AFFILIATION OF THE ASSOCIATION OF TEACHERS OF MATHEMATICS IN NEW ENGLAND WITH THE MATHEMATICAL ASSOCIATION OF AMERICA

The council of the Association of Teachers of Mathematics in New England have voted to accept a plan of affiliation originating in 1925 in conferences between President J. L. Coolidge and the officers of that Association. As modified by the Trustees of the Mathematical Association and put into effect by this recent action, it is agreed

1. That the members of the Association of Teachers of Mathematics in New England may become members of the Mathematical Association of America without the payment of the customary initiation fee, the A.T.M.N.E. to supply annually to the Mathematical Association a list of new members whom the Association may invite to their membership under this special condition.

2. That it is understood that whenever the M.A.A. holds meetings in New England, the A.T.M.N.E. engages to aid in every way, and that meetings of the A.T.M.N.E. in connection with those of the M.A.A. as an affiliated organization will be welcomed.

3. That the present agreement may be terminated by either party on six months' notice.

4. That the vote by this council here recorded makes this agreement effective.

W. D. CAIRNS, *Secretary-Treasurer*.

ANNUAL MEETING OF THE ROCKY MOUNTAIN SECTION

The tenth annual meeting of the Rocky Mountain Section of the Mathematical Association of America was held at the Colorado Agricultural College at Fort Collins, Colorado, on April 16, 17. There were thirty-six present including the following seventeen members of the association: A. G. Clark, I. M. DeLong, G. W. Finley, Philip Fitch, J. C. Fitterer, H. C. Gossard, A. J. Kempner, Claribel Kendall, G. H. Light, W. V. Lovitt, S. L. Macdonald, J. Q. McNatt, L. R. Odell, O. H. Rechard, W. J. Risley, H. E. Russell, and C. H. Sisam.

The section voted to hold the next meeting at Colorado College, Colorado Springs. The secretary was instructed to invite the Association to hold a summer meeting at the University of Colorado sometime in the near future.

A committee was appointed consisting of the secretary, Miss Odell, Professor Russell, and Professor Risley to compile material on the significance and value of the study of mathematics. This material is to be published by the section.

The following officers were elected: W. V. LOVITT, chairman; W. J. RISLEY, vice-chairman; PHILIP FITCH, secretary and G. H. LIGHT, treasurer.

The section was favored Friday evening with an address "The New Heavens" by Dr. D. W. Morehouse, president of Drake University.

A complimentary dinner was served on Friday to all present, at which time President C. A. Lory of the Colorado Agricultural College delivered an address of welcome to which Professor I. M. DeLong made an appropriate response.

The following sixteen papers were read:

(1) "Report on the experiment with a standardized test in college algebra" by Professor H. C. GOSSARD.

(2) "The interpretation of errors" by Professor R. L. PARSHALL (by invitation).

(3) "Graphic solutions" by Mr. J. Q. McNATT.

(4) "Mathematical logic" by Professor H. V. CRAIG (by invitation).

(5) "Concerning d'Alembert's principle" by Professor J. C. FITTERER.

(6) "Finite trigonometric series" by Professor A. G. CLARK.

(7) "Mathematics for freshman women" by Mrs. NELLIE LANDBLOM (by invitation).

(8) "On the reliability of the composite score of a battery test" by Mr. PHILIP FITCH.

(9) "Concerning rigorous proofs" by Professor S. L. MACDONALD.

(10) "Note on the limit functions of sequences of functions of certain types" by Professor O. H. RECHARD.

(11) "The use of the discriminant in differential equations" by Professor G. H. LIGHT.

(12) "Index number bias" by Professor W. V. LOVITT.

(13) "A system of vector coordinates" by Professor H. C. GOSSARD.

(14) "On a property of the Hessians of cubic forms" by Professor C. H. SISAM.

(15) "Complex roots of equations" by Professor A. J. KEMPNER.

(16) "Root extraction with the adding machine" by Professor F. H. LOUD.

In the absence of the author, the abstract of Professor Loud's paper was read by the secretary.

Abstracts of the papers follow below, the numbers corresponding to the numbers in the list of titles.

1. A report of the experiment by the colleges and universities of the Rocky Mountain Section with a standard college algebra speed-accuracy test. This experiment under the direction of the University of Wyoming was voted to be continued through the coming year.

2. This paper dealt with the interpretation of the errors arising in results obtained from experiments on the flow of water over weirs.

3. Mr. McNatt gave some examples of the use of graphic solutions of problems in surveying.

4. The paper discussed the primitive ideas and primitive propositions of the system of Whitehead and Russell; analogies among the calculus of propositions, calculus of classes, and calculus of relations; and the definition of the cardinal numbers 1 and 2. It was shown that a class cannot be used as an argument of anyone of its determining functions and that a hierarchy of functions is necessary.

5. A résumé of its statement and presentation in various texts on mechanics and kinetics was given and it was pointed out that its function, particularly for the teacher of dynamical subjects—especially the practical applications in engineering and allied sciences, consists primarily in simplifying and reducing forces involved in accelerated systems to the field of statics. This service is comparable with the idea Monge had in descriptive geometry, of reducing solid problems to the realm of the plane; and also, as another example, with the conception involved in influence lines in the theory of structures whereby the effect of live loads is simplified to the status of dead loads.

6. Professor Clark indicated that the summation of

$$\sum_{i=1}^{n} F(i) \; \frac{\sin}{\cos} \phi(i)\theta$$

may be effected when $F(i)$ is a rational, integral polynomial by successive application of the parts formula for finite integration,

$$\Sigma u_x \Delta v_x = u_x v_x - \Sigma v_{x+1} \Delta u_x + C_1$$

provided the summation of

$$\sum_{i=1}^{n} \frac{\sin}{\cos} \phi(i)\theta$$

is possible.

When $F(i)$ is the quotient of two rational integral polynomials, the summation may be effected by setting up and solving a system of two linear differential equations, the order of the system being the same as the degree of the polynomial forming the denominator.

7. The question as presented by Mrs. Landblom was "What should be the content of a course in mathematics for freshman women and why?" Arguments set forth dealt primarily with problems arising in home life, teaching, special subjects required by curricula, as physics and chemistry, extension work, child welfare, and social settlement. The solution was given in an outline of topics to be covered in a fifty hour course.

8. In this paper it was shown that the composite score of a battery test could be reliable only if the respective scores of its elements were weighted

according to their reliability, validity and independence after having been reduced to equal spread.

9. In his paper Professor Macdonald pointed out the necessity of making conclusions definite in rigorous proofs.

10. An example was given to show that quasi-uniform convergence is not necessary in order that the existence of a limit of a sequence of functions which are pointwise discontinuous shall itself be proved. The following theorem was then proved: A sufficient condition that the limit of a sequence of functions with upper continuity shall have upper continuity is that the sequence is quasi-uniformly convergent.

11. This paper was intended to show how the discriminant can be applied to the solution of differential equations of the type $f(x,y,p)=0$ and showed how the extraneous factor, if any exists, can be detected before solving the equation.

12. Four primary systems of weighting have been devised. In the customary notation these are p_0q_0, p_0q_1, p_1q_0, p_1q_1. The speaker noted the absence of strict mathematical proofs of the assertions made as to the upward or downward bias of an index number weighted with the weights specified above. In this paper some proofs were given of bias when such exists. Professor Irving Fisher has given a proof that the unweighted arithmetic average of relative prices has an upward bias. This paper gave a new proof of this fact.

13. Professor Gossard presented a system of coordinates based upon naming the points (x) of the Gaussian plane by rotations (t) on a base circle plus such translations as called for by the given equation $x=f(t)$. The expressions arising are symmetric functions of (t) and for many types of theorems in geometry the analytic work is exceedingly simple.

14. This paper dealt with the determination of a simplified form for the equation of the Hessian of a cubic in any number of variables.

15. The roots (real and complex) of an equation $w=a_0z^n+a_1z^{n-1}+\cdots$ $a_n\neq0$, $w=u+iv$, $z=x+iy=re^{i\varphi}$, a_i real or complex, may be isolated and determined to any desired degree of accuracy in the following manner: In a rectangular system of coordinates with a φ-axis and an axis which serves at the same time for $u-$axis and $v-$axis plot, for appropriately chosen values r_i of r, the two curves $u=u(r_i,\varphi)$, $v=v(r_i,\varphi)$. From the order in which the points of intersection of the u-curve with the φ-axis and the points of intersection of the v-curve with the φ-axis follow each other, the number of roots of $w=0$ of absolute value $<r_i$ is read off by a very simple rule. The absolute values of the roots are then determined to any desired degree of accuracy.

Professor Kempner next showed how limits for the arguments of the roots may be determined. The value of the method lies in the fact that instruments

are in existence (harmonic analyzers) which will trace mechanically curves of type $u = u(r_i, \varphi) = \sum c_k \cos k(\varphi)$, $v = v(r_i, \varphi) = \sum d_k \sin k(\varphi)$.

16. This paper dealt with the employment of Newton's binomial formula as a method, and of the adding machine as an instrument, in the extraction of roots. Several cube roots were extracted, as illustrations of certain elementary and rather obvious devices for securing rapid convergence in the series, and otherwise minimizing the labor of computation. In the latter part of the paper, some of the actual records taken from the adding machine were inserted, as fuller demonstration of the method employed.

PHILIP FITCH, *Secretary*.

ELEVENTH ANNUAL MEETING OF THE OHIO SECTION

The eleventh annual meeting of the Ohio Section of the Mathematical Association of America was held at the Ohio State University, Columbus, April 2, 1926, in connection with the meetings of the Ohio College Association.

Thirty-four persons registered attendance, among whom were the following twenty-five members of the Association: R. B. Allen, C. L. Arnold, Grace M. Bareis, I. A. Barnett, H. Blumberg, R. D. Bohannan, W. D. Cairns, V. B. Caris, R. Crane, W. Dancer, O. L. Dustheimer, T. M. Focke, B. C. Glover, H. Hancock, H. W. Kuhn, S. E. Rasor, P. L. Rea, Hortense Rickard, S. A. Singer, C. E. Stout, J. H. Weaver, R. B. Wildermuth, F. B. Wiley, J. B. Winslow, B. F. Yanney.

Officers elected for the coming year were: Chairman, H. W. KUHN; Secretary-Treasurer, RUFUS CRANE; Member of Executive Committee, H. M. BEATTY; Member of Program Committee, T. M. FOCKE. A resolution was adopted expressing the appreciation of the members of the section for the life and services of the late Professor G. N. Armstrong, and their regret at his death. A committee was appointed to study the advisability of attempting to organize a new section of the American Mathematical Society, centering in Ohio. A committee was appointed to study ways and means of improving the teaching situation in the secondary schools. It is expected that the next meeting will be held on April 8, 1927.

The following papers were read:

(1) "Alphabetic symbolism applied to some operations on power series" by the Chairman, Professor R. D. BOHANNAN, Ohio State University.

(2) "Euclidean invariants of plane second degree curves" by Professor C. C. MACDUFFEE, Ohio State University.

(3) "Controversial mathematics" by Professor H. BLUMBERG, Ohio State University.