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Review

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if the following method of detection is mastered—Take the right answer from the book and the wrong answer; form a ratio or fraction of the two answers, placing the incorrect one in the numerator and the correct one in the denominator; then the fraction thus formed will be (1) a square quantity if one ratio is misplaced; (2) the product of two square quantities if two ratios are misplaced." No explanation of this fact is vouchsafed. We might now understand why many teachers prefer their students not to have access to the answers. But the book is full of good points.

**Preliminary Geometry.** By R. ROBERTS. Pp. 56. 1s. 1904. (Blackie.)

This is likely to prove a useful little introduction to geometrical principles. It consists of a series of carefully graduated questions on the elementary parts of the subject, with test papers at intervals. The author claims that he has steered a middle course between discouraging the pupil by making the exercises too difficult, and, on the other hand, avoiding all need for mental effort. The claim is very largely justified.

**Association of Teachers of Mathematics in the Middle States and Maryland.** Bulletin No. I. July, 1904. Pp. 56. (Printed by the Association, New York.)

In the first year of what we hope will prove to be a vigorous existence of this new Society the number of members on its roll has nearly reached 300. The greater part of the Bulletin consists of papers read before the Association during the years 1903-4. They are on the "laboratory method" of teaching Mathematics; the Syllabus for Geometry in the grades; suggestions on topics for investigation by the Association; and on the "genuine applications" of Algebra. The first thing that strikes the reader is the closeness with which the improvements effected in our methods of teaching in this country have been followed by our brethren across the pond. The name of Perry is as well known to them as to us. Strained as the conditions of modern life may be in the States, we find in one of these papers the lament that "the school year is too short in most of our widely patronized private and endowed schools by reason of the vacation plans of their well-to-do patrons, and the luxurious tendencies of the times, which are inimical to strenuous application." It is a pity that the writers of some of these papers do not pay a little more attention to the virtues of literary form. Occasionally we find an outburst of feeble flamboyancy, but as a rule the style is bald and tame. Behold this purple patch! "It is indeed a source of satisfaction to know that so many individuals have awakened from a comatose state of dull perceptions sufficiently to realise that algebra has applications in physical science! We hear the cry 'Eureka' from the shores of Lake Michigan. This is the fountain of youth to the teacher, a promised land to the children after generations have died in the wilderness of old-fashioned mathematical teaching." But apart from the form of the papers there is little to be said against their content. Enthusiasm inspires them, and it is an enthusiasm which is clearly being organised and controlled. It is interesting to note the nature of the problems to which the attention of the American teacher is directed in the paper on topics for investigation by the Association. "What should be the aim of mathematical teaching? How can the bookwork in algebra and geometry be reduced to a minimum? How much exercise work (*examples*) should be done? How much time is necessary for teaching algebra and geometry intelligently (!) to the average class? Is it necessary to give so much time to Arithmetic, and do the results of arithmetical teaching justify the present large expenditure of time? What should be the character of the examinations? What is the maximum number of students in a class which a teacher of mathematics can instruct properly? What should be the qualifications of a teacher of mathematics? Which are the most essential chapters of algebra, geometry, and trigonometry? What parts of book-study could be entirely omitted? Which are the best methods for leading students into original mathematical work? What kind of original work is most suitable for the average secondary student? Which chapters of secondary school mathematics have practical value? Will the introduction of the 'laboratory method' reform mathematical teaching?"

We wish to the new Association a long life and all the success that the importance of its aims demands.

**Aufgaben aus der Niederen Geometrie.** By I. ALEXANDROFF. Pp. v, 123. 1904. (Teubner.)

This is the German edition of a useful introduction to methods of attacking the solution of geometrical riders. It was translated from the Russian into French some years ago, and was at the time reviewed in these columns. We are glad to call attention to the German edition, as to the student who knows French and wishes to pick up German mathematical terminology, the two volumes may prove of considerable value, quite apart from the intrinsic merits of the book.

**Lehrbuch der Differenzenrechnung.** By D. SELIWANOFF. Pp. vi, 92. 1904. (Teubner.)

This is a handy little introduction to the Calculus of Finite Differences, simply and clearly written. The first part deals with introductory matter, interpolation, and the approximate values of certain integrals. The second treats of summation, the J. Bernoulli Function, and Euler's summation formula with its applications. The third is devoted to linear difference equations of the first order, and linear difference equations with constant coefficients—the whole being subject matter of Boole's first eleven chapters, but treated lightly and on a smaller scale.

**Lehrbuch der Analytischen Geometrie.** By O. FORT and O. SCHLOMILCH. Vol. I. **Analytische Geometrie der Ebene.** 7th edition. Revised by R. HEGER. 1904. (Teubner.)

This, the seventh edition of a book, the special characteristic of which is its clearness and simplicity of exposition, is revised and improved in various details by Professor Heger of the Polytechnic at Dresden. The second, third, and fourth editions were edited by O. Fort, and it is one-and-twenty years since the fifth edition was revised by Professor Heger. The ninth and tenth chapters deal with lines of a higher order than the second, with transcendental lines in general, and spirals and the usual roulettes in particular.

**Méthodes de Résolution et de Discussion des Problèmes de Géométrie.** By G. LEMAIRE. Pp. 224. 1904. (Vuibert et Nony.)

This is a good representative of a type of compilation of which we have but few instances in this country. It covers much the same ground as Petersen and Alexandroff, both of which are available in French. There is something to be said for the view that a boy taught, as until recently he has here been taught, will not necessarily take "in his stride" and without preparation in some detail, such a grasp of the different methods by which a problem may be attacked as he will after the study of such a volume as this. The names of the sections will sufficiently indicate the lines on which the book is constructed: Loci; method of the intersection of loci; determination of a line (envelopes, lines through a fixed point, lines parallel to a given direction); translation, rotation, symmetry, method of similar figures; figures similarly and similarly situated, inversion; transformation and division of figures. Many of the solutions of problems are accompanied by discussion in detail, most unusual with us, but a process especially commendable in the case of intelligent boys, who often find this method a source of much inspiration.

**Advanced Course in Algebra.** By W. WELLS. Pp. viii, 581. 6s. 6d. 1904. (Heath.)

The course that is covered in this volume is hardly what we should call "advanced" algebra in this country, and yet we are told it is intended to meet the needs of "Colleges and Scientific Schools of the highest rank." For the book contains no more than is to be found in Smith's *Treatise*, or Hall & Knight's *Higher Algebra*—not so much, indeed, for the subject is not treated with the same detail. It takes nearly four hundred pages to bring the student to the end of the chapter on the binomial theorem, and only one hundred and fifty pages are devoted to permutations and combinations, probability, continued fractions, summation of series, theory of numbers, determinants, and theory of equations. Simple, simultaneous, and quadratic equations take up one-fifth of the book. Graphs are well to the fore in dealing with equations generally, the theory of the irrational number, derivatives, multiple roots, Sturm's theorem, and discontinuous functions. The chapter on involution contains the binomial theorem for positive integral