the Ohio colleges and universities. The main point of interest was that the number of hours required for a mathematical major ranges from fifteen to thirty-eight hours. So wide a range indicates that the colleges are not certain as to the basic values of many courses. The author urges that more interest should be taken in geometrical subjects, such as modern geometry and descriptive geometry.

G. N. ARMSTRONG, *Secretary-Treasurer.*

ANNUAL MEETING OF THE ROCKY MOUNTAIN SECTION.

The seventh annual meeting of the Rocky Mountain section was held at the University of Colorado, Boulder, Colorado, on March 30 and 31.

The attendance was twenty-four, including the following fourteen members of the Association: I. M. DeLong, G. W. Finley, P. Fitch, J. C. Fitterer, G. W. Gorrell, C. A. Hutchinson, Claribel Kendall, O. C. Lester, G. H. Light, F. H. Loud, S. L. Macdonald, J. Q. McNatt, W. J. Risley, H. E. Russell.

The section voted to accept the invitation of the Colorado Fuel and Iron Co. to hold the next meeting at the Steel Plant in Pueblo, Colorado. Mr. J. Q. MCNATT was elected chairman for this meeting.

At the close of the Friday session, the section was favored with a talk by Dr. SAUL EPSTEEN on certain phases of the Einstein Theory.

The following nine papers were read:

(1) "Certain associativity conditions in linear algebras" by Assistant Professor CLARIBEL KENDALL. (Asst. Professor G. W. SMITH, Collaborator.)

(2) "The curve of the price of lumber" by Professor S. L. MACDONALD.

(3) "The intrinsic equation for a family of curves possessing a certain property" by Professor G. H. LIGHT.

(4) "The bearing which the work in the grades has upon college mathematics" by Professor G. W. GORRELL.

(5) "Parabolic grouping of pythagorean triangles" by Professor W. J. HAZARD.

(6) "To calculate the radius of a circle inscribed in a concave triangle" by Mr. J. Q. MCNATT.

(7) "A nomographic perpetual calendar" by Mr. W. K. NELSON.

(8) "Graphical methods for complex roots" by Professor W. J. HAZARD.

(9) "A game of solitaire for an arithmetician" by Dr. F. H. LOUD.

In the absence of the author, a paper by Professor C. H. SISAM was read by title only. All the papers led to considerable discussion. Abstracts of the papers follow below, the numbers corresponding to the numbers in the list of titles:

(1) In this paper it was shown that the associativity conditions

$$A_{ijkm} \equiv \Sigma(\gamma_{ijk}\gamma_{kim} - \gamma_{ikm}\gamma_{jik}) = 0 \qquad (i, j, k, m = 1 \cdots n)$$

for a linear algebra of order n are highly redundant. For $n = 2$ eight independent

syzygies among A_{ijkm} have been found. Four of these are linear and four quadratic. In the general case there will be at least $n^4 - n^3$ such relations.

(2) Taking the price of all commodities for the year 1913 as a standard, lumber included, the ratio of the price of lumber to this standard was computed for each year, beginning with 1865. Plotting a curve from the results thus obtained gave as a "most probable" equation that of a straight line. It was found that a more accurate equation was that of a parabola. Upon further investigation it was found that a logarithmic curve was a trifle better.

(3) Professor Light derived the general equation of the curves whose polars with respect to a fixed circle cut off a segment on the normal proportional to the radius of curvature. When the circle becomes a point, the intrinsic equations for logarithmic spirals, cardioids, parabolas, circles, lines and hyperbolas are obtained.

(4) It is the belief of a number of college teachers of mathematics, judged by the expressions at association meetings, that the instruction in high schools is of inferior quality. The writer believed this to be largely unfounded. High school teachers are usually well prepared to do their work. The amount of required work in high school is not sufficient to give to the high school teacher the time necessary to make much impression upon his students.

Grade teachers are not specially prepared in mathematics and are unable to give clear explanations in many instances. They are likely to fall into the practice of mere formal work in arithmetic.

A test was given to college freshmen in which problems were taken from a grade text in arithmetic. Several students did not attempt certain problems and very few attempted any analysis, though explanation was requested. The writer was inclined to believe that the student's customary approach to a problem follows his practice in the grades rather than that required in high school.

(5) In his paper Professor Hazard showed that when such triangles are plotted in the first quadrant with one acute vertex at the origin and with the base and altitude of the triangle as the coördinates of the other acute vertex, then the triangles having a common property have their vertices on a parabola. Triangles with a common unit difference between the hypotenuse and one side lie on one parabola; those with a difference of 9 lie on another parabola, etc. All possible integral differences represent, also, integral sums of the hypotenuse and one side. There are four families of parabolas, confocal at the origin, being the loci of the vertices of triangles having a constant integral odd difference, odd sum, even difference, and even sum of the hypotenuse and one side. Possible odd differences and sums are given by the squares of the odd numbers. Even differences and sums are given by twice the squares of all the integers.

(6) A unique method was shown in this paper for computing the radius of a circle inscribed in the area enclosed by three mutually tangent circles, when the radii of these circles were known.

(7) This paper showed how some equations of three or more variables may be represented very simply by the methods of Nomography, while the cartesian

representation is hard to construct and hard to read. A method was given of constructing a chart for an equation which represents the day of the week as a function of the year, month and day of the month, thus producing a graphical perpetual calendar.

(8) Professor Hazard commented on the fact that most text books of algebra give graphical methods for the real roots of quadratic and other equations, but either state or imply that the graphical method fails in the case of complex roots because the plotted curve does not cross the axis of X. When the roots of a quadratic are represented by $(r \pm ni)$ the vertex of the graph is the point (r, n^2), so it is only necessary to find the square root of the ordinate to have the roots determined. This may be done by the geometrical method. Reference was made to the straight line and circle construction for the real roots of a quadratic, used by L. E. Dickson and attributed by him to D'Ocagne and Lill. It was shown how this construction may be extended to find the complex roots of quadratics. Reference was also made to a construction given by Schultze for complex roots.

(9) This paper dealt with problems in the theory of numbers and considered the examination of primes with a view to the relation as modulus sustained by each to smaller numbers, the exponents to which the latter belong, and similar inquiries bearing upon the properties of repetends in both the decimal and binary systems. The author's examination, beginning with the smallest primes, has reached the prime, 2161.

PHILIP FITCH, *Secretary.*

MARCH MEETING OF THE SOUTHEASTERN SECTION.

The second meeting of the Southeastern Section of the Mathematical Association of America was held at Agnes Scott College, Decatur, Georgia, March 10, 1923. The meeting was held in the college chapel with Professor FIELD presiding.

There were eighty-five present, including the following twenty-four members of the Association:

D. F. Barrow, S. M. Barton, J. B. Coleman, T. R. Eagles, Floyd Field, Tomlinson Fort, Miss Leslie Gaylord, J. P. Hill, A. W. Hobbs, J. W. Hinton, Miss Ruby Hightower, J. F. Messick, Miss Fannie S. Mitchell, R. E. Mitchell, A. B. Morton, I. C. Nichols, M. T. Peed, W. W. Rankin, Jr., D. Rumble, David Eugene Smith, D. M. Smith, R. P. Stephens, A. H. Stevens, Miss Rose Wood.

The following officers were elected: R. P. STEPHENS, chairman; TOMLINSON FORT, vice-chairman; W. W. RANKIN, Jr., secretary-treasurer. The executive committee decided to hold the next meeting at the University of Georgia, Athens, Ga.

Agnes Scott College entertained the Southeastern Section at lunch after the regular program had been completed.

Professor DAVID EUGENE SMITH of Columbia University was the principal speaker. Professor Smith was brought to Agnes Scott College by the College Lecture Association. He addressed the faculty and students and many visitors