _Theory of Matrices_. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1952.

2.11 At least one of the following: (a-e)

2.11a   Curtis, C. _Linear Algebra: An Introductory Approach_. Boston, Massachusetts, Allyn and Bacon, Inc., 1963.

2.11b   Finkbeiner, Daniel T. _Introduction to Matrices and Linear Transformations_. San Francisco, California, W. H. Freeman and Company, 1960.

2.11c   Shields, Paul C. _Linear Algebra_. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1964.

2.11d   Paige, Lowell J. and Swift, J. Dean. _Elements of Linear Algebra_. New York, Blaisdell Publishing Company, 1961.

2.11e   Stewart, Frank Moore. _Introduction to Linear Algebra_. New York, Van Nostrand Reinhold Company, 1963.

2.12 At least one of the following: (a-d)

2.12a   Hoffman, Kenneth and Kunze, Ray. _Linear Algebra_. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1961.

2.12b   Nering, Evar Dave. _Linear Algebra and Matrix Theory_. New York, Interscience, 1963.

2.12c Stoll, Robert Roth. *Linear Algebra and Matrix Theory*. McGraw-Hill Book Company, 1952.

2.12d Thrall, Robert McDowell and Tornheim, L. *Vector Spaces and Matrices*. New York, John Wiley and Sons, Inc., 1957.

2.13 At least one of the following: (a-c)

2.13a Gantmakher, Feliks R. *Theory of Matrices*, vols. I, II. New York, Chelsea Publishing Company, Inc., 1959.

2.13b Mal'cev, A. I. *Foundations of Linear Algebra*. (translated from the Russian by T. C. Brown, edited by J. B. Roberts) San Francisco, California, W. H. Freeman and Company, 1963.

2.13c Varga, Richard S. *Matrix Iterative Analysis*. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1962.

2.14 At least one of the following: (a-c)

2.14a Jaeger, Arno. *Introduction to Analytic Geometry and Linear Algebra*. New York, Holt, Rinehart and Winston, Inc., 1960.

2.14b Kuiper, N. H. *Linear Algebra and Geometry*. (translated from the Dutch edition) New York, Interscience, 1962.

2.14c Rosenbaum, R. A. *Introduction to Projective Geometry and Modern Algebra*. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1963.

2.15 At least one of the following: (a-c)

2.15a Johnson, Richard Edward. *First Course in Abstract Algebra*. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1953.

2.15b McCoy, Neal H. *Introduction to Modern Algebra*. Boston, Massachusetts, Allyn and Bacon, Inc., 1960.

2.15c Weiss, Marie J. *Higher Algebra for the Undergraduate*, 2nd ed. (revised by Roy Dubisch) New York, John Wiley and Sons, Inc., 1962.

2.16 At least one of the following: (a-b)

2.16a Alexandroff, P. S. *An Introduction to the Theory of Groups*. (translated by Hazel Perfect and J. M. Petersen) New York, Hafner Publishing Company, 1959.

2.16b Ledermann, Walter. Introduction to the Theory of
Finite Groups. New York, Interscience, 1953.

2.17 At least one of the following: (a-c)

2.17a Hall, Marshall, Jr. The Theory of Groups. New York,
The Macmillan Company, 1961.

2.17b Kurosh, A. G. The Theory of Groups, vols. I, II, 2nd
ed. (translated from the Russian and edited by K. A.
Hirsch) New York, Chelsea Publishing Company, Inc.,
1960.

2.17c Zassenhaus, Hans J. The Theory of Groups, 2nd ed.
(translated by S. Kravetz) New York, Chelsea Publish-
ing Company, Inc., 1958.

III. Analysis

Analysis covers a broad spectrum of mathematical disciplines.
This section contains a selection of books which may serve to intro-
duce the mathematics undergraduate to many of these disciplines.

In those areas in which undergraduate courses are usually of-
fered, books of mathematical depth and sophistication are recommend-
ed. Thus, for advanced calculus, or what is rapidly being renamed
real analysis, we list 3.25, 3,26, and 3.27; the last all contain
elements of Lebesgue integration. In addition, we recommend the now
classic 3.4, 3.6. Interesting and unusual presentations of material
in this general area occur in 3.11 and 3.15a.

The elements of ordinary differential equations appear in 3.20.
More advanced treatments are contained in 3.21 and 3.22; the former
have excellent material on boundary value problems while the latter
stress the geometrical and qualitative aspects of differential equa-
tions. An excellent problem source is 3.3.

Presentations of the theory of functions of a complex variable
are to be found in 3.13, 3.23, and 3.24. Introductions to topics in
the theory of linear spaces and functional analysis are contained in
3.10, 3.15b, 3.16, among others. In 3.17 two distinct elementary
treatments of generalized functions are listed. Finally, attention
is called to the note on calculus books which is at the end of this
section.

3.1 Bliss, Gilbert A. Calculus of Variations (Carus Monograph
No. 1). Chicago, Illinois, The Open Court Publishing Company,
1925.

3.2 Boas, Ralph P., Jr. A Primer of Real Functions (Carus Mono-
graph No. 13). New York, John Wiley and Sons, Inc., 1960.

3.3 Brenner, Joel Lee. <u>Problems in Differential Equations</u>. San Francisco, California, W. H. Freeman and Company, 1963.

3.4 Courant, R. <u>Differential and Integral Calculus</u>, vols. I, II. (translated by E. J. McShane) New York, Interscience. Vol. I, 2nd ed. rev., 1937; Vol. II, 1st ed., 1936.

3.5 Flanders, Harley. <u>Differential Forms, with Applications to the Physical Sciences</u>. New York, Academic Press, Inc., 1963.

3.6 Hardy, Godfrey H. <u>Pure Mathematics</u>. New York, Cambridge University Press, 1959.

3.7 Knopp, Konrad. <u>Elements of the General Theory of Analytic Functions</u>, 1st American ed. (translated by F. Bagemihl) New York, Dover Publications, Inc., 1952.

3.8 Knopp, Konrad. <u>Problem Book in the Theory of Functions</u>, vols. I, II. New York, Dover Publications, Inc. Vol. I, Problems in the Elementary Theory of Functions, 1948; Vol. II, Problems in the Advanced Theory of Functions, 1952.

3.9 Knopp, Konrad. <u>Theory and Application of Infinite Series</u>. (translated from the 2nd German edition) New York, Hafner Publishing Company, 1948.

3.10 MAA Studies in Mathematics, vol. I. <u>Studies in Modern Analysis</u> (edited by R. C. Buck) Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1962.

3.11 Nickerson, H. K.; Spencer, D. C.; Steenrod, N. E. <u>Advanced Calculus</u>. New York, Van Nostrand Reinhold Company, 1959.

3.12 Rogosinski, Werner. <u>Fourier Series</u>, 2nd ed. New York, Chelsea Publishing Company, Inc., 1959.

3.13 Titchmarsh, Edward C. <u>Theory of Functions</u>, 2nd ed. New York, Oxford University Press, Inc., 1939.

3.14 Williamson, John Hunter. <u>Lebesgue Integration</u>. New York, Holt, Rinehart and Winston, Inc., 1962.

3.15 At least one of the following: (a-b)

   3.15a Dieudonné, Jean. <u>Foundations of Modern Analysis</u>. New York, Academic Press, Inc., 1960.

   3.15b Simmons, George F. <u>Introduction to Topology and Modern Analysis</u>. New York, McGraw-Hill Book Company, 1963.

3.16 At least one of the following: (a-b)

3.16a   Kolmogorov, Andree N. and Fomin, S. V.   Elements of the
        Theory of Functions and Functional Analysis, vols. I, II
        (translated from the 1st Russian edition) Baltimore,
        Maryland, Graylock Press. Vol. I, Metric and Normed
        Spaces, 1957; Vol. II, Measure, the Lebesgue Integral,
        Hilbert Space, 1961.

3.16b   Lorch, Edgar Raymond. Spectral Theory. New York,
        Oxford University Press, Inc., 1962.

3.17 At least one of the following: (a-b)

3.17a   Erdélyi, Arthur. Operational Calculus and Generalized
        Functions. New York, Holt, Rinehart and Winston, Inc.,
        1962.

3.17b   Lighthill, Michael James. Introduction to Fourier
        Analysis and Generalized Functions. New York, Cam-
        bridge University Press, 1958.

3.18 At least one of the following: (a-b)

3.18a   Akhiezer, Naum I. Calculus of Variations. (translated
        by Aline H. Frink) New York, Blaisdell Publishing Com-
        pany, 1962.

3.18b   Gelfand, I. M. and Fomin, S. V. Calculus of Variations.
        (translated by R. A. Silverman) Englewood Cliffs, New
        Jersey, Prentice-Hall, Inc., 1963.

3.19 At least one of the following: (a-c)

3.19a   Beckenbach, E. F. and Bellman, R. Introduction to
        Inequalities. New York, Random House, Inc., 1961.

3.19b   Kazarinoff, N. D. Geometric Inequalities. New York,
        Random House, Inc., 1961.

3.19c   Korovkin, Pavel P. Inequalities. (translated from the
        Russian by Halina Moss, edited by Ian N. Sneddon) New
        York, Blaisdell Publishing Company, 1962.

3.20 At least one of the following: (a-f)

3.20a   Agnew, Ralph Palmer. Differential Equations, 2nd ed.
        New York, McGraw-Hill Book Company, 1960.

3.20b   Coddington, Earl A. An Introduction to Ordinary
        Differential Equations. Englewood Cliffs, New Jersey,
        Prentice-Hall, Inc., 1961.

3.20c   Ford, Lester R. Differential Equations, 2nd ed. New
        York, McGraw-Hill Book Company, 1955.

3.20d Golomb, Michael and Shanks, Merrill. Elements of
       Ordinary Differential Equations, 2nd rev. ed. New
       York, McGraw-Hill Book Company, 1965.

3.20e Tenenbaum, Morris and Pollard, Harry. Ordinary Dif-
       ferential Equations. New York, Harper and Row,
       Publishers, 1963.

3.20f Pontryagin, Lev S. Ordinary Differential Equations.
       (translated by L. Kocinskas and W. Counts) Reading,
       Massachusetts, Addison-Wesley Publishing Company, Inc.,
       1962.

3.21   At least one of the following: (a-b)

3.21a Birkhoff, Garrett and Rota, Gian-Carlo. Ordinary Dif-
       ferential Equations. New York, Blaisdell Publishing
       Company, 1962.

3.21b Coddington, Earl A. and Levinson, Norman. Theory of
       Ordinary Differential Equations. New York, McGraw-
       Hill Book Company, 1955.

3.22   At least one of the following: (a-c)

3.22a Hurewicz, Witold. Lectures on Ordinary Differential
       Equations. Cambridge, Massachusetts, MIT Press, 1958.

3.22b Lefschetz, Solomon. Differential Equations: Geometric
       Theory, 2nd ed. New York, Interscience, 1963.

3.22c Tricomi, F. G. Differential Equations. New York,
       Hafner Publishing Company, 1961.

3.23   At least one of the following: (a-c)

3.23a Ahlfors, Lars V. Complex Analysis. New York, McGraw-
       Hill Book Company, 1953.

3.23b Knopp, Konrad. Theory of Functions, parts I, II. New
       York, Dover Publications, Inc. Part I, Elements of
       the General Theory of Analytic Functions, 1945; Part II,
       Applications and Continuations of the General Theory,
       1947.

3.23c Nehari, Zeev. Introduction to Complex Analysis.
       Boston, Massachusetts, Allyn and Bacon, Inc., 1961.

3.24   At least one of the following: (a-d)

3.24a Carathéodory, C. Theory of Functions of a Complex
       Variable, vols. I, II, 2nd ed. (translated by F.
       Steinhardt) New York, Chelsea Publishing Company, Inc.
       Vol. I, 1958; Vol. II, 1960.

11

3.24b   Fuchs, B. A. and Shabat, B. V. <u>Functions of a Complex Variable and Some of Their Applications</u>. (translated by J. Berry, edited by T. Kovari) Reading, Massachusetts, Addison-Wesley Publishing Company, Inc. Vol. I, rev. and expanded by J. W. Reed, 1964; Vol. II, 1962.

3.24c   Hille, Einar. <u>Analytic Function Theory</u>, vols. I, II. New York, Blaisdell Publishing Company. Vol. I, 1959; Vol. II, 1962.

3.24d   Saks, S. and Zygmund, A. <u>Analytic Functions</u>. (translated by E. J. Scott) Warsaw, Poland, Nakladem Polskiego Towarziptwa Matematycznego, 1952 (not in print in U. S.). Rev. ed., New York, Dover Publications, Inc., 1964.

3.25   At least one of the following: (a-f)

3.25a   Bartle, Robert G. <u>The Elements of Real Analysis</u>. New York, John Wiley and Sons, Inc., 1964.

3.25b   Franklin, Philip. <u>Treatise on Advanced Calculus</u>. New York, John Wiley and Sons, Inc., 1940.

3.25c   Kaplan, Wilfred. <u>Advanced Calculus</u>. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1952.

3.25d   Olmsted, J. M. H. <u>Advanced Calculus</u>. New York, Appleton-Century-Crofts, 1961.

3.25e   Taylor, Angus Ellis. <u>Advanced Calculus</u>. New York, Blaisdell Publishing Company, 1955.

3.25f   Widder, David Vernon. <u>Advanced Calculus</u>, 2nd ed. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1961.

3.26   At least one of the following: (a-d)

3.26a   Apostol, Tom M. <u>Mathematical Analysis</u>. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1957.

3.26b   Buck, R. C. <u>Advanced Calculus</u>, 2nd ed. New York, McGraw-Hill Book Company, 1964.

3.26c   Maak, Wilhelm. <u>An Introduction to Modern Calculus</u>. (translated by G. Strike) New York, Holt, Rinehart and Winston, Inc., 1963.

3.26d   Rudin, Walter. <u>Principles of Mathematical Analysis</u>, 2nd ed. New York, McGraw-Hill Book Company, 1964.

3.27 At least one of the following: (a-e)

    3.27a Goffman, Casper. <u>Real Functions</u>. New York, Holt, Rinehart and Winston, Inc., 1953.

    3.27b Graves, Lawrence M. <u>Theory of Functions of Real Variables</u>, 2nd ed. New York, McGraw-Hill Book Company, 1956.

    3.27c McShane, Edward J. and Botts, Truman. <u>Real Analysis</u>. New York, Van Nostrand Reinhold Company, 1959.

    3.27d Royden, H. L. <u>Real Analysis</u>. New York, The Macmillan Company, 1963.

    3.27e Thielman, Henry P. <u>Theory of Functions of Real Variables</u>. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1953.

3.28 At least one of the following: (a-d)

    3.28a Green, J. A. <u>Sequences and Series</u>. Glencoe, Illinois, Free Press of Glencoe, 1958.

    3.28b Hirschman, Isidore I., Jr. <u>Infinite Series</u>. New York, Holt, Rinehart and Winston, Inc., 1962.

    3.28c Hyslop, James Morton. <u>Infinite Series</u>, 4th rev. ed. New York, Interscience, 1954.

    3.28d Knopp, Konrad. <u>Infinite Sequences and Series</u>. (translated by F. Bagemihl) New York, Dover Publications, Inc., 1956.

3.29 At least one of the following: (a-b)

    3.29a Epstein, Bernard. <u>Partial Differential Equations, An Introduction</u>. New York, McGraw-Hill Book Company, 1962.

    3.29b Garabedian, P. R. <u>Partial Differential Equations</u>. New York, John Wiley and Sons, Inc., 1964.

3.30 At least one of the following: (a-b)

    3.30a Halmos, Paul R. <u>Measure Theory</u>. New York, Van Nostrand Reinhold Company, 1950.

    3.30b Munroe, Marshall Evans. <u>Introduction to Measure and Integration</u>. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1953.

Two books on mathematical tables: one numerical, such as 3.31, and one functional, such as 3.32.

3.31   Cogan, Edward J. and Norman, R. Z. Handbook of Calculus, Difference and Differential Equations, 2nd ed. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1963.

3.32   At least one of the following: (a-b)

    3.32a   Jahnke, E. and Emde, F. Tables of Functions with Formulas and Curves, 6th ed. New York, McGraw-Hill Book Company, 1960.

    3.32b   National Bureau of Standards, U. S. Department of Commerce, Applied Mathematics, Series 55. Handbook of Mathematical Functions. (edited by M. Abramowitz and I. A. Stegun) Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

The Library should also contain a selection of several calculus books to which students may refer for supplementary reading. These books should be chosen so as to describe a variety of approaches and motivations. It is felt that there should be at least one careful, detailed development such as is contained in any of the following (or similar works):

Apostol, Tom M. Calculus, vols. I, II. New York, Blaisdell Publishing Company. Vol. I, Introduction with Vectors and Analytic Geometry, 1961; Vol. II, Calculus of Several Variables with Applications to Probability and Vector Analysis, 1962.

Begle, Edward G. Introductory Calculus with Analytic Geometry. New York, Holt, Rinehart and Winston, Inc., 1954.

Kuratowski, K. C. Introduction to Calculus. (translated from the Polish by J. Musielak) Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1962.

Landau, Edmund G. H. Differential and Integral Calculus. (translated by M. Hausner and M. Davis) New York, Chelsea Publishing Company, Inc., 1960.

IV.   Applied Mathematics

Because of the increasing interaction between mathematics and the natural and social sciences, it is virtually impossible to list a definitive collection of library books in this area. We urge the student and the teacher, intent on following this interaction, to make use of materials already available in libraries under the science, social science, and engineering listings. Nevertheless, we do recommend that the libraries contain certain books on the

mathematical aspects of physical science and engineering. These are 4.5, 4.6, 4.7, 4.12, 4.15, and 4.18. Recent developments in applied mathematics which bear a close relationship to the developments in social sciences are 4.9, 4.23, 4.24, 4.27, 4.28, and 4.29.

Since mathematical methods form part of applied mathematics, we recommend a few of the many compilations of mathematical analysis methods such as those listed in 4.20 and 4.21. We note that 4.1 consists of a definitive study of problems of partial differential equations occurring in many applications of mathematics. Introductions to functional analytical methods useful in applied mathematics are listed in 4.14.

In the past decade or so, with the advent of highspeed computing machines, numerical analysis and some brances of algebra and logic have become an important area of applied mathematics. Numerical analysis books are listed in 4.2, 4.26, 4.18. The last (4.18) stresses algebraic aspects. Incidentally, the books on linear algebra contained in the algebra section of this report furnish material indispensable in the area of numerical analysis. Selection 4.17 contains introductions to computing machines--their modes of operation, programming techniques, computer logic, and the use of algorithms.

4.1   Courant, R. and Hilbert D.   Methods of Mathematical Physics, 1st English ed.   (translated from the German)   New York, John Wiley and Sons, Inc., Vol. I, 1953.

4.2   Henrici, Peter.   Discrete Variable Methods in Ordinary Differential Equations.   New York, John Wiley and Sons, Inc., 1962.

4.3   Hopf, L.   Introduction to Differential Equations of Physics. (translated by Walter Nef)   New York, Dover Publications, Inc., 1948.

4.4   Kemeny, John G. and Snell, J. Laurie.   Mathematical Models in the Social Sciences.   New York, Blaisdell Publishing Company, 1962.

4.5   Khinchin, A. I.   Mathematical Foundations of Statistical Mechanics.   (translated by G. Gamow)   New York, Dover Publications, Inc., 1949.

4.6   Lamb, Sir Horace.   Hydrodynamics, 6th rev. ed.   New York, Dover Publications, Inc., 1956.

4.7   Landau, Lev D. and Lifshitz, E. M.   The Classical Theory of Fields, 2nd ed.   (translated from the Russian by M. Hamermesh) Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1962.

4.8   Love, A. E. H.   Treatise on the Mathematical Theory of Elasticity, 4th rev. ed.   New York, Dover Publications, Inc., 1956.

4.9   Luce, Robert Duncan and Raiffa, Howard. Games and Decisions. New York, John Wiley and Sons, Inc., 1957.

4.10   National Physical Laboratory, Teddington, England. Modern Computing Methods, 2nd ed. Notes on Applied Science #16. London, Her Majesty's Stationery Office, 1962. (In U. S. Philosophical Library)

4.11   Parzen, Emanuel. Stochastic Processes with Applications to Science and Engineering. San Francisco, California, Holden-Day, Inc., 1962.

4.12   Rayleigh, John W. S. Theory of Sound, 2nd rev. ed. New York, Dover Publications, Inc., 1955. 2 vols.

4.13   Stiefel, E. L. An Introduction to Numerical Mathematics. (translated by W. C. and C. J. Rheinboldt) New York, Academic Press, Inc., 1963.

4.14   At least one of the following: (a-b)

       4.14a   Friedman, Bernard. Principles and Techniques of Applied Mathematics. New York, John Wiley and Sons, Inc., 1956.

       4.14b   Vulikh, Boris Z. Introduction to Functional Analysis for Scientists and Technologists. (translated by Ian N. Sneddon) Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1963.

4.15   At least one of the following: (a-b)

       4.15a   Lichnerowicz, André. Elements of Tensor Calculus. (translated by J. W. Leech and D. J. Newman) New York, John Wiley and Sons, Inc., 1962.

       4.15b   Synge, John L. and Schild, A. Tensor Calculus. Toronto, Ontario, University of Toronto Press, 1949.

4.16   At least one of the following: (a-c)

       4.16a   Fano, Robert M. Transmission of Information. Cambridge, Massachusetts, MIT Press, 1961.

       4.16b   Reza, F. M. An Introduction to Information Theory. New York, McGraw-Hill Book Company, 1961.

       4.16c   Shannon, Claude E. and Weaver, W. The Mathematical Theory of Communication. Urbana, Illinois, University of Illinois Press, 1949.

4.17   At least one of the following: (a-c)

4.17a   Arden, B. W.   An Introduction to Digital Computers.
        Reading, Massachusetts, Addison-Wesley Publishing
        Company, Inc., 1963.

4.17b   Galler, Bernard A.   The Langauage of Computers.   New
        York, McGraw-Hill Book Company, 1962.

4.17c   Leeds, Herbert D. and Weinberg, Gerald M.   Computer
        Programming Fundamentals.   New York, McGraw-Hill Book
        Company, 1961.

4.18 At least one of the following: (a-d)

4.18a   Faddeev, D. K. and Faddeeva, V. N.   Computational
        Methods in Linear Algebra.   (translated by Robert C.
        Williams) San Francisco, California, W. H. Freeman
        and Company, 1963; Authorized translation by Curtis
        Benster.   New York, Dover Publications, Inc., 1959.

4.18b   Fox, Leslie.   An Introduction to Numerical Linear
        Algebra.   Fair Lawn, New Jersey, Clarendon Press, 1964.

4.18c   Frazer, Robert A.; Duncan, W. J.; Collar, A. R.
        Elementary Matrices.   New York, Cambridge University
        Press, 1938.

4.18d   Householder, Alston Scott.   The Theory of Matrices in
        Linear Algebra.   New York, Blaisdell Publishing Company,
        1964.

4.19 At least one of the following: (a-b)

4.19a   Goldstein, Herbert.   Classical Mechanics.   Reading,
        Massachusetts, Addison-Wesley Publishing Company, Inc.,
        1950.

4.19b   Synge, John L. and Griffith, B. A.   Principles of
        Mechanics, 3rd ed.   New York, McGraw-Hill Book Company,
        1959.

4.20 At least one of the following: (a-c)

4.20a   Jeffreys, Sir Harold and Jeffreys, Bertha Swirles.
        Methods of Mathematical Physics, 3rd ed.   New York,
        Cambridge University Press, 1956.

4.20b   Morse, Philip M. and Feshbach, H.   Methods of
        Theoretical Physics, parts I, II.   New York, McGraw-Hill
        Book Company, 1953.

4.20c   Whittaker, Edmund T. and Watson, G. N.   A Course of
        Modern Analysis, 4th ed.   New York, Cambridge University
        Press, 1958.

4.21 At least one of the following: (a-c)

4.21a Kreyszig, Erwin. Advanced Engineering Mathematics. New York, John Wiley and Sons, Inc., 1962.

4.21b Tychonov, A. N. and Samarski, A. A. Partial Differential Equations in Mathematical Physics, vol. I. (translated by S. Radding) San Francisco, California, Holden-Day, Inc., 1964.

4.21c von Kármán, Theodore and Biot, M. A. Mathematical Methods in Engineering. New York, McGraw-Hill Book Company, 1940.

4.22 At least one of the following: (a-b)

4.22a Riordan, John. An Introduction to Combinatorial Analysis. New York, John Wiley and Sons, Inc., 1958.

4.22b Ryser, Herbert John. Combinatorial Mathematics (Carus Monograph #14). New York, John Wiley and Sons, Inc., 1963.

4.23 At least one of the following: (a-c)

4.23a Aris, Rutherford. Discrete Dynamic Programming. New York, John Wiley and Sons, Inc., 1963.

4.23b Bellman, Richard E. and Dreyfus, Stuart E. Applied Dynamic Programming. Princeton, New Jersey, Princeton University Press, 1962.

4.23c Howard, Ronald A. Dynamic Programming and Markov Processes. Cambridge, Massachusetts, MIT Press, 1960.

4.24 At least one of the following: (a-d)

4.24a Dantzig, George B. Linear Programming and Extensions. Princeton, New Jersey, Princeton University Press, 1962.

4.24b Gass, Saul I. Linear Programming, 2nd ed. New York, McGraw-Hill Book Company, 1964.

4.24c Hadley, George. Linear Programming. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1962.

4.24d Vajda, S. Theory of Games and Linear Programming. New York, John Wiley and Sons, Inc., 1956.

4.25 At least one of the following: (a-b)

4.25a Hohn, Franz E. Applied Boolean Algebra. New York, The Macmillan Company, 1960.

4.25b Whitesitt, John Elden. <u>Boolean Algebra and Its Applica-</u><u>tions</u>. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1961.

4.26 At least one of the following: (a-c)

4.26a Hildebrand, Francis B. <u>Introduction to Numerical</u> <u>Analysis</u>. New York, McGraw-Hill Book Company, 1956.

4.26b Householder, Alston Scott. <u>Principles of Numerical</u> <u>Analysis</u>. New York, McGraw-Hill Book Company, 1953.

4.26c Lanczos, Cornelius. <u>Applied Analysis</u>. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1956.

4.27 At least one of the following: (a-c)

4.27a Cox, D. R. and Smith, W. L. <u>Queues</u>. New York, John Wiley and Sons, Inc., 1961.

4.27b Riordan, John. <u>Stochastic Service Systems</u>. New York, John Wiley and Sons, Inc., 1962.

4.27c Takács, Lajos. <u>Introduction to the Theory of Queues</u>. New York, Oxford University Press, 1962.

4.28 At least one of the following: (a-b)

4.28a Gale, David. <u>The Theory of Linear Economic Models</u>. New York, McGraw-Hill Book Company, 1960.

4.28b Dorfman, Robert; Samuelson, Paul A.; Solow, Robert M. <u>Linear Programming and Economic Analysis</u>. New York, McGraw-Hill Book Company, 1958.

4.29 At least one of the following: (a-c)

4.29a Berge, Claude. <u>The Theory of Graphs and Its Applica-</u><u>tions</u>. (translated by Alison Doig) New York, John Wiley and Sons, Inc., 1962.

4.29b Ford, L. R., Jr., and Fulkerson, D. R. <u>Flows in Net-</u><u>works</u>. Princeton, New Jersey, Princeton University Press, 1962.

4.29c Ore, Oystein. <u>Theory of Graphs</u>. Providence, Rhode Island, American Mathematical Society, 1962. (American Mathematical Society Colloquium Publications, Vol. 38)

V.   Geometry-Topology

The following 38 books, of which a minimum of 15 are to be selected, are intended to cover topics in geometry and topology. Besides general reading and introductory material on geometry as found in 5.3 and 5.5, various other topics such as projective geometry (5.4, 5.8), algebraic geometry (5.7), non-Euclidean geometry (5.10), and differential geometry (5.11) are represented. In addition to general and introductory material on topology (5.1, 5.3), increasing levels of sophistication in general topology (5.12, 5.13, 5.14) are mentioned, as is algebraic topology (5.9).

5.1   Arnold, Bradford Henry. _Intuitive Concepts in Elementary Topology_. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1962.

5.2   Artin, Emil. _Geometric Algebra_. New York, Interscience, 1957.

5.3   Hilbert, David and Cohn-Vossen, S. _Geometry and the Imagination_. (translated by P. Nemenyi) New York, Chelsea Publishing Company, Inc., 1952.

5.4   Young, J. W. _Projective Geometry_ (Carus Monograph No. 4). Chicago, Illinois, The Open Court Publishing Company, 1930.

5.5   At least of the following: (a-b)

   5.5a   Coxeter, H. S. M. _Introduction to Geometry_. New York, John Wiley and Sons, Inc., 1961.

   5.5b   Eves, Howard. _A Survey of Geometry_, vol. I. Boston, Massachusetts, Allyn and Bacon, Inc., 1963.

5.6   At least one of the following: (a-c)

   5.6a   Eggleston, Harold G. _Problems of Euclidean Space: Applications of Convexity_. Elmsford, New York, Pergamon Press, Inc., 1957.

   5.6b   Hadwiger, Hugo and Debrunner, Hans. _Combinatorial Geometry in the Plane_. (translated by Victor Klee) New York, Holt, Rinehart and Winston, Inc., 1964.

   5.6c   Yaglom, Isaak M. and Boltyanskiĭ, B. G. _Convex Figures_. (translated by P. J. Kelly and L. F. Walton) New York, Holt, Rinehart and Winston, Inc., 1961.

5.7   At least one of the following: (a-b)

   5.7a   Jenner, William E. _Rudiments of Algebraic Geometry_. New York, Oxford University Press, Inc., 1963.

   5.7b   Walker, Robert John. _Algebraic Curves_. New York, Dover Publications, Inc., 1962.

5.8   At least one of the following: (a-c)

    5.8a   Baer, Reinhold.   Linear Algebra and Projective Geometry.
        New York, Academic Press, Inc., 1952.

    5.8b   Busemann, Herbert and Kelly, Paul J.   Projective
        Geometry and Projective Metrics.   New York, Academic
        Press, Inc., 1953.

    5.8c   Seidenberg, A.   Lectures in Projective Geometry.
        New York, Van Nostrand Reinhold Company, 1962.

5.9   At least one of the following: (a-d)

    5.9a   Aleksandrov, P. S.   Combinatorial Topology, 3 vols.
        Baltimore, Maryland, Graylock Press.   Vol. I., Intro-
        duction, Complexes, Coverings, Dimension, 1956; Vol. II,
        Betti Groups, 1957; Vol. III, Homological Manifolds,
        Duality, Classification, and Fixed Point Theorems,
        1960.

    5.9b   Lefschetz, Solomon.   Introduction to Topology.   Prince-
        ton, New Jersey, Princeton University Press, 1949.

    5.9c   Pontryagin, Lev S.   Foundations of Combinatorial
        Topology.   (translated by Bagemihl, Kohm, and Seidu)
        Baltimore, Maryland, Graylock Press, 1952.

    5.9d   Wallace, Andrew Hugh.   Introduction to Algebraic
        Topology.   Elmsford, New York, Pergamon Press, Inc.,
        1957.

5.10   At least one of the following: (a-b)

    5.10a   Coxeter, H. S. M.   Non-Euclidean Geometry, 4th rev. ed.
        Toronto, Ontario, University of Toronto Press, 1957.

    5.10b   Wolfe, Harold E.   Introduction to Non-Euclidean
        Geometry.   New York, Holt, Rinehart and Winston, Inc.,
        1945.

5.11   At least one of the following: (a-d)

    5.11a   Guggenhein, Heinrich W.   Differential Geometry.   New
        York, McGraw-Hill Book Company, 1963.

    5.11b   Kreyszig, Erwin.   Differential Geometry, 2nd ed.
        Toronto, Ontario, University of Toronto Press, 1963.

    5.11c   Struik, Dirk Jan.   Differential Geometry, 2nd ed.
        Reading, Massachusetts, Addison-Wesley Publishing
        Company, Inc., 1961.

5.11d   Willmore, Thomas James. *Introduction to Differential Geometry.* New York, Oxford University Press, Inc., 1959.

5.12   At least one of the following: (a-f)

5.12a   Baum, John D. *Elements of Point Set Topology.* Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1964.

5.12b   Bushaw, Donald Wayne. *Elements of General Topology.* New York, John Wiley and Sons, Inc., 1963.

5.12c   Hu, Sze-Tsen. *Elements of General Topology.* San Francisco, California, Holden-Day, Inc., 1964.

5.12d   Kuratowski, Kazimierz. *Introduction to Set Theory and Topology.* (translated from the revised Polish edition by L. Boron) Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1962.

5.12e   Mendelson, Bert. *Introduction to Topology.* Boston, Massachusetts, Allyn and Bacon, Inc., 1962.

5.12f   Pervin, William J. *Foundations of General Topology.* New York, Academic Press, Inc., 1964.

5.13   At least one of the following: (a-b)

5.13a   Hall, Dick Wick and Spencer, G. L. *Elementary Topology.* New York, John Wiley and Sons, Inc., 1955.

5.13b   Newman, M. H. A. *Topology of Plane Sets of Points.* New York, Cambridge University Press, 1951.

5.14   At least one of the following: (a-b)

5.14a   Hocking, John and Young, Gail. *Topology.* Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1961.

5.14b   Kelley, John L. *General Topology.* New York, Van Nostrand Reinhold Company, 1955.

5.15   At least one of the following: (a-d)

5.15a   Crowell, Richard Henry and Fox, Ralph H. *Introduction to Knot Theory.* New York, Blaisdell Publishing Company, 1963.

5.15b   Hurewicz, Witold and Wallman, Henry. *Dimension Theory.* Princeton, New Jersey, Princeton University Press, 1941.

5.15c Pontryagin, Lev S. <u>Topological Groups</u>. (translated by Emma Lehmer) Princeton, New Jersey, Princeton University Press, 1958.

5.15d Springer, George. <u>Introduction to Riemann Surfaces</u>. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1956.

VI. Logic, Foundations, and Set Theory

Of the following 23 books on logic, foundations, and set theory, at least 13 are to be selected. Besides historical and introductory material on set theory (6.1, 6.4, 6.8), this field is covered in increasingly sophisticated fashion in 6.8, 6.2, and 6.11. Foundational material is to be found in 6.5, 6.9, and 6.10, while logic is covered in increasing levels of sophistication in 6.6, 6.8, 6.7, 6.3, 6.12, and 6.13.

6.1 Cantor, George. <u>Contributions to the Founding of the Theory of Transfinite Numbers</u>. (translated by P. E. B. Jourdain) Chicago, Illinois, The Open Court Publishing Company, 1961; New York, Dover Publications, Inc.

6.2 Halmos, Paul R. <u>Naive Set Theory</u>. New York, Van Nostrand Reinhold Company, 1960.

6.3 Hilbert, David and Ackerman, W. <u>Principles of Mathematical Logic</u>. (translated from the 2nd German edition) New York, Chelsea Publishing Company, Inc., 1950.

6.4 Kamke, Erich. <u>Theory of Sets</u>. (translated by F. Bagemihl) New York, Dover Publications, Inc., 1950.

6.5 Landau, Edmund G. H. <u>The Foundations of Analysis</u>. (translated by E. Steinhardt) New York, Chelsea Publishing Company, Inc., 1951.

6.6 Nagel, Ernest and Newman, James R. <u>Gödel's Proof</u>. New York, New York University Press, 1958.

6.7 Rosenbloom, Paul Charles. <u>The Elements of Mathematical Logic</u>. New York, Dover Publications, Inc., 1951.

6.8 Stoll, Robert Roth. <u>Sets, Logic and Axiomatic Theories</u>. San Francisco, California, W. H. Freeman and Company, 1961.

6.9 Wilder, Raymond L. <u>Introduction to the Foundations of Mathematics</u>. New York, John Wiley and Sons, Inc., 1952.

6.10 At least one of the following: (a-e)

6.10a Cohen, Leon W. and Ehrlich, G. The Structure of the Real Number System. New York, Van Nostrand Reinhold Company, 1963.

6.10b Feferman, Solomon. The Number Systems: Foundations of Algebra and Analysis. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1964.

6.10c Henkin, Leon A.; Smith, Norman; Varineau, V. J.; Walsh, Michael J. Retracing Elementary Mathematics. New York, The Macmillan Company, 1962.

6.10d Kershner, Richard B. and Wilcox, L. R. Anatomy of Mathematics. New York, Ronald Press Company, 1950.

6.10e Landin, Joseph and Hamilton, N. T. Set Theory: The Structure of Arithmetic. Boston, Massachusetts, Allyn and Bacon, Inc., 1961.

6.11 At least one of the following: (a-b)

6.11a Quine, Willard von Orman. Set Theory and Its Logic. Cambridge, Massachusetts, Harvard University Press, 1963.

6.11b Suppes, Patrick C. Axiomatic Set Theory. New York, Van Nostrand Reinhold Company, 1960.

6.12 At least one of the following: (a-e)

6.12a Copi, Irving Marmer. Symbolic Logic. New York, The Macmillan Company, 1954.

6.12b Kalish, Donald and Montague, Richard. Logic: Techniques of Formal Reasoning. New York, Harcourt Brace Jovanovitch, 1964.

6.12c Quine, Willard von Orman. Mathematical Logic, rev. ed. Cambridge, Massachusetts, Harvard University Press, 1951.

6.12d Suppes, Patrick C. Introduction to Logic. New York, Van Nostrand Reinhold Company, 1958.

6.12e Tarski, Alfred. Introduction to Logic and to the Methodology of Deductive Sciences, 2nd ed. rev. New York, Oxford University Press, Inc., 1946.

6.13 At least one of the following: (a-b)

6.13a Church, Alonzo. Introduction to Mathematical Logic, vol. 1. Princeton, New Jersey, Princeton University Press, 1956.

6.13b Kleene, Stephen C. Introduction to Metamathematics. New York, Van Nostrand Reinhold Company, 1952.

VII. Probability-Statistics

The first five books listed are authoritative reference books in this rapidly growing field. The remainder of the list consists of pairings of books, one book from each pair being sufficient in a minimum library. Probability is treated in increasing levels of sophistication in 7.6, 7.7, 7.2, 7.4, and 7.3, and statistics in the order 7.8, 7.9, 7.10, 7.5, and 7.1. Items 7.6 and 7.8 do not assume a knowledge of the calculus.

7.1 Cramér, Harald. Mathematical Methods of Statistics. Princeton, New Jersey, Princeton University Press, 1946.

7.2 Feller, William. An Introduction to Probability Theory and Its Applications, vol. I, 2nd ed. New York, John Wiley and Sons, Inc., 1957.

7.3 Loève, Michel Moise. Probability Theory, 3rd ed. New York, Van Nostrand Reinhold Company, 1963.

7.4 Parzen, Emanuel. Modern Probability Theory and Its Applications. New York, John Wiley and Sons, Inc., 1960.

7.5 Wilks, Samuel S. Mathematical Statistics, 2nd ed. New York, John Wiley and Sons, Inc., 1962.

7.6 At least one of the following: (a-b)

    7.6a Gnedenko, Boris V. and Khinchin, A. I. An Elementary Introduction to the Theory of Probability. (translated from the Russian by W. R. Stahl, edited by J. B. Roberts) San Francisco, California, W. H. Freeman and Company, 1961; New York, Dover Publishing Company.

    7.6b Goldberg, Samuel. Probability: An Introduction. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960.

7.7 At least one of the following: (a-b)

    7.7a Cramér, Harald. The Elements of Probability Theory and Some of Its Applications. New York, John Wiley and Sons, Inc., 1955.

    7.7b Gnedenko, Boris V. Theory of Probability. (translated by E. D. Seckler) New York, Chelsea Publishing Company, Inc., 1962.

25

7.8   At least one of the following: (a-d)

   7.8a   Hodges, J. L. and Lehmann, E. L. Basic Concepts of
          Probability and Statistics. San Francisco, California,
          Holden-Day, Inc., 1964.

   7.8b   Mosteller, Frederick; Rourke, R. E. K.; Thomas, G. B.
          Probability with Statistical Applications. Reading,
          Massachusetts, Addison-Wesley Publishing Company, Inc.,
          1961.

   7.8c   Neyman, Jerzy. First Course in Probability and Sta-
          tistics. New York, Holt, Rinehart and Winston, Inc.,
          1950.

   7.8d   Wolf, Frank Louis. Elements of Probability and Sta-
          tistics. New York, McGraw-Hill Book Company, 1962.

7.9   At least one of the following: (a-b)

   7.9a   Hogg, Robert V. and Craig, A. T. Introduction to
          Mathematical Statistics. New York, The Macmillan
          Company, 1959.

   7.9b   Lindgren, Bernard William. Statistical Theory. New
          York, The Macmillan Company, 1962.

7.10 At least one of the following: (a-b)

   7.10a Brunk, Hugh Daniel. Introduction to Mathematical
          Statistics, 2nd ed. New York, Blaisdell Publishing
          Company, 1964.

   7.10b Mood, Alexander M. and Graybill, F. A. Introduction to
          the Theory of Statistics, 2nd ed. New York, McGraw-
          Hill Book Company, 1963.

VIII. Number Theory

    The theory of numbers has a perennial appeal for amateurs as
well as for specialists. Both for browsers and for serious students,
a basic library should contain some of the lore of number theory as
well as systematic works.

8.1   Dickson, Leonard E. History of the Theory of Numbers, vols. I,
      II, III. New York, Chelsea Publishing Company, Inc., 1952.

8.2   Hardy, Godfrey H. and Wright, E. M. An Introduction to the
      Theory of Numbers, 4th ed. New York, Oxford University Press,
      Inc., 1960.

8.3   Niven, Ivan. Irrational Numbers (Carus Monograph No. 11).
       New York, John Wiley and Sons, Inc., 1956.

8.4   Ore, Oystein. Number Theory and Its History. New York,
       McGraw-Hill Book Company, 1948.

8.5   Pollard, Harry S. The Theory of Algebraic Numbers (Carus
       Monograph No. 9). New York, John Wiley and Sons, Inc., 1950.

8.6   At least one of the following: (a-d)

       8.6a   Jones, Burton W. The Theory of Numbers. New York,
               Holt, Rinehart and Winston, Inc., 1955.

       8.6b   LeVeque, William Judson. Elementary Theory of Numbers.
               Reading, Massachusetts, Addison-Wesley Publishing
               Company, Inc., 1962.

       8.6c   Stewart, Bonnie Madison. Theory of Numbers, 2nd ed.
               New York, The Macmillan Company, 1964.

       8.6d   Wright, Harry Nable. First Course in the Theory of
               Numbers. New York, John Wiley and Sons, Inc., 1939.

8.7   At least two of the following: (a-g)

       8.7a   Landau, Edmund G. H. Elementary Number Theory. (trans-
               lated by Jacob E. Goodman) New York, Chelsea Publish-
               ing Company, Inc., 1958.

       8.7b   LeVeque, William Judson. Topics in Number Theory,
               vols. I, II. Reading, Massachusetts, Addison-Wesley
               Publishing Company, Inc., 1956.

       8.7c   Nagell, Trygve. Introduction to Number Theory, reprint,
               2nd ed. New York, Chelsea Publishing Company, Inc.,
               1964.

       8.7d   Niven, Ivan and Zuckerman, H. S. An Introduction to
               the Theory of Numbers. New York, John Wiley and Sons,
               Inc., 1960.

       8.7e   Rademacher, Hans A. Lectures on Elementary Number
               Theory. New York, Blaisdell Publishing Company, 1964.

       8.7f   Uspensky, James V. and Heaslet, M. A. Elementary
               Number Theory. New York, McGraw-Hill Book Company,
               1939.

       8.7g   Vinogradov, Ivan M. Elements of Number Theory. (trans-
               lated from the 5th revised edition by Saul Kravetz)
               New York, Dover Publications, Inc., 1954; 6th edition
               translated by H. Popova, Elmsford, New York, Pergamon
               Press, Inc., 1955.

IX. Miscellaneous

Inevitably there are some books which a library needs, not because they neatly fit a category, but because they themselves have unique appeal or utility. The titles under Miscellaneous resist omission for miscellaneous reasons. A mathematics library is made more useful by the inclusion of collections of problems, more diverting because of the less technical or even whimsical insights of capable mathematicians, and better suited for browsing if it is stocked with collections of mathematical fragments or synopses. The following two dozen volumes are an especially good investment because they are likely to wear out first!

9.1   Beaumont, Ross A. and Pierce, Richard S. Algebraic Foundations of Mathematics. Reading, Massachusetts, Addison-Wesley Publishing Company, Inc., 1963.

9.2   Blumenthal, Leonard M. A Modern View of Geometry. San Francisco, California, W. H. Freeman and Company, 1961.

9.3   Burkill, J. C. and Cundy, H. M. Mathematical Scholarship Problems. New York, Cambridge University Press, 1961.

9.4   Eves, Howard and Newsom, C. V. Introduction to the Foundations and Fundamental Concepts of Mathematics, rev. ed. New York, Holt, Rinehart and Winston, Inc., 1964.

9.5   Hadamard, Jacques. Psychology of Invention in the Mathematical Field. New York, Dover Publications, Inc., 1954.

9.6   Hall, Henry S. and Knight, S. R. Higher Algebra, 4th ed. New York, St. Martin's Press, Inc., 1932.

9.7   Hardy, Godfrey Harold. A Mathematician's Apology, rev. ed. New York, Cambridge University Press.

9.8   Jones, Burton W. Elementary Concepts of Mathematics, 2nd ed. New York, The Macmillan Company, 1963.

9.9   Kac, Mark. Statistical Independence in Probability, Analysis and Number Theory (Carus Monograph No. 12). New York, John Wiley and Sons, Inc., 1959.

9.10   Klein, Felix. Elementary Mathematics from an Advanced Standpoint, vols. I, II. (translated from the 3rd German edition) New York, Dover Publications, Inc., 1961. Vol. I, Arithmetic, Algebra, Analysis, 1924; Vol. II, Geometry, 1939.

9.11   National Council of Teachers of Mathematics. Insights into Modern Mathematics (23rd Yearbook). Washington, D. C., National Council of Teachers of Mathematics, 1957.

9.12 Newman, James R. The World of Mathematics, 4 vols. New York, Simon and Schuster, Inc., 1962. Vol. I, Men and Numbers; Vol. II, World of Laws and the World of Chance; Vol. III, Mathematical Way of Thinking; Vol. IV, Machines, Music and Puzzles.

9.13 Pólya, Gyorgy. How to Solve It, 2nd ed. New York, Doubleday and Company, 1957.

9.14 Saaty, Thomas L. Lectures on Modern Mathematics, 3 vols. New York, John Wiley and Sons, Inc. Vol. I, 1963; Vol. II, 1964; Vol. III, 1965.

9.15 Stein, Sherman K. Mathematics: The Man-made Universe. San Francisco, California, W. H. Freeman and Company, 1963.

9.16 Steinhaus, H. One Hundred Problems in Elementary Mathematics. New York, Basic Books, Inc., 1964.

9.17 Toeplitz, Otto. The Calculus: A Genetic Approach. (translated by Luise Lange) Chicago, Illinois, University of Chicago Press, 1963.

9.18 Ulam, Stanislaw. A Collection of Mathematical Problems. New York, Interscience, 1960.

9.19 van der Waerden, Bartel L. Science Awakening. (translated by Arnold Dresden) New York, Oxford University Press, Inc., 1961.

9.20 Weyl, Hermann. Philosophy of Mathematics and Natural Science, rev. and augm. English ed. based on trans. by Olaf Helmar. Princeton, New Jersey, Princeton University Press, 1949; New York, Atheneum Publishers, 1953; Gloucester, Massachusetts, Peter Smith.

9.21 Williams, John Davis. The Compleat Strategyst. New York, McGraw-Hill Book Company, 1954.

9.22 At least one of the following: (a-c)

    9.22a Ball, Walter W. R. Mathematical Recreations and Essays. New York, The Macmillan Company, 1939.

    9.22b Gardner, Martin, ed. Scientific American Book of Mathematical Puzzles and Diversions, 2 vols. New York, Simon and Schuster. Vol. I, 1964; Vol. II, 1961.

    9.22c Kraitchik, Maurice. Mathematical Recreations, 2nd ed. New York, Dover Publications, Inc., 1942.

9.23 At least one of the following: (a-b)

9.23a Pólya, Gyorgy. Mathematics and Plausible Reasoning,
       2 vols. Princeton, New Jersey, Princeton University
       Press, 1954. Vol. I, Induction and Analogy in Mathe-
       matics; Vol. II, Patterns of Plausible Inference.

9.23b Pólya, Gyorgy. Mathematical Discovery. New York,
       John Wiley and Sons, Inc., 1962.

9.24 Shklarsky, D. O.; Chentzov, N. N.; Yaglom, I. M. The USSR
      Olympiad Problem Book. (translated by J. Maykovitch, edited
      by I. Sussman) San Francisco, California, W. H. Freeman and
      Company, 1962.

FURTHER MATHEMATICAL MATERIALS

The value of a mathematical library is considerably enhanced
by the inclusion of materials beyond those in the preceding basic
list. Much of mathematical value can be found in general reference
works, such as encyclopedias. In addition, it is recommended that
the basic library be supplemented by items under the following head-
ings.

Journals

The American Mathematical Monthly. Mathematical Association of
America, Inc. 1225 Connecticut Avenue, N.W., Washington D. C. 20036
Ten issues per year.

The Mathematical Gazette. G. Bell and Sons, Ltd., Portugal Street,
London, W.C. 2, England. Five issues per year.

Mathematics Magazine. Mathematical Association of America, Inc.,
1225 Connecticut Avenue, N.W., Washington, D.C. 20036 Five issues
per year.

Scripta Mathematica. Yeshiva University, New York, New York 10033
Quarterly.

SIAM Review. Society for Industrial and Applied Mathematics,
33 South 17th Street, Philadelphia, Pennsylvania 19103 Quarterly.

The Mathematics Teacher. National Council of Teachers of Mathe-
matics, 1201 Sixteenth Street, N.W., Washington, D. C. 20036 Eight
issues per year.

Series

There exist series of excellent inexpensive books whose inclu-
sion in a library for undergraduates is suggested. Individual vol-
umes in some of the following series are included in the basic list.
In general, the following series are recommended, although, of
course, individual volumes vary in quality and no endorsement of
future volumes in any series is implied.

The Athena Series (Selected Topics in Mathematics). Holt, Rinehart
and Winston, Inc., New York. This is a series of small books that
form excellent supplements to standard junior- and senior-level
courses.

Blaisdell Scientific Paperbacks. Blaisdell Publishing Company,
New York. This is a series of small pamphlets that are translations
of the Russian series "Popular Lectures in Mathematics."

The Carus Mathematical Monographs. The Mathematical Association of
America, Inc., Washington, D. C. There are now 16 volumes in this
series.

Library of Mathematics. Routledge and Kegan Paul, London. Avail-
able from the Free Press, New York. These are small paperback books
covering a wide variety of topics at quite elementary levels.

The MAA Studies in Mathematics. The Mathematical Association of
America, Inc., Washington, D. C.

School Mathematics Study Group New Mathematical Library. Random
House, Inc., New York. This is a series of monographs.

University Mathematical Texts. Interscience, New York. This is a
series of small books at the advanced undergraduate level.

Topics in Mathematics. D. C. Heath and Company, Boston, Massachu-
setts. This is a series of booklets translated and adapted from
the Russian series "Popular Lectures in Mathematics." These
American editions have been prepared by the Survey of Recent East
European Mathematical Literature at the University of Chicago under
a grant from the National Science Foundation. These booklets pro-
vide students of mathematics at various levels, as well as other
interested readers, with valuable supplementary material to further
their mathematical knowledge and development.

The Slaught Memorial Papers. The Herbert Ellsworth Slaught Memorial
Papers are a series of brief expository pamphlets published as sup-
plements to the American Mathematical Monthly. When they are issued,
copies are sent free of charge to all members of the Association and
subscribers to the Monthly. Additional copies may be purchased from
the Mathematical Association of America.

Books in Foreign Languages

We recommend that some books in foreign languages--especially French, German, and Russian--be included in the collection. The principal purpose of these books would be to provide an opportunity for the student to learn to read mathematics in the language rather than to provide additions to the mathematical content of the list. Thus, in some cases it is suggested that, where available, both the English translation and the foreign language original be provided (good examples are van der Waerden's Modern Algebra, and the Heath Series Topics in Mathematics, in the preceding list).

There also should be included some books which do not exist in translation, such as Pólya and Szegö, Aufgaben und Lehrsätze aus der Analysis, or de la Vallée Poussin, Cours d'Analyse.