

**COMPLETE GRADED
ARITHMETIC,
P. 403-548**

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Complete Graded Arithmetic, p. 403-548 by George E. Atwood

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COMPLETE
GRADED ARITHMETIC

SIXTH GRADE

BY
GEORGE E. ATWOOD



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ATWOOD'S
COMPLETE GRADED
ARITHMETIC.

A new edition, thoroughly revised, and printed from new electrotype plates. The work for each grade may be had in a separate book as follows:

THIRD GRADE.

SIXTH GRADE.

FOURTH GRADE.

SEVENTH GRADE.

FIFTH GRADE.

EIGHTH GRADE.

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PREFACE

THIS book is similar in plan and arrangement to those of the series that precede it. It continues a review of the most important topics begun in preceding grades and gradually presents new topics. Throughout the book there is the same combination of oral and written work. The topics studied in the first books are not only reviewed, but further extended and applied. This is especially true of fractions and all work on surface and volume measurements. The new matter presented includes decimals, the completion of denominate numbers, and easy work in percentage.

The rational treatment of decimals will commend itself to teachers. Pupils' work in multiplication and division of decimals is generally mechanical and but little understood. In all examples in multiplication in which the multiplier is a decimal, pure or mixed, a certain number of decimal parts of a number is to be found. Children find seven eighths of a number by finding one eighth of it and multiplying that by seven. It seems rational to proceed in a similar manner in decimals. Pupils can understand division of decimals if they know they are finding how many times one number of decimal parts is contained in another number of like decimal parts. This is the method of division here presented.

A conviction prevails among teachers that too much time has been devoted to the study of denominate numbers. It will be observed that the work on this topic is considerably abridged by omitting several cases in reduction of denominate fractions and by reducing and simplifying the few types of work given. The exercises are limited to reduction ascending

and descending, addition, subtraction, multiplication, division, and the reduction of denominate fractions and denominate decimals to lower units, and under each of these heads there are comparatively few examples.

Easy examples in percentage are introduced soon after decimals. These exercises are limited in the written lessons to finding a per cent of a number and finding a number when a per cent of it is known. Both types of examples are so closely related to what the pupils have already learned that they have no difficulty whatever in understanding them. This knowledge of percentage is then applied to a great variety of simple problems, oral and written.

In the preparation of this book the author has received valuable assistance from F. E. Spaulding, Supt. of Schools, Passaic, N.J.; J. C. Lyford, Principal of Winslow Street School, Worcester, Mass.; Charles L. Van Cleve, Supt. of Schools, Troy, Ohio; and W. H. Baker, Instructor in Mathematics, State Normal School, San Jose, Cal., for which he desires to make grateful acknowledgment.

G. E. A.

COMPLETE GRADED ARITHMETIC



SIXTH GRADE

When anything is divided into tenths, hundredths, thousandths, ten-thousandths, hundred-thousandths, and so on, the parts are called *decimal parts*.

A **Decimal Fraction**, or **Decimal**, is one or more of the equal decimal parts of anything.

$$111 = 100 + 10 + 1$$

The first 1 at the right of 111 denotes 1; the second, 10; the third, 100. Each 1 therefore denotes 1 tenth of the value of the 1 next at the left. The same relation is used in expressing decimals. If we place a point, called the *decimal point*, after the first 1, a 1 immediately at the right of the decimal point denotes 1 *tenth*; the next 1, 1 tenth of 1 tenth, or 1 *hundredth*; the next 1, 1 tenth of 1 hundredth, or 1 *thousandth*; and so on. The figures at the right of the decimal point are called *decimal places*. We see therefore that the first decimal place expresses *tenths*; the second, *hundredths*; the third, *thousandths*; the fourth, *ten-thousandths*; and so on.

.8 denotes 8 tenths; .06, 6 hundredths; .28, 28 hundredths; .005, 5 thousandths; .045, 45 thousandths; .125, 125 thousandths; .0002, 2 ten-thousandths.

Read :	.15	.108	.004	.0125	.00008	.02005
Read :	.07	.025	.375	.2008	.00104	.00125

A **Mixed Decimal** is a whole number and a decimal written together.

Read *and* only at the decimal point.

Read : 4.6 17.005 208.065 600.06 8025.008

A **Complex Decimal** is a decimal with a common fraction written at its right.

Read : $.15\frac{2}{3}$ $.5\frac{1}{8}$ $.008\frac{5}{8}$ $.06\frac{1}{2}$ $.0009\frac{1}{7}$

To write decimals, it is only necessary to remember that one decimal place expresses tenths ; two places, hundredths ; three places, thousandths ; four places, ten-thousandths ; five places, hundred-thousandths ; etc.

Express decimally : six hundredths ; eighteen, and five tenths ; thirty-five thousandths ; sixty, and fifteen ten-thousandths ; fourteen hundredths ; forty-eight, and four thousandths ; nineteen hundred-thousandths ; six hundred eight thousandths ; six hundred, and eight thousandths ; four hundred, and four hundredths ; one hundred four millionths ; seventy-six thousand, and six millionths.

$$\frac{7}{10} = \frac{70}{100} \quad .7 = .70 \quad \frac{130}{1000} = \frac{13}{100} \quad .130 = .13$$

PRINCIPLE. — *Annexing ciphers to a decimal does not change its value ; and conversely, rejecting ciphers from the right of a decimal does not change its value.*

$$.24 = \frac{24}{100} = \frac{6}{25} \quad .85 = \frac{85}{100} = \frac{17}{20} \quad .38 = \frac{38}{100} = \frac{19}{50}$$

To reduce a decimal to a common fraction :

RULE. — *Express the decimal in the form of a common fraction and reduce it to its lowest terms.*

1. Reduce to common fractions : .18, .425, .025, .0125.
2. Reduce to common fractions : .26, .345, .072, .0075.
3. Reduce to common fractions : .85, .175, .008, .0625.

$$\frac{8}{25} = \frac{8 \times 4}{25 \times 4} = \frac{32}{100} = .32 \quad \frac{37}{750} = \frac{37 \times 1\frac{1}{3}}{750 \times 1\frac{1}{3}} = \frac{49\frac{1}{3}}{1000} = .049\frac{1}{3}$$

To reduce a common fraction to a decimal :

RULE. — *Multiply both terms of the fraction by a number that will make the denominator a power of 10 and express the result in the decimal form. Or,*

Annex ciphers to the numerator and divide by the denominator, and from the right of the quotient point off as many decimal places as there are ciphers annexed.

NOTE 1. — If there are not as many figures in the quotient as there are ciphers annexed, prefix ciphers.

NOTE 2. — When the division is not exact, write the remainder over the divisor as a common fraction, or place the sign + after the decimal to show that the result is incomplete.

1. Express in the decimal form: $\frac{3}{16}$, $\frac{18}{40}$, $\frac{23}{750}$, $\frac{9}{4000}$.
2. Express in the decimal form: $\frac{7}{40}$, $\frac{17}{15}$, $\frac{27}{400}$, $\frac{127}{1600}$.
3. Express in the decimal form: $\frac{9}{35}$, $\frac{18}{80}$, $\frac{45}{125}$, $\frac{7}{1250}$.

ADDITION AND SUBTRACTION OF DECIMALS

To add and subtract decimals, write units of the same order in a column and proceed as with whole numbers.

2.45	42.7	5.5	125.75	36.136
1.7	6.25	45.68	40.6	142.023
5.06	38.075	286.375	7.135	65.009
<u>9.21</u>	<u>87.025</u>	<u>337.555</u>	<u>173.485</u>	<u>243.168</u>
8.64	45.6	502.4	180.05	246.008
3.8	9.125	48.625	24.075	25.125
<u>4.84</u>	<u>36.475</u>	<u>453.775</u>	<u>155.975</u>	<u>220.883</u>