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# ARITHMETIC

PARTS I, II AND III COMPLETE

*With Answers*

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# ARITHMETIC

BY THE LATE  
C. GODFREY, M.V.O., M.A.  
AND  
E. A. PRICE, B.A.

PARTS I, II AND III COMPLETE  
*With Answers*

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## PREFACE

WE began with the intention of writing a text for *The Winchester Arithmetic*—a collection of examples published in 1905. But eventually it proved desirable entirely to rearrange and revise the examples after nine years' experience in using them; and also to add very largely to their number. A great proportion of the added examples are drawn from Osborne examination papers, and for these we have to thank our colleagues. If any examples from other text-books have slipped in by this route, we regret it and offer our apologies.

We draw attention to the **large type** used, which conforms to the standards laid down for various ages by the British Association Committee on "The Influence of School-books upon Eyesight." The boldest type is used in the examples in Part I, which presumably will be used by pupils of 9—12. The type used in the rest of the book is smaller, but marks an advance on that hitherto used in the majority of school-books.

The book has perhaps a rather practical flavour, but we have not departed so far from the traditional course as to make it unsuited to the needs of schools that take the ordinary public examinations. We have however lightened it by omitting matter that may now fairly be considered obsolete.

The scope of the work is sufficiently shown in the table of contents.

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It is supposed that before using this book the pupil will have mastered the **Simple and Compound Rules**, as presented in a beginners' book such as *The Groundwork of Arithmetic* by Miss Punnett (Longmans). Our chapters on these topics are intended for purposes of revision and practice in computation.

Parts I and II correspond broadly to the first two stages of the syllabus of Mathematical Teaching issued by the Headmasters' Conference.

We have followed the Mathematical Association Committee in recommending the 'shop' method of subtraction, and multiplication 'from the left.' But when a boy has once learnt to subtract, multiply and divide, it is unwise to make him adopt new methods. There is a time for thinking, and a time for automatic work: a boy should learn to perform the simple operations automatically, with as little thought as possible. He should not be disturbed by doubts as to which way his work should slope.

Part I contains chapters on **unitary method**, and on **areas and volumes**, in which these topics are treated **without introducing any fractions**.

With regard to the question whether **vulgar** or **decimal fractions** should be taught first, we have so arranged the work that teachers can adopt whichever order they prefer: those who begin with decimals are recommended to prelude with the two paragraphs on 'the meaning of a fraction,' which stand at the beginning of the chapter on vulgar fractions.

We may perhaps say one word in explanation of our attitude towards **problems**. There have been many complaints of the behaviour of text-book writers in this matter.

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It is said that whenever examiners succeed in putting a little novelty into their papers by inventing a new type of problem, the next text-book writer by means of a special section effectually sterilizes the new type and purges it of all educational value. From the examiners' point of view, this tendency is certainly regrettable. From an educational point of view, it is doubtful whether much is gained by solving arithmetical problems by means of 'pattern' solutions; presumably a problem is intended to make the pupil devise an appropriate solution, rather than to imitate a pattern: and many teachers hold that much of the time spent on these *chinoiseries* might go to something of more definitely mathematical interest, such as Trigonometry or Mechanics. Nevertheless, some of the stock types of problem do introduce a 'principle' (perhaps this is too dignified a word) of some interest; in these cases, some degree of classification seems permissible; and these types only have received special treatment in this book.

The **Revision Papers** at the end of each Part are supposed to provide straightforward out-of-school work for about 45 minutes. Those at the end of Part III are intentionally made rather long, to leave a certain choice: for instance, some teachers may instruct their pupils to omit questions on square root tables or cylinders, others may prefer to omit compound interest.

The **Miscellaneous Exercises** are less straightforward than the revision papers.

Mr A. W. Siddons, of Harrow, has very kindly read the proof-sheets and suggested many improvements; and some of our colleagues at Osborne have helped us in various ways. Our thanks are also due to the Controller of H.M. Stationery

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Office for permission to use questions from certain Civil Service Examination Papers: and to the Cambridge University Press and Mr Siddons for permission to copy the tables of Squares, Square-roots, Reciprocals and Logarithms from *Four Figure Tables* by Godfrey and Siddons.

C. G.  
E. A. P.

*April, 1915.*

## NOTE TO THE SECOND EDITION

A few minor alterations and corrections have been introduced in this new edition, and an additional Exercise in Stocks and Shares inserted at the end of the last Chapter. The type has been completely re-set.

E. A. P.

*October, 1926.*

¶ Exercises distinguished thus, ¶ *Ex. 1*, are intended  
for discussion in class.



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## WEIGHTS AND MEASURES

## MEASURES OF LENGTH

<i>British</i>	<i>Metric</i>
12 inches = 1 foot	10 millimetres (mm.) = 1 centimetre (cm.)
3 feet = 1 yard	10 cm. = 1 decimetre (dm.)
1760 yards = 1 mile	10 dm. = 1 metre (m.)
	10 m. = 1 dekametre (Dm.)
	10 Dm. = 1 hektometre (Hm.)
	10 Hm. = 1 kilometre (Km.)

*Notes.* 1 inch = 2.540 cm.  
 1 metre = 39.37 inches.  
 1 kilometre = about  $\frac{5}{8}$  mile.  
 A surveyor uses 100 links = 22 yards = 1 chain.

## MEASURES OF AREA

<i>British</i>	<i>Metric</i>
144 square inches = 1 sq. foot	100 sq. mm. or mm. <sup>2</sup> = 1 cm. <sup>2</sup>
9 sq. ft. = 1 sq. yd.	100 cm. <sup>2</sup> = 1 dm. <sup>2</sup>
4840 sq. yds. = 1 acre	100 dm. <sup>2</sup> = 1 m. <sup>2</sup>
640 acres = 1 sq. mile	&c.

*Note.* 10 square chains = 1 acre.

## MEASURES OF VOLUME

<i>British</i>	<i>Metric</i>
1728 cubic inches = 1 cu. ft.	1000 mm. <sup>3</sup> = 1 cm. <sup>3</sup> (1 c.c.)
27 cu. ft. = 1 cu. yd.	&c.

## WEIGHTS AND MEASURES

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## MEASURES OF WEIGHT

<i>British (Avoirdupois)</i>	<i>Metric</i>
16 ounces (oz.) = 1 pound (lb.)	10 milligrams = 1 centigram
14 lbs. = 1 stone	10 cgm. = 1 dgm.
28 lbs. = 1 quarter (qr.)	10 dgm. = 1 gm.
4 qrs. } = 1 hundredweight	1000 gm. = 1 Kgm.
8 stone } (cwt.)	
112 lbs. }	
20 cwts. = 1 ton	

*Notes.* 1 cubic foot of water weighs 1000 oz. =  $62\frac{1}{2}$  lbs. (more accurately 62.4 lbs.).

1 gram is the weight of 1 c.c. of pure water under certain conditions of temperature and pressure.

1 kilogram = about  $2\frac{1}{5}$  lbs.

## MEASURES OF CAPACITY

<i>British</i>	<i>Metric</i>
2 pints = 1 quart	1000 c.c. = 1 litre
4 quarts = 1 gallon	10 decilitres = 1 litre
8 gallons = 1 bushel	&c.

*Notes.* A litre is about  $1\frac{3}{4}$  pints.

1 gallon of water weighs about 10 lbs.

## MONEY

<i>British</i>	<i>French</i>
4 farthings = 1 penny ( <i>d.</i> )	100 centimes = 1 franc
12 <i>d.</i> = 1 shilling (1 <i>s.</i> or 1/-)	<i>German</i>
20/- = 1 pound (£)	100 pfennig = 1 mark
	<i>American</i>
	100 cents = 1 dollar

*Notes.* A franc is worth about 10*d.*

A mark ,, ,, 1*s.*

A dollar ,, ,, 4*s.*  $2\frac{3}{4}$ *d.*

## TIME

60 seconds (60") = 1 minute (1')
60 minutes = 1 hour
24 hours = 1 day
365 days = 1 year
366 days = 1 leap year