

**TEACHERS' MANUAL
FOR TEACHERS USING
ARITHMETIC BY GRADES**

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Teachers' Manual for Teachers Using Arithmetic by Grades by John T. Prince

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BY

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PREFACE.

CONSIDERING the amount of time given to the subject of Arithmetic in our schools, it must be admitted that the results are lamentably poor. It is fair to presume that the faulty character of the text-books in general use is accountable in part for these results. With few exceptions American text-books in Arithmetic seem to leave the teacher out of the account. Definitions, rules, explanations, illustrative problems—in short, everything which should be taught by the teacher is placed before the pupil to be learned. It is true that the best teachers generally ignore these false aids and ask the pupils not to refer to them. Yet, because they are constantly before the pupils, the forbidden aids are oftentimes unwisely used, and problems are performed slyly or thoughtlessly according to the rule or model solution. While these practices are carried on to some extent in good schools, despite the care of teachers, they are universally pursued in schools whose teachers are guided by the text-book. Another fault of text-books in common use is the insufficiency of problems for practice, and teachers are compelled to make up the deficiency by placing upon the black-board original problems or problems taken from Arithmetics other than the regular text-book. The objections to this practice are: (1) The danger for want of time of giving to the pupils unsuitable or poorly-arranged problems; (2) the harm done to pupils' eyes by close and long-continued looking, frequently before a lighted window; (3) a loss of the teacher's time in copying.

The series of books of which this Manual is a part is designed to meet the above objections. It will be readily seen that the pupils' books are not merely books of problems intended to supplement the use of an arithmetic already in the hands of pupils, but

are intended to be used independently as the only text-books needed. Moreover, the very large number and variety of problems warrant the assertion that the books contain all the problems that will be needed for drill work.

The books for pupils are eight in number, arranged somewhat on the lines of classification in City graded schools. The first two or three books are intended for use in Primary schools, the last book in advanced Grammar schools or High schools. The subjects are divided as follows:

Book I.: Numbers from 1 to 20.

Book II.: Numbers from 1 to 100.

Book III.: Integers to 1000000, Fractional Parts of Numbers, U. S. Money, Common Weights and Measures.

Book IV.: Whole Numbers unlimited, Common Fractions to Twelfths, Decimal Fractions to Thousandths, Measurements, Business Transactions, Denominate Numbers.

Book V.: Common and Decimal Fractions, Mensuration, Denominate Numbers, Business Transactions.

Book VI.: Mensuration, Denominate Numbers, Metric System, Percentage and Simple Applications, Business Transactions and Accounts.

Book VII.: Profit and Loss, Commission, Insurance, Taxes, Duties, Interest, Banking, Stocks and Bonds, Exchange, Business Accounts, Geometrical Exercises and Measurements, Ratio and Proportion.

Book VIII.: Miscellaneous questions involving the making of definitions, rules and formulas; Algebraic Exercises, Involution and Evolution, Exercises in Geometry and Mensuration, Book-keeping.

It has been the aim of the author to include in the books all subjects that are likely to be needed in any school, rather than

limit them to the possible needs of a certain class of schools. A selection of subjects, therefore, as well as a selection of problems under a given subject may be made to suit existing conditions.

The following advantages are claimed for the use of the Manual and text-books :

1. The separation of teachers' and pupils' books, whereby pupils may be taught properly and may not be given too great assistance. Suggestions as to methods of teaching and drilling, as well as the illustrative processes, explanations, rules, and definitions which belong to the teacher to develop analytically are put into the Teachers' Manual, while in the pupils' books are presented only such exercises as are needed for practice.

2. The careful gradation of problems, by which pupils acquire inductively a knowledge of arithmetical relations and principles, and skill in arithmetical processes. This is in recognition of the well-known pedagogical principles of proceeding from the known to the unknown, and from the simple to the complex. It is advised that this plan be kept constantly in mind by the teacher, and that whenever a process is not understood or is not readily performed, the pupils be taken back to processes which are well known and which can be performed readily, and then be led forward by easy steps until the desired end is reached.

3. Frequent reviews, and such an arrangement of exercises as will enable pupils to have needed practice in the applications of each principle, first by itself, and afterwards in connection with other principles which have been learned.

4. The large amount of oral work, or work which may be done without the aid of figures. Three objects of Mental Arithmetic are sought in these exercises : (a) Illustration of principles and a preparation for written work, (b) Development of the logical powers, (c) Cultivation of ability to work with large numbers by short processes.

5. The great number and variety of problems. The aim has been to give the *largest number* of problems that will be needed

for teaching and for drilling in all grades. For this reason, and because the forms of expression are varied, being taken from many sources, there will be no necessity of giving supplementary drill lessons on the blackboard.

6. Practicalness of work in respect to the character of the problems, and the solution of them. Care has been taken to give problems which are most likely to be met in every-day life, and to give them in a practical form. Many of the miscellaneous review problems were made by mechanics, clerks, accountants, etc., with a view of presenting conditions most likely to occur.

7. The introduction of statistics and facts of physics, astronomy, history, geography, etc., thus enabling pupils to gain incidentally much useful information.

8. The use of drill tables and other devices to save the time of teachers.

In addition to the above features, some of which are distinctively new so far as American text-books are concerned, there is the separation of pupils' exercises for practice into small books somewhat on the lines of gradation in City graded schools. By this arrangement there are gained greater convenience of handling and economy of wear than in the use of a large book which is intended to be used for several years by the same pupil.

The author is aware that the use of these books with accompanying manual in the manner proposed is not an experiment. Essentially the same plan has been pursued in Germany for many years, and it is confidently believed that American teachers will readily recognize its merits.

The work of bringing together so large a number of exercises has been materially lessened by the valuable contributions of teachers, business men, and mechanics, who generously responded to the author's request for assistance. Especial acknowledgments for such service should be made to Misses Smith, Dale, and Barber of the Practice Department connected with the Framingham, Mass., Normal School; Miss A. Roof and Mr. B. W. Drake, of Waltham, Mass.;

and Mr. L. F. Warren, of West Newton, Mass. Obligations for valuable assistance in correcting proof sheets are also due to Miss F. A. Comstock, of the Bridgewater Normal School, and Miss Amelia Davis, of the Framingham Normal School.

Suggestions for improving the work and corrections of errors, either in the Manual or Pupils' Books, will be gratefully received by the author.

