

Clubs and Allied Activities

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It is first shown that the solution of the problem depends on that of a reduced cubic equation  $x^3 - 3x - 2a = 0$  and that a construction based on these instruments leads only to certain values of a. This part is well done. It is then shown that an angle of the form  $2\pi/n$ , n an integer, can or cannot be trisected by straight edge and compasses according as n is not or is a multiple of 3. It is not shown under what restrictions on n such angles can be constructed.

The second chapter discusses a number of curves which intersect a given circle in the required points and adds the remark that infinitely many such curves exist, none of which can be constructed by the instruments allowed. This chapter is followed by one on mechanical trisectors, based on linkages, which is rather extensive. This is followed, in turn, by one on approximations. A brief historical note is added to many sections and a bibliography is given of works referred to in them. It makes no claim at being complete.

The back fly-leaf is a museum of newspaper clippings on "solutions." May this book do its part to quell the flood of trisectors.

VIRGIL SNYDER

#### **NEW BOOKS RECEIVED**

Elementary Mathematics in Artillery Fire. By J. M. Thomas. (With Tables prepared by Vincent H. Haag.) New York and London, McGraw-Hill Book Company, Inc., 1942. 11+256 pages. \$2.50.

The Trisection Problem. By R. C. Yates. Baton Rouge, La., The Franklin Press, Inc., 1942. 68 pages.

Plane and Spherical Trigonometry. By P. R. Rider. New York, The Macmillan Company, 1942. 7+180 pages. \$1.75.

An Introduction to Analytic Geometry and Calculus. By T. K. Raghavachari. Madras, Humphrey Milford and Oxford University Press, 1941. 8+192 pages. Rs 2.

# CLUBS AND ALLIED ACTIVITIES

Edited by E. H. C. Hildebrandt and J. S. Frame

Send reports of all activities, such as club reports, special features, topics with references, student papers, and other material of interest to J. S. Frame, Brown University, Providence, R. I.

### THE NIMATRON

E. U. CONDON, Westinghouse Electric and Manufacturing Co.

The Nimatron is a machine which is very skillful at playing the game of Nim. Unlike other mathematical machines, the Nimatron serves no other useful purpose than to entertain, unless it be to illustrate how a set of electrical relays can be made to make a "decision" in accordance with a fairly simple mathematical procedure. The machine was built in the spring of 1940 and was exhibited at the Westinghouse Building of the New York World's Fair, where it played more than 100,000 games and won 90,000 of them. Most of its defeats were at the hands of the exhibit attendants as demonstrations to folks who, after numerous trials, became convinced that the machine couldn't be beaten. Now it belongs to the scientific collections of the Buhl Planetarium in Pittsburgh. It was invented by



two members of the staff of the Westinghouse Research Laboratories during a long lunch hour, and considerably improved by one of the engineers of the switchgear department of the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company, where it was designed and built. The Nimatron made its last "personal appearance" at the convention of the Allied Social Science Associations in New York City under the sponsorship of the American Statistical Association and the Institute of Mathematical Statistics. Full details of the circuit diagrams together with a detailed description are given in U.S. Patent Number 2,215,544, obtainable from the U.S. Office in Washington, D.C.

*Editorial Note.* The theory of the game of Nim is due to C. L. Bouton, *Annals of Mathematics*, ser. II, vol. 3, 1901, p. 35. It was recently discussed by D. P. McIntyre, this MONTHLY, vol. 49, 1942, p. 44.

#### CLUB REPORTS 1940-41

#### PI MU EPSILON NATIONAL CONVENTION

The triennial convention of the chapters of Pi Mu Epsilon was held in Lamberton Hall of Lehigh University on Thursday, January 1, 1942 at 12:30 P.M. Twenty-nine members and friends representing ten chapters were present. Following the luncheon a short business meeting was held with Professor Shook of Lehigh presiding. Professor Shook called the roll by chapters and members present were introduced. A partial report for the nominating committee was made by Professor Owens. Dr. Moses Richardson of the Department of Mathematics of Brooklyn College addressed the convention on Some aspects of freshman mathematics, listing some of the difficulties which freshmen experience and making suggestions as to their solution. The convention closed at 2:00 P.M. with a vote of thanks to the Department of Mathematics of Lehigh University and Professor Cutler, chairman of the committee on arrangements.

### Mathematics Club, Massachusetts Institute of Technology

Five meetings were held during the year at which the following topics were discussed by members from the faculty of the departments at the Institute: *The applications of the theory of waves* by Professor Morse of the physics department, *Nomographic charts* by Mr. Adams of the graphics department, *The differential analyser* by Professor Taylor of the electrical engineering department, *Industrial statistics* by Mr. Hermistone, and *Foundations of statistics* by Professor Wadsworth of the mathematics department. Officers were: President, Charles Papas; Vice-President, O. K. Smith; Secretary-Treasurer, Earl Singleton; Program Manager, Marvin Epstein.

#### Mathematics Club, New Jersey State Teachers College at Montclair

Semi-monthly meetings were held throughout the year and the following topics were presented: Books, old and new by Professor V. S. Mallory, Complex numbers by Henry Hausdorff, Fun in mathematics by Shirley Stamer, Mathematical puzzles by Barbara Stauffer, Paper folding by Robert Maurer, Topology by Jean Monsees, Navigation by Philip Stanger, Plane linkages by Philip Egeth, Tricks with numbers by Lillian Sprung and Virginia Florin, and The duodecimal system by Carlton Michelson. Each year the club invites one of the alumni to discuss experiences in the teaching of mathematics. This year the guest speaker was Mrs. Edna H. Young of East Ruthertord High School who spoke on Teaching locus problems with the aid of models. A joint meeting of mathematics clubs in the state was held in November with representatives from the clubs at New Jersey College for Women, Rutgers University and Upsala College in attendance. Professor Richard Courant of New York University spoke on Problems of Maxima and Minima. At a joint meeting with the Science Club, Mr. E. C. Molina of the Bell Telephone Company Laboratories spoke on Mathematics in the Bell Telephone Industry. Officers were: President, John Macchi; Vice-President, Jean Monsees; Secretary, Anne Beaumont; Treasurer, Virginia Florin; Librarian, Audrey Vincentz.

Kappa Mu Epsilon, Albion College

Seven meetings were held during the year. Mathematics in radio and Mathematics in aviation were topics discussed by Ernest Longman and John Telander. Other subjects were presented as follows: Addition and subtraction of logarithms by Gerald Allen, Summation of series by Mark

Putham, Theoretical mathematics is practical by David Lawler, Pike's early American arithmetics by Margaret Ingram, Introduction of zero into the number system by Webster Sawyer, and Archimedes by Helen Shepard.

### Pi Mu Epsilon, University of Illinois

Entertaining programs were the aim of the administrative committee during the year. At the opening meeting members heard a humorous paper on the troubles of a newlywed written by Professor A. R. Crathorne entitled *Statistics in the kitchen*. On the evening of election day members took part in a mock election and revised predictions as returns of the voting were received. At a Get-Acquainted Party Dr. Pepper entertained guests with her collection of puzzles and spoke on the subject *A Yank at Oxford*. In February a talk entitled *A night with probability* by Dr. E. R. Blanche was followed by opportunities for all members to compete against gambling devices. Methods of higher algebra were used at another meeting by Professor Harry Levy in solving mathematical puzzles. Professor H. F. Moore of the College of Engineering was guest speaker at the initiation banquet and used as his topic *Wishful thinking and wishful observation*. Officers were: Director, Dr. E. R. Blanche; Adviser, Dr. Echo Pepper; Secretary, DeLos De Tar; Treasurer, Eleanor Ewing.

#### Mathematics Club, Tennessee Polytechnic Institute

Members of the club participated in a radio program entitled, Battle between the departments, consisting of a quiz program in which teams representing the mathematics and engineering departments competed. The mathematics group consisted of Robert Tate, Joseph Lane, Margaret Plumlee and Charles Tabor. Topics discussed at club meetings were: History of mathematics by Margaret Plumlee, Recent trends in arithmetic by Thurman Webb, Relation of science to mathematics by Dr. Moorman, The number system if we had six fingers by Dr. Hutchinson, Simple mathematics problems in electrical work by Mr. Duncan, Mathematics in war by Professor Mattson, Trisection of angles by Dr. Hutchinson. At the close of the year the club was accepted as the Tennessee Alpha Chapter of Kappa Mu Epsilon by the national organization. Officers were: President, K. Walthall; Vice-President, J. Lane; Corresponding Secretary, Dr. R. A. Moorman; Recording Secretary, Margaret Plumlee; Treasurer, W. Fitzgerald.

## Pi Mu Epsilon, St. Lawrence University

This chapter held regular meetings throughout the year in conjunction with the local mathematics club, *Alpha Mu Gamma*. Included among the talks were *Actuarial mathematics and the use of statistics in industry* given by Nathan Niles, *Your chance to win* by Roy Jefferey, and *Dimensional analysis* by Walter Boris. Two of the members, Stuart Wadsworth and John Boudiette, demonstrated a mechanical differentiator which they built.\* The third annual Pi Mu Epsilon Interscholastic Mathematics Contest was held on May 3, 1941, following the pattern of previous years. Schools competing are members of the Northern New York Interscholastic League which compete annually in football, basketball, and baseball. A cup was awarded to the winning high school team from Potsdam, New York, and medals were given to the three students with the highest scores: John Dooley of Ogdensburg Free Academy, John Turner of Malone Franklin Academy and Ronald Greene of Potsdam High School. Certificates of merit were also awarded to the highest ranking individual of each competing high school. Officers for the year were: President, Constance Weeks; Secretary, Cameron Geraghty; Treasurer, Gerald Bradshaw; Director, Dr. O. K. Bates.

### Mathematics Club, Chicago Teachers College

Six meetings were held during the year and the following topics were presented: The story of the calculus by George Benyek, Higher plane curves by John Conway, The teaching of mathematics

\* For references used, see this department of the MONTHLY, October 1941, p. 553. Also Scientific American Supplement No. 2093, Feb. 12, 1916; Proc. Royal Society of Edinburgh, May 1904. by Dr. Bartky, *Planetary motions* by R. R. Reynolds. The film, *Einstein's Theory of Relativity*, was presented at one program and another meeting was devoted to a description and discussion of the Isograph, slides and a motion picture film being supplied by the Bell Telephone Laboratories and the discussion led by Dr. Mansfield. Officers were: Chairman, H. J. Williams; Vice-Chairman, R. R. Reynolds; Secretary, Asta Einarson; Adviser, Dr. Ralph Mansfield.

### Kappa Mu Epsilon, Nebraska State Teachers College at Wayne

Mathematics and amateur radio work was the topic used by Gerald Wright at a fall meeting of the chapter. He based his discussion on his experiences in amateur radio work in which he holds a number of national prizes and he demonstrated his talk with some of his equipment. At another meeting, Mr. Van Bearinger told of his use of the planimeter in measuring aerial photographs while working in a soil conservation office during the summer and this work led to further study of the calculus involved. Officers were: President, J. Ahern; Vice-President, E. Klein; Treasurer, C. Winter; Secretary, Van Bearinger; Faculty Sponsor, Miss E. Marie Hove.

## Mathematics Club, Mount Mary College

In addition to attending four meetings of the Intercollegiate Mathematics Association of Milwaukee the club members held two discussion meetings, a joint meeting with the Science Club, a Christmas party and a steak fry. Topics presented were: *Diophantine analysis* by Virginia Altenhofen and *Brocard points* by Marie Hiegel. Officers were: President, Marianne Schueler; Vice-President, Marie Hiegel; Secretary-Treasurer, Margaret Weeks; Adviser, Sister Mary Felice.

### Mathematics Club, Butler University

What is mathematics and why study it? was the topic discussed by the club adviser, Mrs. Juna L. Beal at the opening meeting of the year. Later meetings were devoted to talks on *Slide rules and their uses* by Maribelle Foster, *Theory of relativity* by Robert Stump, *History of the calendar* by Jane Gibson, *Some recent discoveries pertaining to the mathematics of the ancient Babylonians* by Helen Caster, *Concepts of the calculus and their development* by Blanchalice Barrett. The final meeting was held at the Goethe Link Observatory at Brooklyn, Indiana, where Dr. Getchell gave a lecture on Astronomy. Officers were: President, Blanchalice Barrett; Vice-President, Helen Caster; Secretary, Maribelle Foster; Treasurer, Robert Stump.

### Mathematics-Physics Club, College of Saint Teresa

This organization consisted of 33 members who met bi-monthly to discuss topics in mathematics and physics. The various reports presented by both the faculty members and the students during the year were: The duo-decimal system, Spectra of molybdenum, Life of Newton, Mathematical magic, The spider lady, Culture in mathematics, Applications of the parallelogram, Telling direction by a watch. The following films were also presented: Precisely So, Elgin Tells Time, and Geometry in Action. Officers were: President, Marian Heinen; Vice-President, Mildred Bertrand; Secretary-Treasurer, Margaret Reckers; Faculty Adviser, Sister M. Thomas á Kempis.

### Mathematics Club, Boston University

At the first meeting of the year, Professor Bruce gave an illustrated lecture on his travels in India and used for his subject Algebra's Land of the Dawn. Mr. C. H. Mergendahl, head of the mathematics department of the Newton Massachusetts high school, was guest speaker at another meeting and illustrated his topic So what? with student's reactions to problems. Other subjects presented were: Natural logarithms by Mr. Gould, Magic squares by Julia Lowe, In defense of the fourth dimension by Joseph Rizzo, Algebraic series by Joseph Lahage, History of pi by Elizabeth Campbell, Life of Rene Descartes by Agnes Caneiro, Brain Teasers by Francis Scheid. The final program was an Information Please program conducted by Dr. Frye. The members also attended two meetings of the Boston Intercollegiate Mathematics Club Association held at Boston College and Regis College. Officers were: President, William Gould; Vice-President, Julia Lowe; Secretary, Elizabeth Campbell; Treasurer, Philip Nassisse; Faculty Adviser, Professor Bruce.

## Kappa Mu Epsilon, Texas Technological College

In its first year as a chapter of Kappa Mu Epsilon, ten program meetings were held. Topics included: Biographies of the mathematicians for whom the chapter officers were named, Non-Euclidean geometry by R. K. Wakerling, The coconut problem by R. S. Underwood, Division without a divisor, by E. R. Heineman, Number numerology and number theory by F. W. Sparks, Projective measurements by William Wallis, Curve tracing using Newton's diagram by Lester LaGrange, Energy transformations as a source of wealth by E. A. Hazelwood. Joe R. Foots, first president of the chapter, was appointed part-time instructor in the department of Pure Mathematics of the University of Texas. Lee Michie, another charter member, received his wings and commission as second lieutenant in the Army Air Corps at Stockton, California, on April 25,1941, and sailed from San Francisco on June 3 for the Philippine Islands. Officers were: President Lobatchewsky, William Wallis; Vice-President Agnesi, Aliene May; Secretary Noether, Marie McCrummen; Treasurer Cayley, Rance Jones; Corresponding Secretary Descartes, Mrs. Opal L. Miller; Faculty Sponsor, Dr R. K. Wakerling.

# PROBLEMS AND SOLUTIONS

Edited by Otto Dunkel, Orrin Frink, Jr., and H. S. M. Coxeter

### ELEMENTARY PROBLEMS

Send all communications concerning Elementary Problems and Solutions to H. S. M. Coxeter, 69 Chaplin Crescent, Toronto, Canada.

The department of Elementary Problems welcomes problems believed to be new, and demanding no tools beyond those ordinarily furnished in the first two years of college mathematics. To facilitate their consideration, solutions should be submitted on separate, signed sheets, within three months after publication of problems.

## PROBLEMS FOR SOLUTION

E 521. Proposed by J. R. Musselman, Western Reserve University

(a) On the sides BC and CA of a triangle ABC, construct externally any two directly similar triangles,  $CBA_1$  and  $ACB_1$ . Show that the midpoints of the three segments BC,  $A_1B_1$ , CA form a triangle directly similar to the two given triangles.

(b) On *BC* externally, and on *CA* internally, construct any two directly similar triangles  $CBA_1$  and  $CAB_1$ . Show that the midpoints of AB and  $A_1B_1$  form with *C* a triangle directly similar to the two given triangles.

E 522. Proposed by V. Thébault, San Sebastián, Spain

Find the smallest prime radix for which there exists a perfect cube of the form *abcabc*.

## E 523. Proposed by N. A. Court, University of Oklahoma

With the vertices of a given orthocentric tetrahedron (T) as centers, spheres are drawn orthogonal to a given sphere (M) concentric with the polar sphere of