KEY TO DAVIES' BOURDON: WITH MANY ADDITIONAL EXAMPLES, ILLUSTRATING THE ALGEBRAIC ANALYSIS

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649257836

Key to Davies' Bourdon: with many additional examples, illustrating the algebraic analysis by Charles Davies

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

CHARLES DAVIES

KEY TO DAVIES' BOURDON: WITH MANY ADDITIONAL EXAMPLES, ILLUSTRATING THE ALGEBRAIC ANALYSIS

Trieste

KEY

TO

DAVIES' BOURDON,

WITH

MANY ADDITIONAL EXAMPLES, ILLUSTRATING THE ALGEBRAIC ANALYSIS.

By CHARLES DAVIES, LL.D.,
AUTHOR OF A FULL COURSE OF MATHEMATICS.

A. S. BARNES & COMPANY,
NEW YORK, CHICAGO AND NEW ORLEANS.
1876.

DAVIES' COURSE OF MATHEMATICS.

IN THREE PARTS.

I. COMMON SCHOOL COURSE.

Davies' Primary Arithmetic.—The fundamental principles displayed in Object Lessons.

Davies' Intellectual Arithmetic.—Referring all operations to the unit 1 as the only tangible basis for logical development.

Davies' Elements of Written Arithmetic.—A practical introduction to the whole subject. Theory subordinated to Practice.

Davies' Practical Arithmetic.—A combination of Theory and Practice, clear, exact, brief, and comprehensive.

II. ACADEMIC COURSE.

Davies' University Arithmetic.—Treating the subject exhaustively as a *science*, in a logical series of connected propositions.

Davies' Elementary Algebra.—A connecting link, conducting the pupil easily from arithmetical processes to abstract analysis.

Davies' University Algebra.—For institutions desiring a more complete but not the fullest course in pure Algebra.

Davies' Practical Mathematics.—The science practically applied to the useful arts, as Drawing, Architecture, Surveying, Mechanics, etc.

Davies' Elementary Geometry.—The important principles in simple form, but with all the exactness of rigorous reasoning.

Davies' Elements of Surveying.—Re-written in 1870. A simple and full presentation for Instruction and Practice.

III. COLLEGIATE COURSE.

Davies' Bourdon's Algebra.—Embracing Sturm's Theorem, and a most exhaustive course. Re-written, in 1873.

Davies' University Algebra.—A shorter course than Bourdon, for Institutions having less time to give the subject.

Davies' Legendre's Geometry.—A standard work in this country and in Europe.

Davies' Analytical Geometry.—A full course of Analysis, embracing the applications to surfaces of the second order.

Davies' Differential and Integral Calculus, on the basis of Continuous Quantity and Consecutive Differences.

Davies' Analytical Geometry and Calculus.—The shorter treatises, combined in one volume.

Davies' Descriptive Geometry.—With application to Spherical Trigonometry, Spherical Projections, and Warped Surfaces.

Davies' Shades, Shadows, and Perspective.—A succinct exposition of the mathematical principles involved.

Davies' Nature and Utility of Mathematics, Logically considered.

Davies and Peck's Mathematical Dictionary, or Cyclopedia of Mathematics.

PREFACE.

A WIDE difference of opinion is known to exist among teachers in regard to the value of a Key to any mathematical work, and it is perhaps yet undecided whether a Key is a help or a hindrance.

If a Key is designed to supersede the necessity of investigation and labor on the part of the teacher; to present to his mind every combination of thought which ought to be suggested by a problem, and to permit him to float sluggishly along the current of ideas developed by the author, it would certainly do great harm, and should be excluded from every school.

If, on the contrary, a Key is so constructed as to suggest ideas, both in regard to particular questions and general science, which the Text-book might not impart; if it develops methods of solution too particular or too elaborate to find a place in the text; if it is mainly designed to lessen the *mechanical labor of teaching*, rather than the labor of study and investigation; it may, in the hands of a good teacher, prove a valuable auxiliary.

The KEY TO BOURDON is intended to answer, precisely, this end. The principles developed in the text are explained and illustrated by means of numerous examples, and these are all wrought in the Key by methods which accord with and make evident the principles themselves. The Key, therefore, not only explains the various questions, but is a commentary on the text itself.

Nothing is more gratifying to an ambitious teacher than to push forward the investigations of his pupils beyond the limits of the text book. To aid him in an undertaking so useful to himself and to them, an Appendix has been added, containing a copious collection of Practical Examples. Many of the solutions are quite curious and instructive; and taken in connection with those embraced in the Text, form a full and complete system of Algebraic Analysis.

The many letters which I have received from Teachers and Pupils, in regard to the best solutions of new questions, have suggested the desirableness of furnishing, in the present work, those which have been most approved. They are a collection of problems that have special values, and their solutions may be studied with great profit by every one seeking mathematical knowledge.

FISHKILL LANDING, }
July, 1873. }

INTRODUCTION.

ALGEBRA.

Algebra. Difficulties. How overcome. Language. Characters which represent quantity. Signs.

1. On an analysis of the subject of Algebra, we think it will appear that the subject itself presents no serious difficulties, and that most of the embarrassment which is experienced by the pupil in gaining a knowledge of its principles, as well as in their applications, arises from not attending sufficiently to the *language* or *signs* of the thoughts which are combined in the reasonings. At the hazard, therefore, of being a little diffuse, I shall begin with the very elements of the algebraic language, and explain, with much minuteness, the exact signification of the characters that stand for the quantities which are the subjects of the analysis; and also of those signs which indicate the several operations to be performed on the quantities.

Quantities. How divided. How represented.

2. The quantities which are the subjects of the algebraic analysis may be divided into two classes: those which are known or given, and those which are unknown or sought. The known are uniformily represented by the first letters of the alphabet, a, b, c, d, &c.; and the unknown by the final letters, x, y, z, v, w, &c.

May be increased or diminished. *Five operations.*

Quantity is susceptible of being increased, diminished, and measured; and there are six operations which can be performed upon a quantity that will give results differing from the quantity itself, viz.:

First 1st. To add it to itself or to some other quantity;

Second 2d. To subtract some other quantity from it;

Third. 3d. To multiply it by a number;

Fourth. 4th. To divide it;

Fifth. 5th. To raise it to any power;

6th. To extract a root of it.

Exception.

The cases in which the multiplier or divisor is 1, are of course excepted; as also the case where a root is to be extracted of 1.

Signs. *Elements of the Algebraic language.* *Its words and phrases:* *How interpreted.*

4. The six signs which denote these operations are too well known to be repeated here. These, with the signs of equality and inequality, the letters of the alphabet and the figures which are employed, make up the elements of the algebraic language. The words and phrases of the algebraic, like those of every other language, are to be taken in connection with each other, and are not to be interpreted as separate and isolated symbols.

Symbols of quantity. *General.* *Examples.* *Signs plus and minus.*

5. The symbols of quantity are designed to represent quantity in general, whether abstract or concrete, whether known or unknown; and the signs which indicate the operations to be performed on the quantities are to be interpreted in a sense equally general. When the sign plus is written, it indicates that the quantity before which it is placed is to be added to some other quantity: and the sign minus implies the

existence of a minuend, from which the subtrahend is to be taken. One thing should be observed in regard to the signs which indicate the operations that are to be performed on quantities, viz.: *they do not at all affect or change the nature of the quantity before or after which they are written, but merely indicate what is to be done with the quantity.* In Algebra, for example, the minus sign merely indicates that the quantity before which it is written is *to* be subtracted from some other quantity; and in Analytical Geometry, that the line before which it falls is estimated in a contrary direction from that in which it would have been reckoned, had it had the sign plus; but in neither case is the *nature* of the quantity itself different from what it would have been had the sign been plus.

Signs have no effect on the nature of a quantity.

Examples: In Algebra.

In Analytical Geometry.

The interpretation of the language of Algebra is the first thing to which the attention of a pupil should be directed; and he should be drilled on the meaning and import of the symbols, until their significations and uses are as familiar as the sounds and combinations of the letters of the alphabet.

Interpretation of the language:

Its necessity.

6. Beginning with the elements of the language, let any number or quantity be designated by the letter a, and let it be required to add this letter to itself and find the result or sum. The addition will be expressed by

Elements explained

$$a + a = \text{the sum.}$$

But how is the sum to be expressed? By simply regarding a as *one* a, or $1a$, and then observing that one a and *one* a, make *two* a*'s* or $2a$: hence,

Signification