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Review

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**L'étoile magique à 8 branches et les étoiles hypermagiques impaires.** By C. SALOMON. Pp. 24. 1 fr. 50 c. 1912. (Gauthier-Villars.)

These arithmetical curiosities show a pretty extension of the idea of a magic square. A device is given for their construction by superposing two simpler figures. Half the pamphlet is taken up with diagrams.

**Die Lehre vom Flächeninhalt in der allgemeinen Geometrie.** By A. FINZEL. Pp. 38. M. 1.20. 1912. (Teubner.)

This pamphlet develops the theory of area on the basis of Schur's system of plane postulates, without using the idea of continuity or referring to the doctrine of parallels.

Euclid's second and third axioms are replaced by two definitions of equality by addition and equality by subtraction, depending on dissections into congruent polygons; the second of these makes it possible to dispense with the axiom of Archimedes. Area is defined in terms of the sum of the angles of a triangle in non-Euclidean space, and in terms of the base and altitude in Euclidean space; and it is formally proved that polygons with the same area are equal according to the definitions. In the last chapter the results are verified in the notation of the integral calculus.

H. P. H.

**Elementary Trigonometry.** By Dr. R. S. HEATH. Pp. 219. With or without Answers. 3s. 6d. 1912. (Clarendon Press.)

This book is written on rather unusual lines. Angles of any magnitude are contemplated from the first, and the proofs of the general theorems relating to supplements and complements of angles and the addition theorems are applicable to all such angles. These proofs are based on cartesian coordinates of points on a circle of unit radius, and will be found of great interest. The book is suitable for university students who already have an acquaintance with simple numerical trigonometry and require a certain amount of higher theory and more advanced applications: as the author says, "the standard" is "in the main suitable for the Intermediate Examinations of Universities," though many propositions of a more advanced character (distinguished by an asterisk) are included.

There is a remarkable slip on p. 16, where the author speaks of "degrees" as *concrete* numbers (Art. 8). This article should be either expunged or rewritten.

The book is full of incidental theorems and ideas of great interest, and the collections of examples are extremely good, particularly the solid problems in the last chapter.

The articles on the triple angle formulae (p. 96), solution of cubic equations (p. 98), properties of triangles (pp. 126-133), various interesting approximations to  $\pi$  and  $\sqrt{\pi}$  (pp. 159, 162), and the volume of a spherical segment (p. 175) are among a number of things deserving special attention. A good deal of the book might with advantage be worked through by students who are beginning to specialise for mathematical scholarships.

**Elements of Plane Trigonometry.** By ROBERT E. MORITZ. Pp. xiv + 361 + 91. \$2.00. 1911. (Wiley & Sons, New York; Chapman & Hall.)

This is a well-written treatise, on somewhat old lines, including discussions on logarithms and logarithmic tables, the exponential theorem, and trigonometric series, with a good introduction to complex quantities, and a particularly interesting chapter on the hyperbolic functions, suitable for students who, in addition to a working knowledge of practical trigonometry, wish to have some acquaintance with the higher theory.

Like so many American text-books, it is got up in a most attractive manner, regardless of space, making it very easy to read. There are 90 pages of tables, the logarithmic tables being to 5 decimals, and the natural functions to 4 decimals, followed by one page of constants and their logarithms, to 7 decimal places.

Examples are taken from physics, surveying and engineering, navigation and astronomy. A good feature is the way in which students are taught to check their own numerical work, and not to give results to more figures than are warranted by the data.

There is a good table of contents, and an index, so that reference to any desired part is easy.

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