Review
Author(s): C. S. Jackson
Review by: C. S. Jackson
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law of extensible minors, the law of complementaries, etc. By means of these many of the proofs might be shortened. Slight modifications occur here and there in the wording, due in part to the introduction of new matter and rearrangement of the old, and in part to clearer statements and simplified proofs. The book on the whole is comparatively little modified, but where changes have been made they are in general improvements. The theorem of article 17, chapter vi., attributed to Netto, was not new with him, and therefore should hardly bear his name. It is found in Reiss, which was published in 1867. W. H. METZLER.

Elementary Algebra. Part II. By W. M. BAKER and A. A. BOURNE of Cheltenham College. 1904. (G. Bell and Sons.)

The strong point of this book is the large and varied assortment of examples, many of which are interesting and instructive. Here and there too the teacher will find an ingenious suggestion, as for instance the neat geometrical illustration (p. 312) of the result of adding equal quantities to each term of a ratio.

But these valuable features are marred by what must be termed the slovenly inaccuracy, often of expression and sometimes of substance, of the text. To prove the justice of this somewhat severe comment I might refer to the treatment of fractional indices, or of the binomial theorem for a negative or fractional index, or of partial fractions, or to such sentences as "draw PQ equal to 56 shillings."

A typical instance is offered by the attempt (§ 260) at a graphical solution of the problem: "A man mixes wine at 30*s*. a dozen with wine at 80*s*. a dozen. How many dozen of each kind must he take in order that a mixture of 60 dozen may be worth 50*s*. a dozen?"

A diagram is given in which price per dozen and number of dozens are plotted as coordinates and the solution begins "In the diagram OA is the graph of the 30*s*. wine."

The line OA (or in fact any line through the origin) has of course no more connection with 30*s*. wine than with wine at any other price.

As further evidence § 325 may be quoted verbatim (a trifling misprint excepted).

"Approximation for the r^{th} root of a number.

If $\sqrt[r]{N}=a+x$ where a is an approximation and consequently x is small, then a closer approximation is given by the formula

$$\sqrt[r]{N}=\frac{(r+1)N+(r-1)a^r}{(r-1)N+(r+1)a^r}a. \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)\text{''}$$

[Special case of $r=3$, and numerical approximation to $\sqrt[3]{2}$ follow.]

"Proof of (1).

$$\frac{(r+1)N+(r-1)a^r}{(r-1)N+(r+1)a^r}a=\frac{(r+1)N+(r-1)[N^{\frac{1}{r}}-x]^r}{(r-1)N+(r+1)[N^{\frac{1}{r}}-x]^r}a$$

$$=\frac{2rN-r.(r-1)xN^{1-\frac{1}{r}}}{2rN-r.(r+1)xN^{1-\frac{1}{r}}}a=\frac{2-(r-1)\dfrac{x}{N^{\frac{1}{r}}}}{2-(r+1)\dfrac{x}{N^{\frac{1}{r}}}}a$$

$$=\frac{2-(r-1)\dfrac{x}{a+x}}{2-(r+1)\dfrac{x}{a+x}}a=\frac{2a+(3-r)x}{2a+(1-r)x}a$$

$$=\left(1+\frac{2x}{2a+(1-r)x}\right)a=a+\frac{x}{1+\dfrac{1-r}{2a}x}=a+x-\frac{(1-r)x^2}{2a}-\text{etc.}$$

$$=a+x \text{ approximately.''}$$

It will be observed that no hint or clue is given as to how the formula was discovered. It might be part of some system of revelation for all that a schoolboy could infer. Further the expansion is effected wrongly, some terms of the second order being omitted and some retained.

Surely a preferable method would be to say that we seek an approximation to $N^{\frac{1}{r}}$ closer than a in the form $\frac{1+py}{1+qy}a$ where $y=N-a^r$.

Expanding $N^{\frac{1}{r}}$ and $\frac{1+py}{1+qy}a$ in powers of y we find that if the series are to be identical as far as the terms in y^2 inclusive we must have $p=\frac{r+1}{2ra^r}$ $q=\frac{r-1}{2ra^r}$ whence the result follows at once. The error in defect proves to be $\frac{r^2-1}{12r^3}\left(\frac{y}{a^r}\right)^3 . a$ nearly, provided $\frac{y}{a^r}$ is < 1.

Of course the result is still more easily obtained as a simple geometrical application of Rolle's theorem.

Other quotations might be given, but enough has perhaps been said to show that among the recommendations of the Mathematical Association which the authors "follow to a great extent" (preface), that one which urges that great stress should be laid on fundamental principles is not so fortunate as to be included. C. S. JACKSON.

Einleitung in die Funktionentheorie, (1 Abteilung), von O. STOLZ und I. A. GMEINER. 1904.

This volume, the fourteenth of Teubner's new mathematical series, is a continuation of the same authors' *Theoretische Arithmetik*:* the two books will when completed form a new and much enlarged edition of the well-known *Allgemeine Arithmetik* of Prof. Stolz, and supersede that excellent work.

The range of the present volume is more like that of Harkness and Morley's *Introduction to the Theory of Analytic Functions* than that of any other English book. But it begins farther on and ends sooner, and the intervening ground is naturally covered with much greater thoroughness. So far as English readers are concerned it is only too likely that this book will fall between two stools. It is altogether too solid and systematic for one who is only beginning the theory of functions. On

*See *Math. Gazette*, vol. II., p. 312.