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Review

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incorporated, and Dr. Gmeiner has succeeded in reducing the number of axioms used in the work. Thus, Peano's treatment of the natural numbers is followed except in that Peano has six axioms, whereas Gmeiner has five (p. 15). It might be remarked that "usf." or "... " is a device of mathematicians which appeals to intuition, but often slurs over a want of logic.

The general features of this book are by now well-known. Perhaps it is unavoidable to teach mathematics at the present time as if we neither believed that arithmetic had so many axioms apart from logic as people believed forty years ago, nor that it had none—as we now know. PHILIP E. B. JOURDAIN.

**Plane Trigonometry.** L. K. GOSH. (Halder, Calcutta.)

This volume is written especially for the Intermediate Examinations in Arts and Science of the Indian Universities. It labours under the disadvantage of bad type and poor printing, this being especially noticeable in the signs +, -, and =, and the spacing of the working of proofs and exercises. The subject is treated in much, perhaps too much, detail; a multitude of special cases only serves to confuse a student. The author is evidently unacquainted, or not in sympathy, with the present idea of gradual extension and generalisation. In our opinion the early introduction of circular measure is not to be recommended, and the obsolete (some say never used) "grade" should have been omitted. The ratios of angles of any magnitude are illogically defined from a triangle of reference instead of from the coordinates of the extremity of the vector; illogically, because the triangle bears a totally different relation to the angle in each quadrant. Much space is wasted on the changes in sign and magnitude of the ratios, which could have been saved by treating this section graphically. Not sufficient regard is paid to the sign of a line, e.g. on page 35,  $PM/AP$  is given as the sine of  $A$  instead of  $MP/AP$ , and this error persists through the book. The author seems unaware that  $355/113$  is a closer approximation to  $\pi$  than  $3\cdot14159$ . The volume would have been more interesting if solution of right-angled triangles could have been introduced earlier.

**Advanced Arithmetic.** M. H. JURDAK.

This volume is intended for school use in Syria, and is very carefully thought out.

A little too much space is devoted to complex fractions, there being seventeen pages of exercises and problems on this section! Decimals and the Metric system are treated very conscientiously; but what is now deemed the important part, approximation methods of multiplication, division, etc., are apparently left out. It is stated that the Unitary method is used, but the worked-out examples have a strange appearance as examples of this method; it is nowhere stated, or rather insufficiently insisted on, that Interest and Discount are all "examples on Proportion"; in fact these sections precede the chapter on the Unitary Method. Horner's method for cube roots, if any, is preferable to that founded on the formula  $300a^2 + 30ab + b^2$  for the new divisor. At the end of the book, we find the best part, namely, introduction to Algebra by generalisation; this should prove very useful in accustoming the pupil to the use of symbols.

Bearing in mind the standard set up by Pendlebury and others, it is difficult to judge this book justly; no doubt it will prove very serviceable for the special use for which it is intended.

**Arithmetic for Schools.** F. C. BOON. (Mills & Boon, Ltd.)

This seems to be an exceptionally well-planned book for school use. Every difficulty likely to arise is taken in hand and thoroughly well explained. The importance of rough checks is rightly insisted on throughout. Approximation methods in decimals are accorded particularly full treatment, but the method advised is open to objection. Experience shows that it is shorter and quite as accurate to work to "one figure more" and allow "for the figure to carry" as to work to "two figures more." Again, the Unitary Method is relegated to a second place with regard to the Method of Ratios, but most readers will at once recognise in the Method of Ratio what they have generally known as the abbreviated Unitary Method. Logarithms and their connection with indices are well done, but no attempt, wisely perhaps at this stage, is made to justify the

existence of such an index as 0.3010300. There is a valuable section on limits of error; but the method of basing the theory on formulae to be memorised is open to objection; also we prefer the method of upper and lower limits to that of relative error when teaching young students. The book ends with sections on Graphs, Theory of Numbers, and Problems, and a large collection of harder Miscellaneous Exercises.

**Workshop Arithmetic.** H. A. DARLING. (Blackie.)

This little book should prove very useful for the class to which it appeals. All kinds of different things have been drawn upon to furnish examples, from engineering to cricket. This makes the book 'live' and interesting. A curious misprint occurs throughout the closing pages, "lateral" for "literal." The explanation of logarithms is rather short, as is also the important section on contracted methods with decimals.

**New School Geometry.** R. DEAKIN. (Mills & Boon.)

The excellent plan of leading up to a theorem by means of well-planned exercises is adopted in this text-book. The author, however, seems in several cases to be doubtful to which side to give his adherence—the Euclidean or non-Euclidean, for several pairs of alternative proofs are given. This savours of an attempt to please everybody, and is a mistake, especially when the alternative proof, *e.g.* Prop. 9, has to be taken out of the order in which it is put in the book. One of the best portions of the volume is the careful way in which congruent triangles are led up to and explained. In fact the pupil, carefully drilled, should all through be quite convinced of the truth of a theorem before the demonstration is set before him; and this cannot fail to help him to understand the demonstration. Sufficient practical work is given concurrently to interest the pupil; and a selection of 150 riders brings the book to a close.

The printing leaves nothing to be desired, but the pagination, reminding one of the Todhunter of one's youth, is poor. A Theorem seems to gain dignity when it has a page to itself, or at least starts a fresh page; also it is a matter of opinion whether a proof in which abbreviations are barred is anything like so easily assimilated as one which, by the use of abbreviations, can be taken in at a glance.

**School Geometry.** CHAMPION and LANE. (Rivingtons.)

This book follows a sequence of its own as regards the early propositions, and does not lose in value thereby. The propositions are well set out, with large clear diagrams, abbreviations being freely used from the start, and each proposition starts on a fresh page, giving the book a nice appearance on first opening. We do not meet with any practical work, however, until page 57, and then we get a batch to page 72, in the form of propositions, instead of applications of the preceding fundamental facts. Areas come before the circle, and here the first few propositions of Euclid's Book II. are treated with scant ceremony, and although "quoted freely in the remainder of the book," are dismissed in about half a page. We have always found it one of the most difficult things in teaching to get a student to understand the relation of these propositions to the mensuration ideas of the equivalent algebraical identities. The difficulty is that a student, being told of the relation, insists subconsciously in thinking of  $AB^2$  as  $A \times B \times B$  instead of  $x^2$  where  $x$  is the length of  $AB$ . The scant treatment afforded to this section will hardly improve matters. The circle is satisfactorily handled, but the objection raised to the limit definition, in which the two points defining the secant are supposed to *coincide*, applies also here. If the limit definition is used it must have more careful treatment. The book closes with a section on Ratio, and here again the fundamental algebraic identities are dismissed in half a page. Several of the propositions given in this section seem redundant, as they follow naturally from the fundamental algebraic identities.

The book closes with a large number of sets of miscellaneous riders which are distinctly good.

J. M. CHILD.