THE WASHINGTON CONFERENCE

A conference to review the program of the Association and to formulate a plan of action was held at the Burlington Hotel, Washington, D. C., from May 16 to 18, 1958. The expenses incurred in holding the conference and in publishing its proceedings have been paid by means of a grant from the National Science Foundation. Invitations to attend the conference were sent to the officers of the Association, to the members of the Committee on the Undergraduate Program in Mathematics and of the Committee to Review the Activities of the Association, and to representatives of other interested groups.

The following thirty-three persons attended the conference:

E. G. Begle	Yale University
R. C. Buck	University of Wisconsin
E. A. Cameron	University of North Carolina
W. B. Carver	Cornell University
L. W. Cohen	National Science Foundation
C. W. Curtis	University of Wisconsin
R. L. Davis	University of Virginia
W. L. Duren	University of Virginia
H. P. Fawcett	Ohio State University
H. M. Gehman	University of Buffalo
R. D. James	University of British Columbia
B. W. Jones	University of Colorado
J. R. Mayor	American Association for the Advancement of Science
E. J. McShane	University of Virginia
A. E. Meder	Rutgers University
L. J. Montzingo	University of Buffalo
L. W. Nelson	Fund for the Advancement of Education
G. B. Price	University of Kansas
A. L. Putnam	University of Chicago
Tibor Rado	Ohio State University
Mina Rees	Hunter College
G. A. Rietz	General Electric Company
R. D. Schafer	University of Connecticut
M. A. Shader	International Business Machines Corporation
M. F. Smiley	University of Iowa
Rothwell Stephens	Knox College
R. R. Stoll	Oberlin College
Patrick Suppes	Stanford University
G. B. Thomas, Jr.	Massachusetts Institute of Technology
A. W. Tucker	Princeton University
E. D. Vinogradoff	President's Committee on Scientists and Engineers
S. S. Wilks	Princeton University
Dael Wolfle	American Association for the Advancement of Science

The topics discussed at the conference were grouped under these five headings: I. What the Nation Needs in the Area of Responsibility of the M.A.A.; II. Programs Required to Fill These Needs; III. Modernization of the M.A.A.'s Organization, Staff, and Headquarters; IV. The Funds Required; V. A Plan of Action.

Members of the Conference were invited to prepare working papers on topics coming under the above headings. Most of these papers were mimeographed and distributed to participants in advance of the meeting. Summaries of the prepared papers and of some of the discussions are given herewith.

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Price: Purpose of the Conference. The purpose of the Conference is to study some of the problems created by the revolution in mathematics and to seek solutions for them. The revolution in mathematics and the rapidly increasing enrollments in high schools and colleges have resulted in unprecedented needs for mathematics teachers in high school and college, mathematicians for industry, preparation of students for graduate work in mathematics, modernized college mathematics courses, undergraduate programs for the training of mathematicians, textbooks from which the modernized mathematics courses can be taught, development of film and television aids to teaching, more efficient methods of instruction (such as the teaching of large sections), and expositions designed to help assimilate mathematical research into the body of common knowledge.

Besides considering the nation's needs in mathematics and programs which will help to satisfy them, some means must be found for initiating, organizing, operating, and supervising these programs. The Conference is to consider also the role of the M.A.A. as a professional organization and an operating agency.

The rapid growth of the Association in recent years has emphasized its strength and the appeal of its program, but growth has also brought problems. There are now approximately 7500 members, with a membership of 12,000 to 15,000 indicated by 1970. Approximately 23% of the members are now employed in business, industrial, and government positions.

The Association's program and responsibilities have undergone explosive growth, but there has been no corresponding growth in its staff, facilities, and ability to deal with its problems. The transition from an organization operated by a volunteer staff in donated headquarters space to one operated by a paid professional staff in rented quarters has begun. Nevertheless the officers of the Association are for the most part still chairmen of departments of mathematics. The Association needs leaders who have the time required to organize new activities and to locate the personnel and funds to operate them.

This Conference should study the nation's needs in mathematics and plan a program for the Association, and it should also seek ways to strengthen the M.A.A. so that it is equal to the tasks which lie before it.

Jones: Visiting Lectureship Programs of the M.A.A. Since 1954, the Association has administered, with the support of the National Science Foundation, a Visiting Lectureship Program for colleges. Its general aims are to strengthen and stimulate the mathematics programs of the colleges, to provide personal contacts with productive and creative mathematicians to staff members and students in the colleges, and to aid in motivating able college students to consider careers in mathematics.

A feature of the program has been its adaptability to local needs. In addition to formal lectures, each lecturer has conferred with students on future opportunities for study and employment, discussed problems of teaching and curriculum with faculty, disseminated information about what is going on elsewhere in the field of mathematics, and talked with administrators.

During the past four years there have been 16 lecturers, spending a total of 34 months on tour, and visiting a total of 270 institutions. During 1958–59 there are plans for 8 lecturers for a total of 14 months.

Visiting lectureship programs for high schools have been sponsored by the Kentucky and Northern California Sections of the Association, resulting in increased interest in mathematics among high school students, teachers, and administrators. The Association expects to sponsor a secondary school lectureship program on a wider scale starting in September 1958.

Buck: Mathematical Competitions. The reasons for initiating high school mathematical contests on a statewide or national basis are: to give official recognition by awards, presented in the name of the M.A.A., to some of the better students now taking mathematics courses; to discover and encourage talented students; to motivate students to

take additional mathematics courses; to encourage highly-gifted students to consider mathematics as a career; to give tactful guidance to the high school curriculum by indicating the level of competence that could be expected of the better students.

Several different types of examinations have been used to achieve these objectives. Since students differ in the amount of preparation, one method is to offer the contest at two levels depending on courses completed. Another solution is to devise a test which could be passed successfully by a very able sophomore, but could not be passed by an *average* senior with four years of mathematics. The Wisconsin Section has chosen this solution.

Two types of examination have been used: the *achievement* type and the *aptitude* type. The achievement type is characterized as a multiple choice test which attempts to measure a wide sampling of basic concepts and skills. The questions are of varying difficulty and are drawn from standard subject matter. It can be machine graded and is especially suited to a large-scale contest. The aptitude type is marked by an emphasis upon originality and insight rather than upon routine competence. It does not seem possible to design a multiple choice test of this type. This poses a difficult problem in the administration and grading of such a test where large numbers of entrants are involved.

A modification of the current national competition is proposed under which the contest would have two stages. The Preliminary would be held in February and would be a multiple choice test given in the high schools and proctored by local teachers. Since this test is to serve as a selection screen for the Final, the level should be set to select approximately the top 5% of the entrants. Statewide and local winners might be announced on the basis of the Preliminary examination. The Final Contest would be held at certain centers scattered through each state, usually at colleges and universities. This examination would be of the aptitude type. National awards and prizes of substantial value would be awarded on the basis of the Final Contest.

A summary was given of the Mathematical Olympiads of the U.S.S.R., the Eötvös Competition in Hungary, the Stanford University Competitive Examination, and the contests sponsored by the Wisconsin Section and the Metropolitan New York Section of the M.A.A., and by the National Committee of the M.A.A. in 1958 with the cooperation of the Society of Actuaries.

Discussion: Professor Rado stated that the problems in the Eötvös Competition were set by research mathematicians and that great prestige was attached to winning an Eötvös examination.

The Putnam Competition for undergraduates in colleges and universities was described as an example of an aptitude type of examination.

Meder: Textbooks. There are three types of courses for which syllabi, textbooks, and other teaching materials are needed: college freshman courses, major courses for prospective high school teachers, and other unconventional undergraduate courses. It would be an appropriate activity of the Association to issue a report discussing possible syllabi for freshman courses and the relative advantages of each; to appoint a committee to study the proper content for courses for prospective teachers and to make recommendations and prepare teaching materials; and finally to suggest and outline various types of unconventional courses. There is needed an overall directing committee, working committees in each major area, and specific production groups. Actual publication of the books written by these groups might be undertaken by the Association.

Begle: Textbooks. A writing group to produce a series of sample high school texts will assemble at Yale University in the summer of 1958. The group will consist of both high school and university teachers. It is hoped that first drafts of the texts will be completed by the summer of 1959 and that these texts will influence commercially-published books thereafter.

It is planned also to publish monographs on topics not ordinarily taught in the high schools. They are to be written by eminent mathematicians and are intended for the

better students, their teachers and the educated public. Texts for junior high school pupils will probably be written later.

Discussion: The need for both new textbooks and teachers manuals at the high school level was mentioned. The need for better preparation of prospective teachers was emphasized, as well as for upgrading of present high school teachers. Professor Fawcett stated that teachers are sincere and earnest in wanting to study more mathematics, but need special courses which are not often available.

Price: Summer Institutes. The National Science Foundation is supporting a major program of summer institutes for high school and college teachers of mathematics. In some cases demonstration classes of high school students have been employed with great effectiveness in conjunction with the institutes for teachers.

The institutes have been highly successful in accomplishing the purposes for which they were established. The participants have been brought into contact with current mathematics, and the encouragement and recognition they have received as participants have been highly stimulating.

Two trends have been observed which should be reversed: first, summer institutes for college teachers of mathematics have been almost completely eliminated; second, the number of summer institutes in mathematics, relative to the number in other fields, has been decreased. Because of the large number of high school teachers of mathematics and the importance of the subject, the percentage of institutes in mathematics is obviously too small.

If there should be a significant increase in the number of summer institutes in mathematics in 1959, the Association should stand ready to give help and advice concerning the planning, organization, and operation of these institutes.

Mayor: Summer Institutes. It has been estimated that there are 150,000 secondary school teachers of science and mathematics and that more than half of these are teachers of mathematics. This situation should be recognized in planning for summer institutes, and a much larger part should be institutes for mathematics teachers alone.

While it is true that in a considerable number of summer institutes mathematics courses were offered along with science courses, it appears that in many institutes a first consideration was for science. While all would recognize that it is important for mathematics teachers to study science as well as mathematics, it appears more important, in this time of curriculum modernization, that secondary school mathematics teachers be provided the opportunity in a summer institute to give their full-time study to the field of mathematics.

Discussion: Mention was made of other N.S.F. institutes, such as Academic Year Institutes and In-Service Institutes, also of institutes sponsored by industry, such as General Electric and Shell. It was suggested that a series of institutes be established, each emphasizing the applications of mathematics to one of the social or physical sciences.

Suppes: Some Possible Revisions of Mathematics Curricula. At Stanford University a course in calculus, not including foundations or set theory, has been given for behavioral scientists for the past four years. Emphasis is placed on probability, which seems to be most useful to the students, and which provides many nontrivial examples of application. Possibly material in probability theory will be introduced into the regular calculus sequence. Material on applications is needed for a number of other courses, such as matrix theory, where the students are mainly electrical engineers, physicists, and psychologists.

The acceleration of high school mathematics programs raises the problem of advanced standing in college. On the other hand is the problem of the large amount of remedial mathematics now done in college, particularly at state universities.

Finally there is the problem of the mathematical education of gifted children. Experiments are under way in the teaching of mathematical logic to sixth, seventh, and eighth

graders and in the teaching of plane geometry constructions to first graders. The present mathematical curriculum realizes a pitifully small part of the mathematical potential of the abler students.

Cameron: Undergraduate Honors Programs in Mathematics. Honors programs constitute one of the ways in which American colleges and universities attempt to solve the difficult problem of providing appropriate training for the more able students in a system committed to the education of all the people. Traditionally, honors programs have been limited to the upper years of college and they have consisted principally of a considerable amount of solitary study on the part of the student. There appears to be an increased interest in a rather different form of honors work.

Swarthmore has long been known for its honors work in several fields. More recently, Carleton and Dartmouth Colleges have inaugurated some very exciting honors programs in mathematics. These programs start with the freshman year and provide special attention for superior students throughout the four years of college. In these programs special work is not limited to individual study. The top students are together in classes or seminars with their peers for much of their work.

The importance of starting special work for gifted students in the freshman year should be emphasized. Many promising mathematics students have been lost by being subjected to dull and uninspiring first-year courses.

The Advanced Placement Program should have a direct influence on undergraduate honors programs. Talented students entering college with advanced training in mathematics constitute likely candidates for honors work. The proper education of superior students, from which group the mathematicians of the future must come, is surely a matter of great concern to us all.

Rees: Recruiting of Teachers of Mathematics. The extent of the need for additional teachers of mathematics was discussed. A solution is to recruit into mathematics those who are committed to teaching as a career but in a field where the need for teachers is less urgent. The long range problem requires that we interest more students in mathematics as a career, and that we provide better training for these students. We need better-equipped teachers who are assisted throughout their careers to remain alert and interested.

To interest more high school students in the study of mathematics requires beneficial relations between college faculty members and high school teachers. Even more important are contacts with high school guidance counselors, who need to be equipped to give sound advice to young people about the nature of a career in mathematics.

Another plan is to use lecturers to promote an interest in mathematics, especially lecturers from industry. Books and monographs afford another method for arousing interest.

Thomas: Expanded Programs at Meetings of the M.A.A. Five years ago the typical summer and annual meeting of the Association consisted of two half-day sessions either preceding or following the meetings of the Society. Since 1957 the summer meeting has been scheduled for four days, from Monday to Thursday, overlapping the meetings of the Society but avoiding conflicts with the general sessions of the Society. Similarly the Annual Meeting of January 1958 consisted of three sessions. The change in time of the Annual Meeting from December to January did not discourage attendance.

The reasons for the expanded programs of meetings is due to the increase in the membership of the Association, the broadening of interests of the membership, and the increase in the activities in which the M.A.A. is engaged.

Meetings of Sections are either one-day or two-day meetings. The variety of topics covered roughly parallels that at national meetings, with closer cooperation between college and high school groups, and, in particular, attention to matters of local responsibility and activity.

Meetings of the Association provide us with a variety of experiences. We renew

acquaintances, we talk shop, we make new friends, we become informed of what the various committees and projects of the Association are doing, we have the opportunity to learn something new in mathematics, and we may pick up some pointers on curriculum or on teaching which will make us more effective teachers. The longer meetings provide increased opportunities for us to realize the benefits of the experience just described.

Curtis: Expository Writing. It is suggested that a new expository journal be established under the auspices of the Association, each number to consist of a single article, to be self-contained, and to include a reasonably comprehensive account of its subject. Some articles should be aimed at research mathematicians, some at undergraduates or high school teachers. Substantial royalty payments should be made to authors.

It was also recommended that the Association publish lists of recommended books and articles with brief critical comments.

Buck: Expository Writing. Three separate expository series of books are suggested: Monographs of high-level expositions directed toward the active research mathematician who desires a survey of the present state of a restricted area of mathematics; college-level expository articles; high-school-level series.

Discussion: The concensus was favorable toward the idea of a journal or a series of books of the types discussed, but the difficulty in obtaining authors for the present Carus Monographs and Slaught Papers seemed to make it unwise to attempt to expand the present program of expository publications of the Association. It was pointed out that the most economical method of putting mathematical material into the hands of a large group was through publication in the MONTHLY rather than through the establishment of new periodicals or series of books.

In connection with expository writing, attention was called to the Chauvenet Prize awarded every three years by the M.A.A. for an outstanding expository article.

James: Publication Program of the M.A.A. The official journal of the Association, the American Mathematical Monthly, is issued ten times a year. Usually there is a supplement in the form of a Slaught Paper, although in 1957 there were two supplements, a Slaught Paper and the Dunkel Problem Book. The total number of printed pages (not including advertisements) was 760 in 1956 and 778 in 1957.

There is a waiting period of about a year for all accepted articles. This time interval is too long. Since the volume of mathematical material will increase, some thought should be given to the possibility of eliminating or reducing some departments of the MONTHLY.

The section on News and Notices, and the department of Official Reports and Communications of the M.A.A. might be eliminated or reduced in size. There is nothing in the by-laws that makes it mandatory to publish either the names of new members or reports of Section meetings. The question of the publication of book reviews that may be duplicated in other journals is a more difficult one.

The Association might very well consider increasing publication to twelve issues a year and including more 96-page issues. (The normal size is 80 pages.)

For expository articles, it would seem desirable to concentrate on expanding the series of Slaught Papers. It is difficult to persuade mathematicians to write expository articles, and it is by no means certain that payment for writing is the answer.

The editor is responsible for the acceptance of main articles, and the section editors for the material in their respective sections. It is clear that eventually the Association should have a central editorial office where the routine work of marking manuscript and reading proof can be done. Such an office will probably be required before the end of the term of office of the present editor.

Price: Facilities for Departments of Mathematics. The revolution in mathematics has greatly increased the needs of departments of mathematics for adequate department offices, offices for staff members, secretarial assistance, and special equipment and special facilities of various kinds. Buildings for departments of mathematics are still a rarity, and the problem of facilities for departments of mathematics is largely ignored.

Departments of Mathematics are asked to teach and to produce research. Research reports must be prepared and issued. Summer institutes must be organized and operated. Courses must be revised and text materials must be written and reproduced for class use. Staffs have become large and the administration of departments of mathematics has become burdensome. Proper facilities of all kinds would greatly increase the effectiveness of the nation's limited supply of mathematicians.

Davis and Tucker: Committee on the Undergraduate Program in Mathematics. The present committee has asked to be discharged as of September 1, 1958. It is expected that the committee will be reorganized on a larger scale.

During the five years of its existence, the committee has published four volumes of experimental textbook material: *Universal Mathematics* (two parts) and *Modern Mathematical Methods and Models* (two volumes). *Universal Mathematics* is now out of print but has been rewritten and will be available before the end of 1958. Artin's notes on *A Freshman Honors Course in Calculus and Analytic Geometry* have also been published by the C.U.P.

Gehman: Brief History of the M.A.A. The Mathematical Association of America was organized in December 1915 to cultivate collegiate mathematics (as contrasted with secondary mathematics and with mathematical research). It adopted as its official journal the American Mathematical Monthly, founded by B. F. Finkel in 1894. The object of the Association is, briefly, to assist in promoting the interests of mathematics. Membership is open to anyone interested in the field of mathematics.

With a Board of Governors of 42 persons, and 27 Sections with three officers each, there are (in spite of duplications) over 100 persons officially connected with the government of the Association. This is desirable; it encourages the feeling of loyalty that most members have for the Association.

Sections should be established in individual states, rather than having a Section include several states. As the number of Sections increases, a change in the form of government may be needed with an enlarged Executive Committee acting as a legislative body, and a Board of Governors consisting of sectional representatives and members-at-large acting merely in an advisory capacity.

It is recommended that the By-laws of the Association be amended as soon as possible to provide for the separation of the offices of Secretary and Treasurer. In time the Association will need a full-time paid Business Manager or Executive Director. In the case of the Editor, the Secretary, and the Treasurer, financial arrangements should be made with his institution to relieve him of part of his teaching load.

The Association holds various permanent funds, largely as bequests, whose income is used to support the publication program of the Association. The General Fund, amounting to $40,000, represents the surplus which has accumulated since 1915 because the cost per member was for many years less than the amount charged for dues. The cost of operation has been low because of the contributions of time and money made by many mathematicians. The magnitude of the operations now conducted by the Association requires more time on the part of its officers and hence requires greater financial support.

Mayor: Paid Executive Staff and Office for M.A.A. The recommendation that the M.A.A. establish a permanent, paid executive staff functioning under elected officers and a permanent national office in Washington is based on the need for a national organization, which will have as a principal purpose the improvement of mathematics education at the college level, and the need for a person in a full-time administrative position in Washington to represent mathematics. Many meetings concerned with science and mathematics education during the past three years in Washington have had no official representative of mathematics. This has resulted in mathematics failing to receive its needed share of attention in the development of programs.

Discussion: Wilks described the organization of the Washington office of the Ameri-

can Statistical Association. Cohen urged the establishment of an office of the M.A.A. in the Washington area. It was pointed out that the matter of public relations might be cared for through the establishment of a Washington office of the Conference Board of the Mathematical Sciences.

Stephens: The Role of the Sections in the M.A.A. A program by which the central organization might strengthen the Sections would include the establishment of a Vice-President for Sectional Affairs whose sole function would be to promote the welfare of the Sections. The MONTHLY should carry reports on important activities of Sections. Funds available to Sections should be increased. Each Section should be urged to establish a Committee to Study the Activities of the Section. The Association should recommend to the Sections speakers who are informed on and active in the Association's work.

Many of the Association's current activities have had their origins in the Sections, such as the contest for high school students, and the visiting lectureship program for high schools. But more can be done. Sections should interest themselves in providing increased facilities in mathematics for the gifted student. They can urge the establishment of courses, assist with Science Fairs in making mathematics an integral part of the exhibit, provide awards for outstanding college undergraduates, and can speed revision of the curriculum by sponsoring intensive courses on phases of mathematics not generally known by a good segment of the teaching profession.

Stoll: What is the Role of the Sections of the M.A.A.? At the organization meeting of the Association in 1915 three Sections were organized. Within ten years, seventeen Sections were in operation. At present there are 27 Sections covering all of the U. S. and Canada.

Section meetings show a great diversity in nature. The majority tend to offer a balance of talks on new mathematics, collegiate mathematics, and applied mathematics. Currently there is great interest and concern with high school mathematics and related subjects. A Section might indulge in self-help by providing that its members be well informed on the current emphasis in mathematical research and new applications of mathematics. It might help others by assuming an active role in the revolution that is currently underway in the high school mathematics curriculum. The program now under way in certain Sections to stimulate interest in mathematics and to encourage exceptional students in high schools could be greatly extended.

There are opportunites for a Section to perform a service at the state level by cooperating with state agencies and other scientific societies in overcoming existing deficiencies in the training of secondary teachers.

Mayor: State Programs for the Improvement of Science and Mathematics Education. It is probable that Federal funds will become available during the next few years to assist State Academies of Science in the development of programs for the improvement of science education. It is important that such activities include mathematics. Since many of the Academies do not include mathematics sections, some planning should be done to provide for cooperative programs involving the State Academies and the Sections of the M.A.A. It is recommended that the Sections seek opportunities to work in cooperation with other scientific societies and with State Academies.

Mayor: M.A.A. and National Council of Teachers of Mathematics. It would be desirable that these two organizations sponsor a number of joint committees and that they publish jointly certain publications of interest to secondary and college teachers. At least one annual meeting should be a joint meeting of the two organizations, and within the states, one meeting of the Section of the M.A.A. and the affiliated group of the N.C.T.M. should be held jointly each year.

Mayor: Membership. Substantial gains in membership of M.A.A. have been made in the past five years. Ways and means should be investigated to bring about an increase in membership. A few possibilities are: organization of special campaigns to be conducted by the Sections of the Association, joint meetings with other groups, solicita-

tion of membership during summer and academic year institutes, and by asking each present member to obtain one additional member.

RESOLUTIONS ADOPTED BY THE WASHINGTON CONFERENCE

A. *Resolutions on Institutes*

1. The Secretary is instructed to transmit the following resolution to the appropriate committees of the Congress:

Whereas the National Science Foundation has found it possible to support institutes for college teachers of mathematics and science only to an extent completely inadequate to meet existing needs, and

Whereas there is great need for these institutes both to bring about improvement in collegiate instruction and to undergird the recent widespread activity directed toward the improvement of secondary school programs in mathematics and science, and

Whereas institutes for college teachers may be considered essential in effecting improved preparation of new teachers of mathematics and science on all levels, therefore

Be it resolved that the Congress be requested to increase the discretionary power of the National Science Foundation in allotting funds for institutes for college teachers of science and mathematics, and

Be it further resolved that the Congress be requested to increase the funds available to the National Science Foundation so that this program may be instituted without detracting from the secondary school institute program, and

Be it further resolved that the Washington Conference support the request of the National Science Foundation for support of the expanded programs of institutes for teachers of science and mathematics.

2. The Secretary is instructed to transmit the following resolution to Dr. Alan T. Waterman, Director of the National Science Foundation.

Whereas more than half of the approximately 150,000 science and mathematics teachers in secondary schools in the U. S. are teachers of mathematics, and

Whereas, the needs of mathematics teachers are often inadequately met by combined science-mathematics institutes, and

Whereas, in the summer of 1958 only 13 out of 125 institutes are in mathematics, therefore

Be it resolved that the Washington Conference recommends that at least one-third of all institutes in the summer of 1959 provide complete programs in mathematics, under the direction of mathematicians, for mathematics teachers.

3. This Conference recommends that the President and the Secretary-Treasurer of the M.A.A. urge chairmen of departments of mathematics to submit proposals to the National Science Foundation for summer institutes in 1959, and supply them with information concerning appropriate proposals, programs, and staff.

4. Whereas this Conference believes (a) that the effectiveness of the program of summer and other institutes can be greatly enhanced if there is reasonable diversity in the objectives and programs of the several institutes, and the groups to be served by them, subject always to the fundamental principles that the institute programs shall consist essentially of the study of mathematics, and (b) that it is therefore important that institutions submitting proposals should give careful attention to formulating specific objectives for the proposed institutes and to the suitability of the program and staff for attaining them, and that the reviewing panels give weight to these matters; therefore

Be it resolved that the officers of the Association call these considerations to the attention of colleges and universities planning the establishment of institutes and urge the National Science Foundation to continue to judge proposals in the light of their stated objectives and their probable success in achieving them for the specific groups of teachers the institutes are planned to serve, and, indeed, to place increased emphasis

upon these considerations.

5. This Conference recommends that the President of the Mathematical Association of America appoint a standing committee on summer, academic year, and in-service institutes for mathematics teachers.

6. This Conference recommends to the Association's Committee on Institutes (when established in accordance with the preceding resolution) that financial support from the National Science Foundation or other foundations be sought, so that the functions of the Committee can be carried out without exclusive reliance upon volunteer activity.

B. *Resolutions on Programs of the Mathematical Association of America*

1. This Conference commends the work of the Committee on the Undergraduate Program in Mathematics, and urges that its work be continued with all possible vigor and on an expanded scale.

2. This Conference recommends to the Board of Governors of the Association that vigorous steps be taken toward more extensive publication of an expository nature, possibly including reprints of selected articles appearing in former issues of the MONTHLY and elsewhere.

3. This Conference recommends to the members of the Committee on High School Contests that they consider seriously the detailed proposals made by Professor R. C. Buck in his report on mathematical competitions, and requests that the date of the contest be much earlier than at present, not later than February 15 if possible.

4. This Conference recommends that a committee of the Association be appointed to gather and disseminate information about honors programs in mathematics.

5. This Conference recommends that a committee of the Association be appointed to distribute information about mathematics and employment in the field of mathematics to teachers, counselors and students in high schools and colleges. Especially should this committee initiate contacts with national and, through the sections, with local guidance and counselor organizations. Not only should written information be supplied but speakers should be suggested for meetings of these organizations. The publication of future editions of "Professional Opportunities in Mathematics" should be the responsibility of this committee.

6. This Conference recommends that a committee of the Association be appointed to organize and operate a Speakers Bureau. Such speakers should be drawn from business, industry, and government as well as from academic institutions and should be available to speak at secondary schools, collegiate institutions, civic organizations, and meetings of Sections of the Association. This committee should cooperate with the Sections of the Association in establishing similar activities on a sectional basis.

7. This Conference recommends that the Secretary-Treasurer request the Sections of the Association to appoint state liaison officers to deal with mathematical matters within individual states or provinces. A matter requiring immediate attention is the National Science Foundation program of support to state academies. The Conference also recommends that the Sections be urged to offer their cooperation to the state and regional academies in planning programs for which NSF support will be sought.

8. This Conference recommends that the Joint Committee on Places of Meetings invite the National Council of Teachers of Mathematics to hold its annual meeting at the time and place of the winter meetings of the Society and Association in 1960 or as early as is feasible.

C. *Resolutions on a Plan of Action*

1. This Conference recommends to the Board of Governors of the Association that the By-Laws of the Mathematical Association of America be amended so as to provide for a Secretary and a Treasurer, and an officer to be known as Executive Director, who shall be a full-time paid employee of the Association.

2. This Conference recommends that the office of the Executive Director be located in Washington, D. C., that an appropriate person be appointed to this position, and that funds be sought to support the position for an initial period of five years. The duties of the Executive Director shall be to serve as the executive officer of the Association, to carry out its policies and programs, and to serve as a liaison officer in promoting its activities. He should inform the Board of Governors of the Association of current problems and needs, desirable programs for meeting these needs, and governmental decisions affecting mathematics.

3. The Washington Conference recommends to the Conference Board of the Mathematical Sciences that the Board look to the establishment of an office in Washington coupled with the appointment of a suitable officer based there to deal on a national scale with problems and questions involving mathematics as a whole.

4. Whereas government, foundations and industry have begun to launch vast new programs of mathematical education in the public interest, and

Whereas these national and continental programs of mathematical education can be expected to grow and to involve much greater amounts of money in the future, and

Whereas the foundations and government have called upon the Mathematical Association of America to organize certain of these programs, to bring them into being, and to insure that suitable mathematical quality is maintained in them, therefore

Be it resolved that this Conference recommends to the Board of Governors a reorganization of the Association to include the formation of departments of management with men and money adequate to carry out the responsibilities assigned to them.

Specifically, special departments of the Association might now be recognized in the following existing activities:

(a) A Department of Periodical Publication charged with editing and publishing the American Mathematical Monthly, the Slaught Papers, and the Carus Monographs.

(b) A Department of the Undergraduate Program, charged with the Curricular work of the Committee on the Undergraduate Program in Mathematics, including the preparation of source material on new undergraduate courses, the urgently needed new courses for teachers, expositions, honors programs, and the promotion of curricular studies.

(c) A Department of Institutes, Visiting Lectureships, and Speakers.

(d) A Department of Competitions, charged with preparing examinations for national prize contests and conducting a service for operating such contests.

(e) A Department of Professional Guidance and Mathematical Manpower charged with the preparation and publication of guidance material on mathematical manpower and the promulgation of information on mathematical vocations and training for them which is needed by school guidance officers and industrial employment agents.

The establishment of these departments of management should meet the following requirements.

(A) Each department should have a charter approved by the Board of Governors which defines its sphere of activity. Each department should be responsible to the Board of Governors through a committee with appropriate provision for limited terms of office and rotation, including representatives of Canadian collegiate mathematics where appriate.

(B) Each department should have a Chairman whose position is guaranteed by the Association to be stable, to have professional status, and to carry a full or part-time salary adequate to attract professional mathematicians of established reputation and ability.

(C) Each department should be financed in an adequate manner.

(D) Finally, the proposed departments are not intended to duplicate the responsibilities of the central organization of the Association as carried out by the home office and the proposed Washington liaison office of the Executive Director. Nor are they intended to duplicate the work on high school text materials now being organized in an

interorganization staff of all the mathematical organizations, in which the Association may cooperate.

D. *Resolutions of thanks*

1. Whereas, the Washington Conference has been of great value to the officers and members of the Mathematical Association of America by giving an opportunity to review its past activities and to plan its future activities, and

Whereas, such a conference was made possible by a grant from the National Science Foundation, therefore

Be it resolved that those in attendance at this Conference hereby express their sincere appreciation to the Foundation for making the Conference possible.

2. This Conference votes its sincere thanks to its chairman, Professor G. Baley Price, President of the Mathematical Association of America, for having arranged the program of the Conference and for having directed its actions in such an effective manner.

Concluding Note. The resolutions were duly transmitted by the Secretary-Treasurer of the Association to the persons concerned. In particular, about 500 letters were sent in June to chairmen of departments of mathematics urging them to submit proposals to the National Science Foundation for summer institutes in 1959. A memorandum of information on N.S.F. Summer Institutes prepared by Professor E. A. Cameron was enclosed, as were announcements of two current institutes. The various resolutions on Programs of the M.A.A. and on a Plan of Action are now under consideration by the Board of Governors.

HARRY M. GEHMAN, *Secretary-Treasurer*

ON A CERTAIN FAMILY OF ARITHMETIC FUNCTIONS

PAUL J. McCARTHY, Florida State University

1. Introduction. If r is a positive integer we define the arithmetic function $T_r(n)$ in the following way: $T_r(n)$ is the number of integers k such that $1 \leq k \leq n$ and the greatest common divisor (k, n) is not divisible by the rth power of any prime. $T_1(n)$ is Euler's totient function $\phi(n)$ and the function $\rho(n) = T_2(n)$ was introduced and studied by Haviland in [3]. In this paper it is our purpose to investigate some of the arithmetic and asymptotic properties of the functions $T_r(n)$. The methods used are similar to those used to treat $\phi(n)$ and the results we obtain show that the $T_r(n)$ behave in a manner somewhat similar to their better-known relative.

Haviland [3] defined $T_2(n)$ in terms of the properties of certain arithmetic progressions. The other $T_r(n)$ may be defined in a similar manner. We shall say that an integer is r-free if it is not divisible by the rth power of any prime.

THEOREM 1. $T_1(n)$ *is the number of arithmetic progressions* $sn+k$, $k=1, \cdots ,n,$ *which have infinitely many prime terms. For* $r \geq 2$, $T_r(n)$ *is the number of these arithmetic progressions which have infinitely many r-free terms.*

When $r = 1$ this statement is an immediate consequence of Dirichlet's theo-