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Reported is an initial attempt to define a minimal college mathematics library. Included is a list of some 300 books, from which approximately 170 are to be chosen to form a basic library in undergraduate mathematics. The areas provided for in this list include Algebra, Analysis, Applied Mathematics, Geometry, Topology, Logic, Foundations and Set Theory, Probability-Statistics, and Number Theory. The intended goals of this basic collection are to (1) provide the student with introductory materials in various fields of mathematics which he may not have previously encountered, (2) provide the interested students with reading material collateral to his course work, (3) provide the student with reading at a level beyond that ordinarily encountered in the undergraduate curriculum, (4) provide the faculty with reference material, and (5) provide the general reader with elementary material in the field of mathematics. (RP)

COMMITTEE ON THE UNDERGRADUATE PROGRAM IN MATHEMATICS

BASIC LIBRARY LIST

JANUARY, 1965

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

The Committee on the Undergraduate Program in Mathematics of the Mathematical Association of America is charged with making recommendations for the overall improvement of college and university mathematics curricula at all levels and in all educational areas. The Committee, through its parent association, has received a grant from the National Science Foundation to support its work. To carry on the activities under this grant, the Committee has organized the Commission on the Undergraduate Program in Mathematics consisting of the Committee, an Executive Director, and an Associate Director.

Membership of the Commission on the Undergraduate Program in Mathematics at the time this list was prepared:

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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, and 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 new federal program in education will, we hope, enable colleges to finance purchases from this basic list.

It is expected that separate library lists will be published by CUPM dealing with special areas including teacher training and the biological, management and social sciences.

The Advisory Group on Communications of the Committee on the Undergraduate Program in Mathematics has prepared this list over a a period ending in 1964; hence, recently published books do not appear on the list. The list will be revised from time to time. Any

suggestions which will aid in such revision or which are aimed at the improvement of the list will be welcomed and should be sent to CUPM, P. O. Box 1024, Berkeley, California 94701.

Membership of CUPM's Advisory Group on Communications at the time this list was prepared:

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* Deceased

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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, $9.50.

1.2 Bell, Eric T. Men of Mathematics. New York, Simon and Schuster, Inc., 1937, $6.50, paper $2.25.

1.3 Courant, R. and Robbins, H. What is Mathematics? New York, Oxford University Press, 1941, $9.00, text ed. $7.00.

1.4 Dantzig, Tobias. Number, The Language of Science, 4th rev. and augm. ed. New York, Macmillan Company, 1954, $6.95; New York, Doubleday and Company, 1956, paper $0.95.

1.5 Rademacher, Hans and Toeplitz, Otto. The Enjoyment of Mathematics. Trans. by H. Zuckerman. Princeton, New Jersey, Princeton University Press, 1957, $4.50.

1.6 Steinhaus, H. Mathematical Snapshots, 2nd ed., rev. and enl. New York, Oxford University Press, 1960, $7.50.

1.7 Struik, Dirk Jan. A Concise History of Mathematics, 2nd rev. ed. New York, Dover Publications, 1948, paper $1.75.

1.8 Weyl, Hermann. Symmetry. Princeton, New Jersey, Princeton University Press, 1952, $4.50.

1.9 Whitehead, Alfred North. An Introduction to Mathematics, rev. ed. New York, Oxford University Press, 1959, paper $1.50.

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

1.10 a Kemeny, John G.; Snell, J. Laurie; Thompson, G. L. Introduction to Finite Mathematics. Englewood Cliffs, New Jersey, Prentice-Hall, 1957, $11.65, text ed. $8.75.

1.10 b Kemeny, John G.; Mirkil, H.; Snell, J. Laurie; Thompson, Gerald L. Finite Mathematical Structures. Englewood Cliffs, New Jersey, Prentice-Hall, 1959, $13.35, text ed. $10.00.

1.10 c Kemeny, John G.; Snell, J. Laurie; Thompson, Gerald L.; Schleifer, Arthur. Finite Mathematics with Business Applications. Englewood Cliffs, New Jersey, Prentice-Hall, 1962, $11.95, text ed. $8.95.

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

1.11 a James, Glenn and Robert C., editors. Mathematical Dictionary. Princeton, New Jersey, D. Van Nostrand Company, 1959, multilingual ed. $15.00, text ed. $10.00.

1.11 b Karush, William. The Crescent Dictionary of Mathematics. New York, Macmillan Company, 1962, $6.50.

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 subjects (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, ed. by Arthur Milgram, 2nd rev. ed. Notre Dame, Indiana, University of Notre Dame Press, 1946, $1.75.

2.2 Birkhoff, Garrett and MacLane, Saunders. A Survey of Modern Algebra, rev. ed. New York, Macmillan Company, 1965, $9.00.

2.3 Halmos, Paul R. Finite-dimensional Vector Spaces, 2nd ed. Princeton, New Jersey, D. Van Nostrand Company, 1958, $5.00.

2.4 Herstein, I. N. Topics in Algebra. New York, Blaisdell Publishing Company, 1963, $8.50.

2.5 MAA Studies in Mathematics, Vol. II. Studies in Algebra, A. A. Albert, editor. Englewood Cliffs, New Jersey, Prentice-Hall, 1963, text ed. $4.00.

2.6 McCoy, Neal H. Rings and Ideals (Carus Monograph No. 8). The Mathematical Association of America, Chicago, Illinois, The Open Court Publishing Company, 1948, $4.00.

2.7 Mostow, George D.; Sampson, J. H.; Meyer, J. P. Fundamental Structures of Algebra. New York, McGraw-Hill Book Company, 1963, $8.95, teacher's manual $2.00.

2.8 Uspensky, J. V. Theory of Equations. New York, McGraw-Hill Book Company, 1948, $6.95, paper $2.95.

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

2.9 a Jacobson, Nathan. Lectures in Abstract Algebra, Vols. I, II, III. Princeton, New Jersey, D. Van Nostrand Company, Vol. I, Basic Concepts, 1951, $6.95; Vol. II, Linear Algebra, 1953, $7.95; Vol. III, Theory of Fields and Galois Theory, 1964, $9.75.

2.9 b van der Waerden, Bartel L. Modern Algebra, Vols. I, II, trans. by Fred Blum. New York, Frederick Ungar Publishing Company, Vol. I, rev. ed., 1953, $6,00; Vol. II, 1950, $5.50.

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

2.10 a Aitken, Alexander C. Determinants and Matrices, 8th ed. New York, Interscience, 1956, $2.25.

2.10 b Hohn, Franz Edward. Elementary Matrix Algebra, 2nd. ed. New York, Macmillan Company, 1964, $8.00.

2.10 c MacDuffee, Cyrus C. Vectors and Matrices (Carus Monograph No. 7). The Mathematical Association of America, Chicago, Illinois, The Open Court Publishing Company, 1943, $4.00.

2.10 d Murdoch, D. C. Linear Algebra for Undergraduates. New York, J. Wiley and Sons, 1957, $5.50.

2.10 e Perlis, Sam. Theory of Matrices. Reading, Massachusetts, Addison-Wesley Publishing Co.; Inc., 1952, $8.75.

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

2.11 a Curtis, C. Linear Algebra: An Introductory Approach. Boston, Massachusetts, Allyn and Bacon, Inc., 1963, $10.95, text ed. $8.25.

2.11 b Finkbeiner, Daniel T. Introduction to Matrices and Linear Transformations. San Francisco, California, W. H. Freeman and Company, 1960, $6.50.

2.11 c Shields, Paul C. Linear Algebra. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1964, $7.50.

2.11 d Paige, Lowell J. and Swift, J. Dean. Elements of Linear Algebra. New York, Blaisdell Publishing Company, 1961, $8.50.

2.11 e Stewart, Frank Moore. Introduction to Linear Algebra. Princeton, New Jersey, D. Van Nostrand Company, 1963, $7.50.

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

2.12 a Hoffman, Kenneth and Kunze, Ray. Linear Algebra. Englewood Cliffs, New Jersey, Prentice-Hall, 1961, $11.65, text ed. $8.75.

2.12 b Nering, Evar Dave. Linear Algebra and Matrix Theory. New York, Interscience, 1963, $6.95.

2.12 c Stoll, Robert Roth. Linear Algebra and Matrix Theory. New York, McGraw-Hill Book Company, 1952, $7.50.

2.12 d Thrall, Robert McDowell and Tornheim, L. Vector Spaces and Matrices. New York, J. Wiley and Sons, 1957, $6.75.

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

2.13 a Gantmakher, Feliks R. Theory of Matrices, Vols. I, II. New York, Chelsea Publishing Company, 1959, $6.00 ea.

2.13 b Mal'cev, A. I. Foundations of Linear Algebra. Trans. from the Russian by T. C. Brown, edited by J. B. Roberts. San Francisco, California, W. H. Freeman and Company, 1963, $7.50.

2.13 c Varga, Richard S. Matrix Iterative Analysis. Englewood Cliffs, New Jersey, Prentice-Hall, 1962, $16.65, text ed. $12.50.

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

2.14 a Jaeger, Arno. Introduction to Analytic Geometry and Linear Algebra. New York, Holt, Rinehart and Winston, Inc., 1960, $6.00.

2.14 b Kuiper, N. H. Linear Algebra and Geometry. Trans. from the Dutch ed., New York, Interscience, 1962, $8.75.

2.14 c Rosenbaum, R. A. Introduction to Projective Geometry and Modern Algebra. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1963, $7.50.

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

2.15 a Johnson, Richard Edward. First Course in Abstract Algebra. Englewood Cliffs, New Jersey, Prentice-Hall, 1953, $9.75.

2.15 b McCoy, Neal H. Introduction to Modern Algebra. Boston, Massachusetts, Allyn and Bacon, Inc., 1960, $10.60, text ed. $7.95.

2.15 c Weiss, Marie J. Higher Algebra for the Undergraduate, 2nd ed. rev. by Roy Dubisch. New York, J. Wiley and Sons, 1962, $4.95.

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

2.16 a Alexandroff, P. S. An Introduction to the Theory of Groups, trans. by Hazel Perfect and J. M. Petersen, New York, Hafner Publishing Company, 1959, $3.25.

2.16 b Ledermann, Walter. Introduction to the Theory of Finite Groups. New York, Interscience, 1953, $2.25.

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

2.17 a Hall, Marshall, Jr. The Theory of Groups. New York, Macmillan Company, 1961, $9.50.

2.17 b Kurosh, A. G. The Theory of Groups, Vols. I, II, 2nd ed., trans. from Russian and edited by K. A. Hirsch. New York, Chelsea Publishing Company, 1960, $5.50 ea.

2.17 c Zassenhaus, Hans J. The Theory of Groups, 2nd ed., trans. by S. Kravetz. New York, Chelsea Publishing Company, 1958, $6.00.

III. ANALYSIS

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

In those areas in which undergraduate courses are usually offered, books of mathematical depth and sophistication are recommended. 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 equations. 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 in 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). The Mathematical Association of America. Chicago, Illinois, The Open Court Publishing Company, 1925, $4.00.

3.2 Boas, Ralph P., Jr. A Primer of Real Functions (Carus Monograph No. 13). The Mathematical Association of America. New York, J. Wiley and Sons, 1960, $4.00.

3.3 Brenner, Joel Lee. Problems in Differential Equations. San Francisco, California, W. H. Freeman and Company, 1963, paper $2.00.

3.4 Courant, R. Differential and Integral Calculus, Vols. I, II, trans. by E. J. McShane. New York, Interscience, Vol. I, 2nd ed. rev., 1937, $7.50; Vol. II, 1st ed., 1936, $9.00.

3.5 Flanders, Harley. Differential Forms, with Applications to the Physical Sciences. New York, Academic Press, 1963, $7.50.

3.6 Hardy, Godfrey H. Pure Mathematics. New York, Cambridge University Press, 1959, $6.50, paper $2.95.

3.7 Knopp, Konrad. Elements of the General Theory of Analytic Functions, trans. by F. Bagemihl. 1st American ed., New York, Dover Publications, 1952, paper $1.35.

3.8 Knopp, Konrad. Problem Book in the Theory of Functions, Vols. I, II. New York, Dover Publications. Vol. I, Problems in the elementary theory of functions, 1948; Vol. II, Problems in the advanced theory of functions, 1952, paper $1.35 ea.

3.9 Knopp, Konrad. Theory and Application of Infinite Series, trans. from the 2nd German ed. New York, Hafner Publishing Company, 1948, $9.50.

3.10 MAA Studies in Mathematics, Vol. I. Studies in Modern Analysis, R. C. Buck, editor. Englewood Cliffs, New Jersey, Prentice-Hall, 1962, $4.00.

3.11 Nickerson, H. K.; Spencer, D. C.; Steenrod, N. E. Advanced Calculus. Princeton, New Jersey, D. Van Nostrand Company, 1959, paper $6.50.

3.12 Rogosinski, Werner. Fourier Series, 2nd ed. New York, Chelsea Publishing Company, 1959, $2.50, paper $1.39.

3.13 Titchmarsh, Edward C. Theory of Functions, 2nd ed. New York, Oxford University Press, 1939, $7.75.

3.14 Williamson, John Hunter. Lebesgue Integration. New York, Holt, Rinehart and Winston, Inc., 1962, $3.75.

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

3.15 a Dieudonne, Jean. Foundations of Modern Analysis. New York, Academic Press, 1960, $8.50.

3.15 b Simmons, George F. Introduction to Topology and Modern Analysis. New York, McGraw-Hill Book Company, 1963, $9.50.

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

3.16 a Kolmogorov, Andree N. and Fomin, S. V. Elements of the Theory of Functions and Functional Analysis, Vols. I, II, trans. from 1st Russian ed. New York, Graylock Press, Vol. I, Metric and normed spaces, 1957, $3.95; Vol. II, Measure, the Lebesgue integral, Hilbert Space, 1961, $4.00.

3.16 b Lorch, Edgar Raymond. Spectral Theory. New York, Oxford University Press, 1962, $5.50.

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

3.17 a Erdélyi, Arthur. Operational Calculus and Generalized Functions. New York, Holt, Rinehart and Winston, Inc., 1962, $3.25.

3.17 b Lighthill, Michael James. Introduction to Fourier Analysis and Generalized Functions. New York, Cambridge University Press, 1958, $3.50, paper $1.75.

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

3.18 a Akhiezer, Naum I. Calculus of Variations, trans. by Aline H. Frink. New York, Blaisdell Publishing Company, 1962, $8.50.

3.18 b Gelfand,I.M. and Fomin, S.V. Calculus of Variations, trans. by R. A. Silverman. Englewood Cliffs, New Jersey, Prentice-Hall, 1963, $10.60, text ed. $7.95.

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

3.19 a Beckenbach, E. F. and Bellman, R. Introduction to Inequalities. New York, Random House, 1961, $2.95, paper $1.95.

3.19 b Kazarinoff, N. D. Geometric Inequalities. New York, Random House, 1961, $2.95, paper $1.95.

3.19 c Korovkin, Pavel P. Inequalities, trans. from Russian by Halina Moss, ed. by Ian N. Sneddon. New York, Blaisdell Publishing Company. 1962, paper $0.95.

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

3.20 a Agnew, Ralph Palmer. Differential Equations, 2nd ed. New York, McGraw-Hill Book Company, 1960, $8.50.

3.20 b Coddington, Earl A. An Introduction to Ordinary Differential Equations. Englewood Cliffs, New Jersey, Prentice-Hall, 1961, $11.00, text ed. $8.25.

3.20 c Ford, Lester R. Differential Equations, 2nd ed. New York, McGraw-Hill Book Company, 1955, $7.50.

3.20 d Golomb, Michael and Shanks, Merrill. Elements of Ordinary Differential Equations. 2nd rev. ed. New York, McGraw-Hill Book Company, 1965, $6.95.

3.20 e Tenenbaum, Morris and Pollard, Harry. Ordinary Differential Equations. New York, Harper and Row Publishers, Inc.,1963, $10.75.

3.20 f Pontryagin, Lev S. Ordinary Differential Equations, trans. by L. Kocinskas and W. Counts. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1962, $9.50.

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

3.21 a Birkhoff, Garrett and Rota, Gian-Carlo. Ordinary Differential Equations. New York, Blaisdell Publishing Company, 1962, $9.50.

3.21 b Coddington, Earl A. and Levinson, Norman. Theory of Ordinary Differential Equations. New York, McGraw-Hill Book Company, 1955, $9.95.

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

3.22 a Hurewicz, Witold. Lectures on Ordinary Differential Equations. Cambridge, Massachusetts, M.I.T. Press, 1958, $7.50, paper $1.95.

3.22 b Lefschetz, Solomon. Differential Equations: Geometric Theory, 2nd ed. New York, Interscience, 1963, $10.00.

3.22 c Tricomi, F. G. Differential Equations. New York, Hafner Publishing Company, 1961, $8.50.

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

3.23 a Ahlfors, Lars V. Complex Analysis. New York, McGraw-Hill Book Company, 1953, $7.95.

3.23 b Knopp, Konrad. Theory of Functions, Parts I, II. New York, Dover Publications, Part I, Elements of the general theory of analytic functions, 1945; Part II, Applications and continuations of the general theory, 1947, paper $1.35 ea.

3.23 c Nehari, Zeev. Introduction to Complex Analysis. Boston, Massachusetts, Allyn and Bacon, Inc., 1961, $9.95, text ed. $7.50.

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

3.24 a Caratheodory, C. Theory of Functions of a Complex Variable, Vols. I, II, 2nd ed. trans by F. Steinhardt. New York, Chelsea Publishing Company, Vol. I, 1958, Vol. II, 1960, $4.95 each.

3.24 b Fuchs, B. A. and Shabat, B. V. Functions of a Complex Variable and Some of Their Applications, trans. by J. Berry, ed. by T. Kovari. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., Vol. I, rev. and expanded by J. W. Reed, 1964, $10.00; Vol. II, 1962, $7.00.

3.24 c Hille, Einar. Analytic Function Theory, Vols. I, II. New York, Blaisdell Publishing Company, Vol. I, 1959, $9.50; Vol. II, 1962, $10.50.

3.24 d Saks, S. and Zygmund, A. Analytic Functions, trans. by E. J. Scott. Warsaw, Poland, Nakladem Polskiego Towarziptwa Matematycznego, 1952 (not in print in U. S.) Rev. ed., New York, Dover Publications, 1964, $2.25.

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

3.25 a Bartle, Robert G. The Elements of Real Analysis. New York, J. Wiley and Sons, 1964, $10.95.

3.25 b Franklin, Philip. Treatise on Advanced Calculus. New York, J. Wiley and Sons, 1940, $10.95.

3.25 c Kaplan, Wilfred. Advanced Calculus. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1952, $11.75.

3.25 d Olmsted, J. M. H. Advanced Calculus. New York, Appleton-Century-Crofts, Inc., 1961. $9.50.

3.25 e Taylor, Angus Ellis. Advanced Calculus. New York, Blaisdell Publishing Company, 1955, $9.75.

3.25 f Widder, David Vernon. Advanced Calculus, 2nd ed. Englewood Cliffs, New Jersey, Prentice-Hall, 1961, $14.35, text ed. $10.75.

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

3.26 a Apostol, Tom M. Mathematical Analysis Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1957, $11.75.

3.26 b Buck, R. C. Advanced Calculus, 2nd ed. New York, McGraw-Hill Book Company, 1964, $9.00.

3.26 c Maak, Wilhelm. An Introduction to Modern Calculus, trans. by G. Strike. New York, Holt, Rinehart and Winston, Inc., 1963, $9.35, text ed. $7.00.

3.26 d Rudin, Walter. Principles of Mathematical Analysis, 2nd ed. New York, McGraw-Hill Book Company, 1964, $7.95.

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

3.27 a Goffman, Casper. Real Functions. New York, Holt, Rinehart and Winston, Inc., 1953, $8.00, text ed. $6.00.

3.27 b Graves, Lawrence M. Theory of Functions of Real Variables, 2nd ed. New York, McGraw-Hill Book Company, 1956, $9.50.

3.27 c McShane, Edward J. and Botts, Truman. Real Analysis. Princeton, New Jersey, D. Van Nostrand Company, 1959, $6.60.

3.27 d Royden, H. L. Real Analysis. New York, Macmillan Company, 1963, $9.00.

3.27 e Thielman, Henry P. Theory of Functions of Real Variables. Englewood Cliffs, New Jersey, Prentice-Hall, 1953, $9.95.

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

3.28 a Green, J. A. Sequences and Series. Glencoe, Illinois, Free Press of Glencoe, 1958, paper $1.25.

3.28 b Hirschman, Isidore I., Jr. Infinite Series. New York, Holt, Rinehart and Winston, Inc., 1962, $4.75.

3.28 c Hyslop, James Morton. Infinite Series, 4th rev. ed. New York, Interscience, 1954, $1.75.

3.28 d Knopp, Konrad. Infinite Sequences and Series, trans. by F. Bagemihl. New York, Dover Publications, 1956, $3.50, paper $1.75.

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

3.29 a Epstein, Bernard.. Partial Differential Equations, An Introduction. New York, McGraw-Hill Book Company, 1962, $9.50.

3.29 b Garabedian, P. R. Partial Differential Equations. New York, J. Wiley and Sons, 1964, $14.00

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

3.30 a Halmos, Paul R. Measure Theory. Princeton, New Jersey, D. Van Nostrand Company, 1950, $7.75.

3.30 b Munroe, Marshall Evans. Introduction to Measure and Integration. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1953, $10.50.

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, 1963, paper $1.95.

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

3.32 a Jahnke, E. and Emde, F. Tables of Functions with Formulas and Curves, 6th ed. New York, McGraw-Hill Book Company, 1960, $9.95.

3.32 b 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., $6.50.

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, $9.50; Vol. II, Calculus of several variables with applications to probability and vector analysis, 1962, $9.50.

Begle, Edward G. Introductory Calculus with Analytic Geometry. New York, Holt, Rinehart and Winston, Inc., 1954, $5.75.

Kuratowski, K. C. Introduction to Calculus, trans. from Polish by J. Musielak. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1962, $5.00.

Landau, Edmund G. H. Differential and Integral Calculus, trans. by M. Hausner and M. Davis. New York, Chelsea Publishing Company, 1960, $6.00.

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 high-speed computing machines, numerical analysis and some branches 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., trans. from the German original. New York, J. Wiley and Sons, Vol. I, 1953, $10.50.

4.2 Henrici, Peter. Discrete Variable Methods in Ordinary Differential Equations. New York, J. Wiley and Sons, 1962, $9.95.

4.3 Hopf, L. Introduction to the Differential Equations of Physics, trans. by Walter Nef. New York, Dover Publications, 1948, paper $1.25.

4.4 Kemeny, John G. and Snell, J. Laurie. Mathematical Models in the Social Sciences. New York, Blaisdell Publishing Company, 1962, $6.50.

4.5 Khinchin, A. I. Mathematical Foundations of Statistical Mechanics, trans. by G. Gamow. New York, Dover Publications, 1949, $1.50.

4.6 Lamb, Sir Horace. Hydrodynamics, 6th rev. ed. New York, Dover Publications, 1956, paper $3.25.

4.7 Landau, Lev D. and Lifshitz, E. M. The Classical Theory of Fields, trans. from the Russian by M. Hamermesh, 2nd ed. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1962, $12.75.

4.8 Love, A.E.H. Treatise on the Mathematical Theory of Elasticity, 4th rev. ed. New York, Dover Publications, reprint, 1956, paper $3.00.

4.9 Luce, Robert Duncan and Raiffa, Howard. Games and Decisions. New York, J. Wiley and Sons, 1957, $9.50.

4.10 National Physical Laboratory, Teddington, England. Modern Computing Methods. Notes on Applied Science #16, Her Majesty's Stationery Office, London, 2nd ed. 1962. (In U. S. Philosophical Library, $6.00)

4.11 Parzen, Emanuel. Stochastic Processes with Applications to Science and Engineering. San Francisco, California, Holden-Day, Inc., 1962, $10.50.

4.12 Rayleigh, John W. S. Theory of Sound, 2nd rev. ed. New York, Dover Publications, 1955, 2 Vols., paper $2.35 ea.

4.13 Stiefel, E. L. An Introduction to Numerical Mathematics, trans. by W. C. and C. J. Rheinboldt. New York, Academic Press, 1963, $6.75.

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

4.14 a Friedman, Bernard. Principles and Techniques of Applied Mathematics. New York, J. Wiley and Sons, 1956, $8.00.

4.14 b Vulikh, Boris Z. Introduction to Functional Analysis for Scientists and Technologists, English trans. by Ian N. Sneddon. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1963, $10.00.

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

4.15 a Lichnerowicz, André. Elements of Tensor Calculus, trans. by J. W. Leech and D. J. Newman. New York, J. Wiley and Sons, 1962, $4.50.

4.15 b Synge, John L. and Schild, A. Tensor Calculus. Toronto, University of Toronto Press, 1949, $6.50.

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

4.16 a Fano, Robert M. Transmission of Information. Cambridge, Massachusetts, M.I.T. Press, 1961, $10.00.

4.16 b Reza, F. M. An Introduction to Information Theory. New York, McGraw-Hill Book Company, 1961, $14.00.

4.16 c Shannon, Claude E. and Weaver, W. The Mathematical Theory of Communication. Urbana, Illinois, University of Illinois Press, 1949, $2.50, paper $0.95.

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

4.17 a Arden, B. W. An Introduction to Digital Computers. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1963, $9.75.

4.17 b Galler, Bernard, A. The Language of Computers. New York, McGraw-Hill Book Company, 1962, $8.95.

4.17 c Leeds, Herbert D. and Weinberg, Gerald M. Computer Programming Fundamentals. New York, McGraw-Hill Book Company, 1961, $8.50, text ed. $6.00.

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

4.18 a Faddeev, D. K. and Faddeeva, V. N. Computational Methods in Linear Algebra, trans. by Robert C. Williams. San Francisco, California, W. H. Freeman and Company, 1963, $11.50; authorized trans. by Curtis Benster, New York, Dover Publishing Company, 1959, $2.00.

4.18 b Fox, Leslie. An Introduction to Numerical Linear Algebra. American ed., Fair Lawn, New Jersey, Clarendon Press, 1964, $7.80.

4.18 c Frazer, Robert A.; Duncan, W. J.; Collar, A. R. Elementary Matrices. New York, Cambridge University Press, 1938, $7.50, paper $2.95.

4.18 d Householder, Alston Scott. The Theory of Matrices in Linear Algebra. New York, Blaisdell Publishing Company, 1964, $6.50.

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

4.19 a Goldstein, Herbert. Classical Mechanics. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1950, $11.50.

4.19 b Synge, John L. and Griffith, B. A. Principles of Mechanics, 3rd ed. New York, McGraw-Hill Book Company, 1959, $10.50.

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

4.20 a Jeffreys, Sir Harold and Jeffreys, Bertha Swirles. Methods of Mathematical Physics, 3rd ed. New York, Cambridge University Press, 1956, $18.50.

4.20 b Morse, Philip M. and Feshbach, H. Methods of Theoretical Physics. New York, McGraw-Hill Book Company, Pt. I, 1953, $16.00; Pt. II, 1953, $16.00.

4.20 c Whittaker, Edmund T. and Watson, G. N. A Course of Modern Analysis, 4th ed. New York, Cambridge University Press, 1958, $11.50, paper $4.95.

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

4.21 a Kreyszig, Erwin. Advanced Engineering Mathematics. New York, J. Wiley and Sons, 1962, $10.50.

4.21 b Tychonov, A. N. and Samarski, A. A. Partial Differential Equations in Mathematical Physics, trans. by S. Radding. San Francisco, California, Holden-Day, Inc., 1964, Vol. I, $11.75.

4.21 c von Karman, Theodore and Biot, M. A. Mathematical Methods in Engineering. New York, McGraw-Hill Book Company, 1940, $9.50.

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

4.22 a Riordan, John. An Introduction to Combinatorial Analysis. New York, J. Wiley and Sons, 1958, $8.50.

4.22 b Ryser, Herbert John. Combinatorial Mathematics (Carus Monograph #14). New York, J. Wiley and Sons, 1963, $4.00.

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

4.23 a Aris, Rutherford. Discrete Dynamic Programming. New York, J. Wiley and Sons, 1963, $4.00.

4.23 b Bellman, Richard E. and Dreyfus, Stuart E. Applied Dynamic Programming. Princeton, New Jersey, Princeton University Press, 1962, $8.50.

4.23 c Howard, Ronald A. Dynamic Programming and Markov Processes. Cambridge, Massachusetts, M.I.T. Press, 1960, $5.75.

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

4.24 a Dantzig, George B. Linear Programming and Extensions. Princeton, New Jersey, Princeton University Press, 1962, $11.50.

4.24 b Gass, Saul I. Linear Programming, 2nd ed. New York, McGraw-Hill Book Company, 1964, $8.95.

4.24 c Hadley, George. Linear Programming. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1962, $10.75.

4.24 d Vajda, S. Theory of Games and Linear Programming. New York, J. Wiley and Sons, 1956, $2.00.

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

4.25 a Hohn, Franz E. Applied Boolean Algebra. New York, Macmillan Company, 1960, paper $2.95.

4.25 b Whitesitt, John Elden. Boolean Algebra and Its Applications. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1961, $7.50.

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

4.26 a Hildebrand, Francis B. Introduction to Numerical Analysis. New York, McGraw-Hill Book Company; 1956, $10.50.

4.26 b Householder, Alston Scott. Principles of Numerical Analysis. New York, McGraw-Hill Book Company, 1953, $8.50.

4.26 c Lanczos, Cornelius. Applied Analysis. Englewood Cliffs, New Jersey, Prentice-Hall, 1956, $15.00, text ed. $11.25.

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

4.27 a Cox, D. R. and Smith, W. L. Queues. New York, J. Wiley and Sons, 1961, $3.75.

4.27 b Riordan, John. Stochastic Service Systems. New York, J. Wiley and Sons, 1962, $6.75.

4.27 c Takacs, Lajos. Introduction to the Theory of Queues. New York, Oxford University Press, 1962, $7.50.

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

4.28 a Gale, David. The Theory of Linear Economic Models. New York, McGraw-Hill Book Company, 1960, $10.50.

4.28 b Dorfman, Robert; Samuelson, Paul A.; Solow, Robert M. Linear Programming and Economic Analysis. New York, McGraw-Hill Book Company, 1958, $11.00.

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

4.29 a Berge, Claude. The Theory of Graphs and Its Applications, trans. by Alison Doig. New York, J. Wiley and Sons, 1962, $6.50.

4.29 b Ford, L. R., Jr., and Fulkerson, D. R. Flows in Networks. Princeton, New Jersey, Princeton University Press, 1962, $6.00.

4.29 c Ore, Oystein. Theory of Graphs. Providence, Rhode Island, American Mathematical Society, 1962. American Mathematical Society Colloquium Publications Vol. 38, $9.20; membership price $6.90.

V. GEOMETRY-TOPOLOGY

The following thirty-eight books, of which a minimum of fifteen 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, 1962, $10.60, text ed. $7.95.

5.2 Artin, Emil. Geometric Algebra. New York, Interscience, 1957, $8.00.

5.3 Hilbert, David and Cohn-Vossen,S. Geometry and the Imagination, trans. by P. Nemenyi. New York, Chelsea Publishing Company, 1952, $6.00.

5.4 Young, J. W. Projective Geometry (Carus Monograph No. 4). The Mathematical Association of America. Chicago, Illinois, The Open Court Publishing Company, 1930, $4.00.

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

5.5 a Coxeter, H. S. M. Introduction to Geometry. New York, J. Wiley and Sons, 1961, $8.75.

5.5 b Eves, Howard. A Survey of Geometry, Vol. I. Boston, Massachusetts, Allyn and Bacon, Inc., 1963, $13.25, text ed. $9.95.

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

5.6 a Eggleston, Harold G. Problems of Euclidean Space: Applications of Convexity. New York, Pergamon Press, 1957, $6.50.

5.6 b Hadwiger, Hugo and Debrunner, Hans. Combinatorial Geometry in the Plane, trans. by Victor Klee. New York, Holt, Rinehart and Winston, Inc., 1964, paper $3.75.

5.6 c Yaglom, Isaak M. and Boltyanskii, B. G. Convex Figures, trans. by P. J. Kelly and L. F. Walton. New York, Holt, Rinehart and Winston, Inc., 1961, $7.50, text ed. $5.50.

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

5.7 a Jenner, William E. Rudiments of Algebraic Geometry. New York, Oxford University Press, 1963, paper $2.95.

5.7 b Walker, Robert John. Algebraic Curves. New York, Dover Publications, 1962, $1.60.

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

5.8 a Baer, Reinhold. Linear Algebra and Projective Geometry. New York, Academic Press, 1952, $9.50.

5.8 b Busemann, Herbert and Kelly, Paul J. Projective Geometry and Projective Metrics. New York, Academic Press, 1953, $9.50.

5.8 c Seidenberg, A. Lectures in Projective Geometry. Princeton, New Jersey, D. Van Nostrand Company, 1962, $6.50.

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

5.9 a Alexandroff, P. S. Combinatorial Topology, Vols. I, II, III. New York, Graylock Press. Vol. I, Introduction, complexes, coverings, dimension, 1956, paper $4.95; Vol. II, Betti Groups, 1957, $6.50; Vol. III, Homological manifolds, duality, classification, and fixed point theorems, 1960, $6.50.

5.9 b Lefschetz, Solomon. Introduction to Topology. Princeton, New Jersey, Princeton University Press, 1949, $6.00.

5.9 c Pontryagin, Lev S. Foundations of Combinatorial Topology, trans. by Bagemihl, Kohm and Seidu. Rochester, New York, Graylock Press, 1952, paper $4.00.

5.9 d Wallace, Andrew Hugh. Introduction to Algebraic Topology. New York, Pergamon Press, 1957, $6.50.

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

5.10 a Coxeter, H. S. M. Non-Euclidean Geometry, 4th rev. ed. Toronto, University of Toronto Press, 1957, $5.50.

5.10 b Wolfe, Harold E. Introduction to Non-Euclidean Geometry. New York, Holt, Rinehart and Winston, Inc., 1945, $5.50.

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

5.11 a Guggenheim, Heinrich W. Differential Geometry. New York, McGraw-Hill Book Company, 1963, $12.50.

5.11 b Kreyszig, Erwin. Differential Geometry, 2nd ed. Toronto, University of Toronto Press, 1963, $8.50.

5.11 c Struik, Dirk Jan. Differential Geometry, 2nd ed. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1961, $9.75.

5.11 d Willmore, Thomas James. Introduction to Differential Geometry. New York, Oxford University Press, 1959, $7.75.

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

5.12 a Baum, John D. Elements of Point Set Topology. Englewood Cliffs, New Jersey, Prentice-Hall, 1964, $7.95, text ed. $5.95.

5.12 b Bushaw, Donald Wayne. Elements of General Topology. New York, J. Wiley and Sons, 1963, $6.95.

5.12 c Hu, Sze-Tsen. Elements of General Topology. San Francisco, California, Holden-Day, Inc., 1964, $8.50.

5.12 d Kuratowski, Kazimierz. Introduction to Set Theory and Topology, trans. from rev. Polish ed. by L. Boron. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., $7.50.

5.12 e Mendelson, Bert. Introduction to Topology. Boston, Massachusetts, Allyn and Bacon, Inc., 1962, $11.35, text ed. $8.50.

5.12 f Pervin, William J. Foundations of General Topology. New York, Academic Press, 1964, $7.95.

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

5.13 a Hall, Dick W. and Spencer, G. L. Elementary Topology. New York, J. Wiley and Sons, 1955, $7.00.

5.13 b Newman, M. H. A. Topology of Plane Sets of Points. New York, Cambridge University Press, 1951, $6.50, 1962, paper $2.95.

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

5.14 a Hocking, John and Young, Gail. Topology. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1961, $10.75.

5.14 b Kelley, John L. General Topology. Princeton, New Jersey, D. Van Nostrand Company, 1955, $8.75.

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

5.15 a Crowell, Richard Henry and Fox, Ralph H. Introduction to Knot Theory. New York, Blaisdell Publishing Company, 1963, $9.50.

5.15 b Hurewicz,Witold and Wallman, Henry. Dimension Theory. Princeton, New Jersey, Princeton University Press, 1941, $4.50.

5.15 c Pontryagin, Lev S. Topological Groups, trans.by Emma Lehmer. Princeton, New Jersey, Princeton University Press, 1958,$6.00.

5.15 d Springer, George. Introduction to Riemann Surfaces. Reading, Massachusetts, Addison-Wesley,Publishing Co.,Inc., 1956, $12.50.

VI. LOGIC, FOUNDATIONS AND SET THEORY.

Of the following twenty-three books on logic, foundations, and set theory, at least thirteen 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. Contributions to the Founding of the Theory of Transfinite Numbers, trans. by P. E. B. Jourdain. Chicago, Illinois, The Open Court Publishing Company, 1961, $3.50; New York, Dover Publications, paper $1.35.

6.2 Halmos, Paul R. Naive Set Theory. Princeton, New Jersey, D. Van Nostrand Company, 1960, $3.50.

6.3 Hilbert, David and Ackerman, W. Principles of Mathematical Logic. New York, Chelsea Publishing Company, 1950, trans. from the German 2nd edition, $3.95.

6.4 Kamke, Erich. Theory of Sets, trans. by F. Bagemihl. New York, Dover Publications, 1950, paper $1.35.

6.5 Landau, Edmund G. H. The Foundations of Analysis, trans. by E. Steinhardt. New York, Chelsea Publishing Company, 1951, $3.95.

6.6 Nagel, Ernest and Newman, James R. Gödel's Proof. New York, New York University Press, 1958, $2.95, paper $1.75.

6.7 Rosenbloom, Paul Charles. The Elements of Mathematical Logic. New York, Dover Publications, 1951, paper $1.45.

6.8 Stoll, Robert Roth. Sets, Logic and Axiomatic Theories. San Francisco, W. H. Freeman and Company, 1961, paper $2.25.

6.9 Wilder, Raymond L. Introduction to the Foundations of Mathematics. New York, J. Wiley and Sons, 1952, $5.75.

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

6.10 a Cohen, Leon W. and Ehrlich, G. The Structure of the Real Number System. Princeton, New Jersey, D. Van Nostrand Company, 1963, $4.25.

6.10 b Feferman, Solomon. The Number Systems: Foundations of Algebra and Analysis. Reading, Massachusetts, Addison-Wesley Publishing Co., Inc., 1964, $8.75.

6.10 c Henkin, Leon A.; Smith, Norman; Varineau, V. J.; Walsh, Michael J. Retracing Elementary Mathematics. New York, Macmillan Company, 1962, $6.50.

6.10 d Kershner, Richard B. and Wilcox, L. R. Anatomy of Mathematics. New York, Ronald Press Company, 1950, $7.50.

6.10 e Landin, Joseph and Hamilton, N. T. Set Theory: The Structure of Arithmetic. Boston, Massachusetts, Allyn and Bacon, Inc., 1961, $10.35, text ed. $7.75.

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

6.11 a Quine, Willard von Orman. Set Theory and Its Logic. Cambridge, Massachusetts, Harvard University Press, 1963, $5.95.

6.11 b Suppes, Patrick C. Axiomatic Set Theory. Princeton, New Jersey, D. Van Nostrand Company, 1960, $6.00.

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

6.12 a Copi, Irving Marmer. Symbolic Logic. New York, Macmillan Company, 1954, $6.50.

6.12 b Kalish, Donald and Montague, Richard. Logic; Techniques of Formal Reasoning. New York, Harcourt, Brace and World, Inc., 1964, $6.95.

6.12 c Quine, Willard von Orman. Mathematical Logic, rev. ed. Cambridge, Massachusetts, Harvard University Press, 1951, $5.25; paper, New York, Harper, $2.25.

6.12 d Suppes, Patrick C. Introduction to Logic. Princeton, New Jersey, D. Van Nostrand Company, 1958, $6.75.

6.12 e Tarski, Alfred. Introduction to Logic and to the Methodology of Deductive Sciences, 2nd ed. rev. New York, Oxford University Press, 1946, $4.50.

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

6.13 a Church, Alonzo. Introduction to Mathematical Logic, Vol. I. Princeton, New Jersey, Princeton University Press, 1956, $9.00.

6.13 b Kleene, Stephen C. Introduction to Metamathematics. Princeton, New Jersey, D. Van Nostrand Company, 1952, $12.75.

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 Cramer, Harald. Mathematical Methods of Statistics. Princeton, New Jersey, Princeton University Press, 1946, $10.00.

7.2 Feller, William. An Introduction to Probability Theory and Its Applications, Vol. I, 2nd ed. New York, J. Wiley and Sons, 1957, $9.75, text ed. $8.00.

7.3 Loève, Michel Moise. Probability Theory, 3rd ed. Princeton, New Jersey, D. Van Nostrand Company, 1963, $14.75.

7.4 Parzen, Emanuel. Modern Probability Theory and Its Applications. New York, J. Wiley and Sons, 1960, $9.75.

7.5 Wilks, Samuel S. Mathematical Statistics, 2nd ed. New York, J. Wiley and Sons, 1962, $12.95.

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

7.6 a Gnedenko, Boris V. and Khinchin, A. I. An Elementary Introduction to the Theory of Probability, trans. from Russian by W. R. Stahl, ed. by J. B. Roberts. San Francisco, California, W. H. Freeman and Company, 1961, paper $1.75; New York, Dover Publishing Company, paper $1.45.

7.6 b Goldberg, Samuel. Probability: An Introduction Englewood Cliffs, New Jersey, Prentice-Hall, 1960, $10.60, text ed. $7.95.

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

7.7 a Cramér, Harald. The Elements of Probability Theory and Some of Its Applications. New York, J. Wiley and Sons, 1955. $7.00.

7.7 b Gnedenko, Boris V. Theory of Probability, trans. by E. D. Seckler. New York, Chelsea Publishing Company, 1962, $8.75.

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

7.8 a Hodges, J. L. and Lehmann, E. L. Basic Concepts of Probability and Statistics. San Francisco, California, Holden-Day, Inc., 1964, $6.95.

7.8 b Mosteller, Frederick; Rourke, R.E.K. and Thomas, G. B. Probability with Statistical Applications. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1961, $8.75.

7.8 c Neyman, Jerzy. First Course in Probability and Statistics. New York, Holt, Rinehart and Winston, Inc., 1950, $6.50.

7.8 d Wolf, Frank Louis. Elements of Probability and Statistics. New York, McGraw-Hill Book Company, 1962, $7.95, answers $1.00.

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

7.9 a Hogg, Robert V. and Craig, A. T. Introduction to Mathematical Statistics. New York, Macmillan Company, 1959, $6.95.

7.9 b Lindgren, Bernard William. Statistical Theory. New York, Macmillan Company, 1962, $7.95.

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

7.10 a Brunk, Hugh Daniel. Introduction to Mathematical Statistics, 2nd ed. New York, Blaisdell Publishing Company, 1964, $8.00.

7.10 b Mood, Alexander M. and Graybill, F. A. Introduction to the Theory of Statistics, 2nd ed. New York, McGraw-Hill Book Company, 1963, $8.95, answers $0.75.

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, 1952 (reprint) $19.95 set.

8.2 Hardy, Godfrey H. and Wright, E. M. An Introduction to the Theory of Numbers, 4th ed. New York, Oxford University Press, 1960, $7.70.

8.3 Niven, Ivan. Irrational Numbers (Carus Monograph No. 11). The Mathematical Association of America. New York, J. Wiley and Sons, 1956, $4.00.

8.4 Ore, Oystein. Number Theory and Its History. New York, McGraw-Hill Book Company, 1948, $7.50.

8.5 Pollard, Harry S. The Theory of Algebraic Numbers (Carus Monograph No. 9). The Mathematical Association of America. New York, J. Wiley and Sons, 1950, $4.00.

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

8.6 a Jones, Burton W. The Theory of Numbers. New York, Holt, Rinehart and Winston, Inc., 1955, $3.75.

8.6 b LeVeque, William Judson. Elementary Theory of Numbers. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1962, $5.00.

8.6 c Stewart, Bonnie Madison. Theory of Numbers, 2nd ed. New York, Macmillan Company, 1964, $8.50.

8.6 d Wright, Harry Nable. First Course in the Theory of Numbers. New York, J. Wiley and Sons, 1939, $3.50.

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

8.7 a Landau, Edmund G. H. Elementary Number Theory, trans. by Jacob E. Goodman. New York, Chelsea Publishing Company, 1958, $4.95.

8.7 b LeVeque, William Judson. Topics in Number Theory, Vols. I,II. Reading, Massachusetts, Addison-Wesley Publishing Co.,Inc., 1956, Vol. I $7.75, Vol. II $8.50.

8.7 c Nagell, Trygve. Introduction to Number Theory, reprint, 2nd ed. New York, Chelsea Publishing Company, 1964, $5.50.

8.7 d Niven, Ivan and Zuckerman, H. S. An Introduction to the Theory of Numbers. New York, J. Wiley and Sons, 1960, $6.25.

8.7 e Rademacher, Hans A. Lectures on Elementary Number Theory. New York, Blaisdell Publishing Company, 1964, $6.50.

8.7 f Uspensky, James V. and Heaslet, M. A. Elementary Number Theory. New York, McGraw-Hill Book Company, 1939, $7.75.

8.7 g Vinogradov, Ivan M. Elements of Number Theory, trans. from the 5th rev. ed. by Saul Kravetz. New York, Dover Publications, 1954, $3.00, paper $1.60; 6th ed. trans. by H. Popova, 1955, New York, Pergamon Press, $3.00.

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 Co.,Inc., 1963, $8.75.

9.2 Blumenthal, Leonard M. A Modern View of Geometry. San Francisco, California, W. H. Freeman and Company, 1961, paper $2.25.

9.3 Burkill, J. C. and Cundy, H. M. Mathematical Scholarship Problems. New York, Cambridge University Press, 1961, $1.50.

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, $7.95.

9.5 Hadamard, Jacques. Psychology of Invention in the Mathematical Field. New York, Dover Publications, 1954, paper $1.25.

9.6 Hall, Henry S. and Knight, S. R. Higher Algebra, 4th ed. New York, St. Martin's Press, 1932, $2.75; key $2.75.

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, Macmillan Company, 1963, $6.00.

9.9 Kac, Mark. Statistical Independence in Probability, Analysis and Number Theory (Carus Monograph No. 12). New York, J. Wiley and Sons, 1959, $4.00.

9.10 Klein, Felix. Elementary Mathematics from an Advanced Standpoint, trans. from the German 3rd ed., Vols. I, II. New York, Dover Publications, 1961, Vol. I, Arithmetic, Algebra, Analysis, 1924, paper $1.85; Vol. II, Geometry, 1939, paper $1.75.

9.11 National Council of Teachers of Mathematics. Insights into Modern Mathematics, ed. by Lynwood F. Wren, 1957; 23 yearbook $5.75.

9.12 Newman, James R. The World of Mathematics, 4 Vols. New York, Simon and Schuster, Inc., $25.00 set; paper $9.95 set. Vol. I, Men and Numbers, paper $2.95; Vol. II, World of Laws and the World of Chance, paper $2.75; Vol. III, Mathematical Way of Thinking, paper $2.45; Vol. IV, Machines, Music and Puzzles, paper $2.25.

9.13 Pólya, George. How to Solve It, 2nd ed. New York, Doubleday and Company, 1957, paper $0.95.

9.14 Saaty, Thomas L. Lectures on Modern Mathematics, Vol.I,II, III. New York, J. Wiley and Sons, Vol. I, 1963, $5.75; Vol. II, 1964, $5.75; Vol. III, 1965, $5.75.

9.15 Stein. Sherman, K. Mathematics: The Man-made Universe. San Francisco, California, W. H. Freeman and Company, 1963, $6.50.

9.16 Steinhaus, H. One Hundred Problems in Elementary Mathematics. New York, Basic Books, 1964, $4.95.

9.17 Toeplitz, Otto. The Calculus: A Genetic Approach, trans. by Luise Lange. Chicago, Illinois, University of Chicago Press, 1963, $6.50, paper $1.95.

9.18 Ulam, Stanislaw. A Collection of Mathematical Problems. New York, Interscience, 1960, $5.00.

9.19 van der Waerden, Bartel L. Science Awakening, trans. by Arnold Dresden. New York, Oxford University Press, 1961, $7.50.

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, paper $1.95; New York, Atheneum Publishers, 1953, paper $1.65; Gloucester, Massachusetts, Peter Smith Publisher, $4.00.

9.21 Williams, John Davis. The Compleat Strategyst. New York, McGraw-Hill Book Company, 1954, $5.95.

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

9.22 a Ball, Walter W. R. Mathematical Recreations and Essays. New York, Macmillan Company, 1939, $6.00; paper $1.95.

9.22 b Gardner, Martin, editor. Scientific American Book of Mathematical Puzzles and Diversions, Vol. I,II. New York, Simon and Schuster, Vol. I,1964, $3.50, paper $1.45; Vol. II, 1961, $3.95.

9.22 c Kraitchik, Maurice. Mathematical Recreations, 2nd ed. New York, Dover Publications, 1942, $1.75.

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

9.23 a Pólya, George. Mathematics and Plausible Reasoning, Vols. I, II. Princeton, New Jersey, Princeton University Press, 1954, $9.00 set. Vol. I, Induction and Analogy in Mathematics, $5.50; Vol. II, Patterns of Plausible Inference, $4.50.

9.23 b Pólya, George. Mathematical Discovery New York, J. Wiley and Sons, 1962, $4.25.

9.24 Shklarsky, D. O., Chentzov, N. N., and Yaglom, I. M. The USSR Olympiad Problem Book, ed. by I. Sussman, trans. by J. Maykovich. San Francisco, California, W. H. Freeman and Company, 1962, $9.00.

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 headings.

JOURNALS

The American Mathematical Monthly. Buffalo, New York: The Mathematical Association of America, Inc., SUNY at Buffalo, ten issues per year; $6.00 per year for members of MAA; $10.00 for nonmembers.

Mathematical Gazette. London, England: G. Bell and Sons, Ltd., Mathematical Association, 21 shillings (about $2.95) per year; five issues per year.

Mathematics Magazine. Buffalo, New York: The Mathematical Association of America, Inc., SUNY at Buffalo, published bimonthly except July and August, 2 years for $5.00 for members of MAA, $3.00 per year for nonmembers.

Scripta Mathematica. New York: Yeshiva University, $4.00 per year, published quarterly.

SIAM Review. Philadelphia, Pennsylvania: Society for Industrial and Applied Mathematics, Box 7541, published quarterly (January, April, July, and October), $10.00 per year.

The Mathematics Teacher. Washington 36, D. C.: National Council of Teachers of Mathematics, 1201 Sixteenth Street, N. W., eight issues per year; $5.00 per year for members of NCTM; $7.00 per year for institutions.

SERIES

Series of excellent inexpensive books exist, whose inclusion in a library for undergraduates is suggested. Individual volumes 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). New York: Holt, Rinehart and Winston, Inc. This is a series of small books that forms excellent supplements to standard junior and senior level courses. Ten volumes have been issued, priced between $1.50 and $4.00.

Blaisdell Scientific Paperbacks. New York: Blaisdell Publishing Company. This is a series of six small pamphlets that are translations of the Russian series, "Popular Lectures in Mathematics," selling at $0.95 each.

The Carus Mathematical Monographs. Buffalo, New York: The Mathematical Association of America, Inc., SUNY at Buffalo. There are now fourteen volumes in this series selling at $4.00 each.

Library of Mathematics. London: Routledge and Kegan Paul. Available from the Free Press, New York. These are small paperback books covering a wide variety of topics at quite elementary levels. Some thirteen books have been published at a price of $1.25 each.

The MAA Studies in Mathematics. Buffalo, New York: The Mathematical Association of America, SUNY at Buffalo. These books sell for $4.00 each through Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

School Mathematics Study Group New Mathematical Library. New York: Random House, Inc. This is a series of monographs selling at $1.95 each.

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

Topics in Mathematics. D. C. Heath and Company, Boston, Massachusetts. 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 provide 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 supplements to the 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 Buffalo office at $1.25 each.

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.

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