# THE ELEMENTS OF ALGEBRA; DESIGNED FOR THE USE OF SCHOOLS. PART I

Published @ 2017 Trieste Publishing Pty Ltd

#### ISBN 9780649102013

The elements of algebra; designed for the use of schools. Part I by J. W. Colenso

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## J. W. COLENSO

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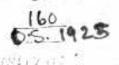
DESIGNED FOR

## THE USE OF SCHOOLS.

BY THE

REV. J. W. COLENSO, D.D.,

PART I.



FROM THE THIRTEENTH LONDON EDITION.

NEW YORK:

SOLD BY ALL BOOKSELLERS IN CANADA.

### ADVERTISEMENT.

In this Edition (which is stereotyped, and so will be secured from further change) the Simpler Parts, those, namely, suited for general School purposes and required for the attainment of an ordinary B.A. degree in the University of Cambridge, are printed separately as Part I; to which is appended a large collection of easy Miscellancous Examples, specially adapted to the contents of this Part, and supplying means of complete Examination in them.

It will be seen that the easiest kinds of Simple Equations and Equation Problems are in this Edition introduced much earlier than is usual in Treatises on Algebra; but there can be no reason why this branch of the subject, which is so interesting to most Students, and gives them some idea of the practical applications of the Science, should not be brought forward as soon as possible.

Part II is also published, and contains the higher parts of the Subject, with such additional remarks on the earlier portions as will suit the wants of more advanced and promising Students, and with a similar Appendix of more difficult Miscellaneous Examples and Equation Papers. This Part may be begun as soon as the Student, having thoroughly mastered Part I, has entered upon the Miscellaneous Examples at the end of it.

Forncett St. Mary, Nov. 1, 1849.

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## ALGEBRA.

### PART I.

#### CHAPTER I.

#### DEFINITIONS.

 ALGEBRA is the science which reasons about quantities by means of letters of the Alphabet, and certain signs and symbols, which are employed to represent both the quantities themselves, and the manner in which they are connected with others.

Thus we might put a to represent 7, and then twice a would 'represent 14; or we might put a to represent 3, and then twice a would represent 6, three times a, 9, &c.

 The sign = (equal) denotes that the quantities between which it stands are equal to one another.

Thus, if a = 17, then twice a = 34.

- The sign : stands for then or therefore, and : for since or because.
- The sign + (plus) denotes that the quantity before which it stands is added, and the sign (minus) that the quantity before which it stands is subtracted.

Thus 
$$5+3=8$$
,  $5-3=2$ ; and if  $a=3$  and  $b=4$ , then  $a+b=3+4=7$ ,  $a+b+2=3+4+2=9$ ,  $10-a=10-3=7$ ,  $10-a-b=10-3-4=7-4=3$ .

The sign  $\sim$  is used to denote that the less of two quantities is taken from the greater, when it is not known which is the greater.

Thus  $a \sim b$  denotes the difference between a and b.

 Ail quantities before which + stands are called positive, and all before which - stands are called negative quantities.

If neither + nor - stand before a quantity, + is understood, and the quantity is positive; thus a means +a.

 The sign × (into) denotes that the quantities between which it stands are to be multiplied together; but very often a full-point is used instead of x, or, still more commonly, one quantity is placed close after the other without any sign between them.

Thus  $a \times b$ ,  $a \cdot b$ , and ab mean all the same thing, viz., a multiplied by b; and, therefore, if a=3 and b=4, we shall have ab = 12, 5a = 15, 5ab = 60; and if also c = 5, d = 0, then

$$4ab + 3ac + 4d - 2b + 2abc - 3abcd = 48 + 45 + 0 - 8 + 120 - 0$$
  
=  $213 - 8 = 205$ .

7. The number, whether positive or negative, prefixed to any algebraical quantity, is called its coefficient: thus 3 is the coefficient of 3a, -7 of -7ax, &c.

If no number is expressed, the coefficient is understood, being 1, since a means once a.

#### Ex. 1.

If a = 6, b = 5, c = 4, d = 3, e = 2, f = 1, and g = 0, find the numerical values of the following expressions:

- 1. a + 2b + 3c + 4d + 3e + 2f + g. 2. 2a + b 3c + 4d 5f + 6g.
- 3. 3b-4a-6c+7d+2e-4g, 4. -3a+2b+3c-2e+f.
- 7. -3ab 2ae + 4be abe, 8. 5ab 8 3ab 2ae + 4be abe, 8. 5ab 8 3ab 2ae + 4be abe, 8. 5ab 8 3ab 3ab 8 3ab 3ab 8 3ab 3a5ab - Sac + 15cde - 14aef.
- 33ab 19cd+22abg 13cdef. 10. abcd 2bcde + 3cdef 4defg.
- The sign \(\infty\) (by) denotes that the quantity which stands before it is to be divided by that which follows it; but, most frequently, to express division, the quantity to be divided is placed over the other with a line between them, in the form of a fraction.