NUMBER PRIMER

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MIDDLESEX A. BAILEY & GEORGE B. GERMANN

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BY

MIDDLESEX A. BAILEY, A.M.

HEAD OF THE DEPARTMENT OF MATHEMATICS, NEW YORK TRAINING SCHOOL FOR TEACHERS

AND

GEORGE B. GERMANN, PH.D.

PRINCIPAL OF PUBLIC SCHOOL NO. 130, BROOKLYN

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PREFACE

THIS primer renders available for the use of pupils beginning the study of number a series of exercises that deal primarily with the fundamental combinations in addition and subtraction and their application. In form and substance these exercises are simple, progressive, and within the reading experience of pupils. The exercises are the outgrowth of three years' classroom experimentation in the selection and arrangement of number material adapted to the needs and understanding of first and second year pupils. The text has been so designed that it may be placed in the pupils' hands as soon as they have acquired the simple vocabulary of the first exercise, during the second week in school. The use of this book necessitates the same guidance as is given with the use of a supplementary primer or first reader. The text supplements the teacher's oral development, includes the essential drill exercises in compact form, and offers the pupils opportunity to visualize number relations. The book is divided into three parts, each of which covers approximately the ground for one half-year's work.

Part I supplies the essential material for the first half-year, presented in picture and simple story form. The exercises of the first half-year, which must necessarily be mainly oral and objective, relate to simple problems of the child's daily experience and to measuring with the units illustrated in the text, and include the addition combinations of numbers of one order with 1 and 2.

Part II covers the ground of the second half-year's work. The exercises of this part are principally occupied with the addition combinations of numbers of one order with 1, 2, 3, and 4, and their correlated subtraction combinations, and with the application of these combinations to the increasing and decreasing of numbers of two orders.

Part III treats of the work of the third half-year. The exercises of this part bring to a logical completion the groundwork of the primer. They deal primarily with the addition combinations of numbers of one order with 5, 6, 7, 8, and 9, and their correlated subtraction combinations, and with the application of these combinations to the increasing and decreasing of numbers of two orders.

Parts II and III contain, in addition to the groundwork enumerated, exercises illustrative of the application of counting and addition to the solution of easy problems of the multiplication and division types, and exercises dealing with measures and simple comparisons.

The problem exercises have been carefully planned as to vocabulary and scope. The vocabulary (pp. 175, 176) consists of 376 words distributed as follows: Part I, 67 words; Part II, 203 new words; Part III, 106 new words. A few of the words are easy technical terms; the others are such as may be found in the usual primers and first readers. With the necessary drill preliminary to a new reading exercise, and with preparatory work of a nature similar to the printed problems, pupils can read and interpret the exercises of the text. The reading and solution of number stories develop a sense of power and independence, and offer a means for the correlation of reading with number work.

The following are the special features of this book: the adaptation of number exercises, both as to substance and as to mode of expression, to the understanding of pupils at the very beginning of number work; the selection of graphic illustrations that elucidate the purpose of the exercises illustrated; the development of the fundamental addition and subtraction combinations from concrete representations, abundant drill on these combinations in abstract form, and their application to easy concrete oral problems; the orderly development of exercises dealing with the increasing and decreasing of numbers of two orders by numbers of one order, as a preparation for column addition and for subtraction; and finally, a logical arrangement of the exercises, which answers the requirements of a good teaching sequence.

SUGGESTIONS TO TEACHERS

THE oral work to accompany Part I should include, in addition to the exercises suggested by the text, simple problems dealing with the four fundamental operations, whose solution can be easily determined with the use of objects. When a pupil has mastered number concepts up to ten, for example, he is prepared to solve problems of the following types by counting objects one at a time.

ADDITION. There are 3 apples on one plate and 2 apples on another plate. How many apples are there on both plates?

Solution. The pupil puts 3 splints in one group and 2 splints in another group, and counts the splints.

SUBTRACTION. There were 5 cups on the table. 2 cups were taken away. How many cups remained on the table?

Solution. The pupil puts 5 splints in a group, takes 2 of them away, and counts the splints that remain.

MULTIPLICATION. John plants 4 trees in a row. He plants 2 rows of trees. How many trees does he plant?

Solution. The pupil places 4 splints in each of 2 groups, and counts the splints.

DIVISION. (Measuring.) I give 8 cents to some boys. To each boy I give 2 cents. How many boys receive money from me?

Solution. The pupil takes 8 splints, gives 2 splints to each of several boys in succession, and counts the number of boys who receive splints.

DIVISION. (Partition.) I give 6 marbles to 3 boys. To each boy I give the same number of marbles. How many marbles does each boy receive?

Solution. The pupil takes 6 splints, distributes them one at a time in rotation among 3 boys, and counts the number received by one boy.

As the pupil learns the addition and subtraction combinations of Parts II and III, he is prepared for column addition and for

subtraction, and for the more expeditious solution of simple problems related to the five types noted. The advance of Parts II and III over Part I is illustrated by the following methods of solution of the first three problems just mentioned:

ADDITION. The pupil applies the combination $3 + 2$, and finds the answer 5 from this relation.

SUBTRACTION. The pupil applies the combination $5 - 2$, and finds the answer 3 from this relation.

MULTIPLICATION. The pupil applies counting by 4's, and from the relation 4 and 4 are 8, finds the answer.

In teaching the combinations the aim should be to have each combination in addition associated with its sum, and each combination in subtraction with its remainder. The association should be direct and immediate. It is an error to have constant reference to objects for the purpose of correcting mistakes made by the pupils. After the combinations have been objectively developed, pupils should be required to memorize them in tabular form. Mistakes in the statement of the results of the combinations are best corrected by having the pupil repeat the table involved. The tables are memorized with ease, because the sums have the common difference of one. The laws of association are followed, because the terms to be associated and their result are brought into direct and immediate relation. The combinations are not properly known, however, until the pupil can give the results as readily as he is required to recognize a printed word. To encourage direct association, it is well to require the pupil to name, both in concert work and in individual recitation, the results of a series of miscellaneous combinations, such as row 5 of Exercise 44, without a pause, and at the uniform rate of two a second, as indicated by the tapping of a pencil.

For the purpose of relating the combinations dealing with increasing and decreasing numbers of two orders by numbers of one order, with their correlated fundamental combinations, the

first column of exercises similar to Exercises 28 and 32 includes the latter combinations.

Attention is called to the Arabic figures occurring instead of dots in the rectangles of exercises similar to Exercise 42. This is a typographic device to indicate the fact that the combinations which these figures represent have occurred in preceding exercises. The small full-faced figures in the addition tables of exercises similar to Exercise 43 indicate the same fact.

For training in thought and expression, pupils may be required to formulate questions whose substance is suggested by the elliptical statements occurring in exercises similar to Exercise 43, or whose numerical terms are indicated by the incomplete equations of exercises similar to Exercises 43 and 50.

Variety in sequence will be obtained in the use of drill exercises on the combinations, if exercises similar to Exercises 44, 46, 50, and 52 are read forwards and backwards by rows, and up and down by columns.

CONTENTS

PART I

PART II