

**HARPERS' GRADED ARITHMETICS.  
FIRST BOOK IN ARITHMETIC:  
COMPRISING TWO YEARS OF  
ORAL AND WRITTEN WORK IN  
THE ELEMENTS OF NUMBERS**

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Harpers' Graded Arithmetics. First Book in Arithmetic: Comprising Two Years of Oral and Written Work in the Elements of Numbers by Anonymous

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**ANONYMOUS**

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*HARPERS' GRADED ARITHMETICS*

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FIRST BOOK IN ARITHMETIC

COMPRISING

TWO YEARS OF ORAL AND WRITTEN WORK  
IN THE ELEMENTS OF NUMBERS

NEW YORK

HARPER & BROTHERS, FRANKLIN SQUARE

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## PREFACE.

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WHATEVER instruction in numbers is given to children in the beginning of their school course should be oral, and purely objective. Oral instruction usually continues through about two school years, or until the children can read readily and intelligently in a Second Reader.

This book is intended for the third and fourth years in a school course; and is the first of a series of two books embracing a complete course in arithmetic, both oral and written, for schools below the high-school grade.

Oral and written work are combined throughout the book. Pages 9-59 contain work for one year; and pages 61-140 contain work for a second year. The lessons in the first ten numbers embrace all the possible combinations that form these numbers; numerous practical applications; and the use of the necessary signs and terms. The lessons on these ten numbers are arranged as follows:

I. **INDUCTION.**—In these introductory lessons the child is made familiar with each number as made up of ones, with its relation to the preceding number, and to the number *one*.

II. **MEASURING.**—In these lessons every possible combination that forms the number, all of the relations of the number to each number smaller, and the equal fractional parts of the number are brought out by questions on the objective plan.

III. **TABLE.**—Having formed all the combinations that produce the number, an outline for the table of these combinations is given, which is to be filled up, learned, and recited by the pupil.

IV. **COMPARISON.**—In these lessons the pure or abstract number is compared, in all possible ways, with all less numbers.

V. COMBINATIONS.—In these exercises all the pure numbers that have formed the subjects of previous lessons are variously combined, the result of no combination exceeding the number which forms the subject of the lesson.

VI. APPLICATIONS.—These consist of exercises or problems in applied or concrete numbers, no result being greater than the number which forms the subject of the lesson.

WRITTEN WORK.—This includes the outlines for the tables of combinations, and numerous exercises and problems for slate and blackboard work.

In brief, the lessons, in their order, on each of the ten numbers are—I. Induction; II. Measuring; III. Constructing Table; IV. Comparison; V. Combinations; VI. Applications.

The lessons on the numbers 10–100, pages 61–77; and on the numbers 100–1,000, pages 79–99, are arranged on the same general plan as those in the first ten numbers, the advancement being more rapid, to keep pace with the constantly increasing abilities of the child. Pages 100–140 make the child familiar with the written processes of notation, addition, multiplication, subtraction, and division of numbers less than one billion—including United States money,—and give him a large amount of practice in both oral and written work.

MODELS OF WORK.—Models are given of slate and blackboard work, and of oral explanations and solutions, suited to the age and advancement of the pupils.

Instruction in the elements of numbers, in accordance with the plan developed in this book, will give to children—

1. Ability to write, read, and use numbers less than one billion;
2. Knowledge of all the tables of elementary combinations;
3. Facility in giving oral and written solutions of questions in integers and United States Money; and
4. Familiarity with the fundamental operations of written arithmetic, and a thorough preparation for the study of the Second Book in Arithmetic.



## SUGGESTIONS TO TEACHERS

On pages 5, 6, 7, 60, 78, 100, and 121 are suggestions on points which require special attention, and which can be referred to in this way better than in the text of the book. It is not intended to prescribe forms and methods, but to offer a few hints to aid in the successful use of this book.

**Assigning Work.**—The activity of child nature demands that the child have employment. Therefore, with every lesson assigned, give the pupil work to do at his seat, and give him all necessary instruction how to do that work. *Tell him what to do*, and, if necessary, *show him how to do it*.

**Written Work.**—Give particular attention to all the written work of the pupil. See that his slate is properly ruled before he begins written work, and inspect the work after he has finished it.

**Class Work.**—Devote a portion of the time of each recitation to an animated drill upon impromptu exercises similar to those contained in the lesson for the day. Test the comprehension of the pupil by familiar questions similar to those contained in the text of the lesson. Illustrate on the board, by lines and diagrams, questions that admit of such illustration, and then require the pupil to do the same.

**Use of Books in Class.**—Pupils encounter more difficulty in arithmetic from inability to read correctly than from any other cause. To become good arithmeticians, they must read *understandingly*. No amount of reading *for them*, or *to them*, or explanation by the teacher, can make good the inability to read *intelligently*. Therefore, require each pupil to read from the book, in the class, the exercises of the lesson, and then to state orally the meaning of what he has read.

**Forms of Answer.**—Require only brief answers to the questions in applied, or concrete, numbers. Always require pupils to answer in complete sentences and in correct language. Whenever you can give a better form of answer than is found in the book, adopt it; but before doing this, be sure that it is better, both for the particular question or kind of questions, and for the pupil or class.

**Oral Instruction.**—Impromptu oral exercises should be either—

- 1st. To prepare the pupil for a lesson to be learned from the book; or,
- 2d. For drill in connection with a lesson or recitation; or,
- 3d. To test the pupil's knowledge of subjects already passed over—i. e., for review or examination.

Use no time in giving oral instruction on topics in numbers not immediately connected with the lessons in the regular course.

**Tables of Combinations.**—A knowledge of the elementary combinations is indispensable to any progress in arithmetic. Therefore, give pupils frequent and thorough drills in the tables of combinations.

Keeping pupils employed a few minutes once or twice each day, in writing tables of combinations, aids in fixing these tables in their memories.

After a table of combinations has been learned, allow no counting to form the same combinations. If a pupil is to add 3 to 6, multiply 6 by 3, subtract 3 from 6, or divide 6 by 3, require him to form the combination from knowledge of the tables already acquired.

#### LESSONS IN THE NUMBERS 1 TO 10, INCLUSIVE.

**Page 9.**—In the picture on page 8 are shown all the objects mentioned in the questions on page 9. Vary the questions on this page, by using the names of other objects. Thus:

Two boys and one boy are how many boys?

One girl and one girl are how many girls?

Teach children to make neat figures. This may be done by requiring them, one day, to write on their slates five columns of ten 1's each, and five columns of ten 2's each. Another day require them to write 3's and 4's in the same manner; and so on. This will give them written work at their seats for a week or more. Practice of this kind for two or three weeks will secure the object sought. At first, rule column lines on their slates, or have the pupils rule them, as guides in writing figures in columns.

**Page 10.**—In reciting the lessons found on this page, pupils should have their books open, and the objects named in any question should be counted, in the out, before the answer to the question is given.

**Page 12.**—The marks made by the pupil become visible objects, which he uses in measuring the first ten numbers. Require him to use other objects in a similar manner.

**Page 13.**—Require the pupil, in measuring numbers, to use marks and other visible objects, before using the applied, or concrete, numbers given in these exercises.

**Page 16 (b), Questions 5 and 6.**—In all cases where remainders

occur, teach pupils to call them so many over, or so many remainder. Neither require nor permit pupils to give a remainder in a fractional form—as halves, thirds, etc.

**Table of 3.**—Allow the pupil to use counters in completing this table, and in forming and completing similar tables.

**IV.**—The form of expression, “Three ones are three,” “Four twos are eight,” etc., is limited to pure, or abstract numbers; while the form, “Three times one is three,” “Four times two birds are eight birds,” etc., is the necessary form for applied, or concrete, numbers. Require pupils to use the proper form with each class of numbers.

**Page 31.**—It may be well to explain the terms *Vertical*, *Oblique*, *Horizontal*, and *Parallel*, and to require pupils to use the proper terms in describing each sign.

**Page 33.**—Lessons a, b, c, d, are for drill in combinations of the numbers 1, 2, 3, 4, 5, 6. Use any one of the following methods, with these and all similar exercises:

1. As an exercise is read, require answer—from pupil or class—to each new combination in the exercise, when it is named in the reading.
2. As each combination in an exercise is read, require all who can give the result to raise the hand, but have only the final result given orally, after the reading of the exercise is finished.
3. As the successive combinations in an exercise are read, require each member of the class, in turn, to name the result.
4. Call for final result—from pupil or class—when the reading of the exercise is finished.