

**NUMBERS ILLUSTRATED
AND APPLIED IN
LANGUAGE, DRAWING,
AND READING LESSONS**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649479818

Numbers Illustrated and Applied in Language, Drawing, and Reading Lessons by Andrew J. Rickoff & E. C. Davis

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Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

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APPLETONS' STANDARD ARITHMETICS

° NUMBERS ILLUSTRATED

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LANGUAGE, DRAWING, AND READING
LESSONS

AN ARITHMETIC FOR PRIMARY SCHOOLS

BY

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NEW YORK, BOSTON, AND CHICAGO
D. APPLETON AND COMPANY

1886

P R E F A C E.

It is the design of this book, in the first place, to familiarize the child with numbers and their combinations, not by means of repeating such formulæ as 4 and 3 are 7, but by provoking observation to lead him to the adoption of the formula as a statement of his own experience. In this way an intimate and spontaneous association of thought and expression will be induced, and that listlessness avoided which makes it possible for many children to repeat 4 and 3 are 7, without a thought of 4 or 3, or of the combination of 4 and 3.

It is not difficult to understand how it is that so much effort is wasted in teaching a child to answer always with readiness and confidence the question, "How many are 4 and 3?" when it is recollected that the custom has too often been, not to lead him to tell us what he has observed and knows, but to repeat a form of words which he had committed to memory as mere words. The methods of our schools are happily greatly improved in this respect, and it is the purpose of this book, especially of Part I, to afford a great variety of exercises in which the pupil may gain a wide experience in the application of number to objects, and a ready perception of their relation to each other.

The pictorial illustrations at the head of the pages, entitled "*The Conversation*," are designed for language-lessons in which the immediate design is to excite thought and cultivate expression, but their adaptation to the ultimate purpose of the book will be readily understood.

In the smaller illustrations, under the heading "*What can you tell?*" the imagination is called into more active play, and the child is led to give more independent and original expression to the ideas gained from the pictures than the purpose of the foregoing exercises would permit, which was to follow out a logical and consistent plan of development. Here he is to find for himself the thread of the "story" hinted at in the picture, and weave it into a connected form for himself, the basis being the special combinations suggested in the picture.

In these illustrations, the operations in numbers are more definitely brought to notice than previously, but it is especially desirable that no form of words or even process of objective illustration be repeated with such a

degree of uniformity that the mere form may assume undue importance, or supersede the exercise of intelligence.

The Slates are to supplement and carry on the object-work, suggestions for which will be found in the general notes. They serve the twofold purpose: first, of teaching the child the use of the slate, at the same time familiarizing him with the language conveying the ideas, position, direction, etc.; and, second, of picturing out the various combinations with more distinctness and freedom from distracting surroundings than can be attained in any other mode of illustration.

The Diagrams, which, after Lesson V, take the place of the slates, are designed for more extended slate exercises, still involving the use of numbers. Their usefulness as primary drawing-lessons can not fail to be recognized.

The children are not only to discover and describe the various combinations depicted, but, taking them as models, are to exercise their ingenuity in making as many others as possible with marks, dots, etc., upon their slates, or with sticks and other counters. This is a training in *form*, *number*, and *arrangement*, and, if counters of different colors can be obtained, admirable lessons in *color* may also be given. Thus is the inventive faculty called into play, imagination exercised, and taste cultivated, while the child is becoming accustomed to the number in all its combinations. The constant handling of the number, in this and the other exercises, affords the child experience, and, as far as the purely arithmetical aim of these first lessons is concerned, this is the *sole* object, *not* to teach him to say that $2 + 1 + 2 = 5$, but to lead him to *know* it by experience.

Figures and arithmetical signs have, of course, no place in Part I. Normal or schematic representations and names only are given. These are to be learned by sight, as suggested in the general notes.

In the *Script Lesson* at the foot of each page will be found the name of each number in script form. This is given for copy-work.

Hints.—The suggestions and questions to be found under this heading on the teacher's page are merely intended as hints of an extended work and great variety of exercises, to be supplied at the discretion of the teacher.

The Parts from I to V indicate divisions of the subject; they do not correspond with successive grades in school classification.

PART I.

Suggestions for exercises to precede and supplement the lessons on the illustrated pages.

SLATE EXERCISES.

Object Lesson on Slate.—As the slate and pencil are most important implements of study in this branch, it is well to make them first objects of study—for one reason, that the child may become so well acquainted with them and their use that his ignorance of the tools may not interfere with the efficiency of the work to be done with them, and, also, because the study of them affords excellent opportunity for certain preparatory work necessary to the introduction of written arithmetic. Although every teacher has, doubtless, her form for object lessons on the slate, yet suggestions are here given for such lessons, that certain points having a more especial bearing upon the subject under consideration may not be overlooked.

The children are first encouraged to tell, in their own way, all they can see or be led to observe about their slates; then, by skillful questioning, not hinting too much as to answers expected, the teacher draws out the following, in consecutive form. *Frame.*—Use of frame; what made of; if covered, with what, and why [a little lesson on quietness]; if rubber corners, why. *For slate part.*—Of what made; hard; breakable; color. *Parts.*—Sides, how many; corners, how many; *faces*, one looking up at you, *upper* face; one looking at desk, lower face; how many faces has a slate? How many faces have you? *Care of slate.*—Breaking, scratching, cleanliness, etc.

An Object Lesson on the Pencil has its place here, and the following points to be made are suggested: A conversation on pencils in general; use lead-pencils for white paper, black on white, stone-pencils for slate, white on black; compare crayon and blackboard. *Shape.*—Long, round, pretty; easy to hold. *Ends.*—How many; one blunt, one sharp; why sharp. *How to hold pencils.*—Position of fingers; of wrist [writing position]. *Use.*—Make firm, light lines; heavy lines scratch and are not easily erased. *Care of pencils.*—Easily broken; carefully handled; kept sharp for neat work and light lines.

Lessons on Position and Direction.—It is an accepted theory that the child must go from the known to the unknown, and that each newly-acquired experience be made a stepping-stone to the next. Few children on first entering school, without previous training, would be able to obey the direction, "Make a ring in the left upper corner of your slate." On the other hand, few, if any, would be found that did not know which is the right hand. With this bit of "terra firma" to stand upon, the teacher, after giving a short and entertaining exercise upon "right hand and left hand," begins the lessons on the use of the slate by the following exercise, which has for its purpose the learning of

Position.—The children being first directed to place their slates *lengthwise* on their desks [the word will be readily learned by "telling and doing"], the teacher begins by having them point out the *right side* of the slate; *left side*; the *lower side* [side lower down on desk]; *upper side* [side farther up on the desk]. "How many corners on left side? Where are they? Who can point to a left corner? To the left *upper* corner? To the left *lower* corner? Who can tell me the name of this corner [pointing to corner of slate pictured on blackboard]? Who can find the *right* upper corner? Who can find the right *lower* corner? Jennie may point to any one corner of her slate and tell me its name. Johnnie may show and tell another, etc., etc." After this follows an exercise on

Direction.—"Put your finger on the left side of your slate, in the upper corner. Now slowly move it *downward* as far as you can. Where does it stop [left lower corner]? Where did you start? Now start at the left lower corner, and move your finger *upward*. Where does it stop?" Repeat with the right side. "Put your finger in the left upper corner again. Now move it slowly *across* the top of your slate, *toward* the right side. Where does it stop [right upper corner]? Where did you start? Now start at the right upper corner, and move it *back* toward the left." Question as before, and then repeat with the lower side of the slate.

CLASS EXERCISES.

THE Class Exercises outlined here are given only suggestively, to be amplified or condensed, omitted or repeated, at the discretion of the teacher; their purpose being, mainly, to show what kind of oral work may advantageously supplement the work for the children's pages.

By means of such exercises as the following, each of which has its definite purpose, it will be found that memory is cultivated, imagination stimulated,

and observation trained; sight, hearing, and touch are exercised, and thus a harmonious development of the child's powers is attained; the habit of attention, more or less sustained, is formed, and prompt action in obedience to command is acquired, as also a ready expression of thought.

1. The teacher calls upon Johnnie to come and find out what she has in her right hand. Johnnie finds "a marble." Jennie finds "two marbles" in her left hand. "Would you rather have Jennie's marbles or Johnnie's? Why? Who would rather have mine [showing a handful]? Why?"

2. "How many more marbles has Jennie than Johnnie? What can I do so that Johnnie and Jennie will each have the same number of marbles?"

3. "Ned, bring me one little girl; now bring me one little girl again. How many times did Ned bring me one girl? [Putting arms around them and bringing them close together.] How many are there? [Sends one to her seat.] How many did I send back? How many are left here?"

4. "Hold up as many hands as I do. Hold up *twice as many*. Who can show me this many [two] pencils? Show me *half as many*."

5. "Now, let me see all the little heads bowed down upon the desks. Shut your eyes tight. Listen! [Claps twice.] Wake up! Who can tell me what he heard? How many claps?"

6. "Who would like to play blindman? Well, blindman, feel these pebbles and tell me how many there are." She tests him with numbers, from one to three, and then with a large number, calling out the expression "*many pebbles*."

7. "Clap your hands this many times. [Makes two rings.] Clap once for each star I make. [Makes ten stars, and covers them quickly.] Tell me, without seeing, how many stars I made. How many times you clapped?"

8. "Show me as many counters as you have heads; arms; chins; cheeks."

9. "Who knows of something that has one wheel? Two wheels? Three wheels? Two feet? Four feet? More than four feet?"

10. "How many eyes has a cat? What has *one eye*? [Needle.] How many ends has a pin? Name them. How many wings has a bird? A fly?"

11. "If Nellie earns one penny making lamp-lighters to-day and one penny to-morrow, how many will she have? If you had two pencils, and lost one yesterday and one to-day, how many would you have left?"

12. "Nellie, find two blue stars [paper]. Jennie, find one red, one blue, and one yellow star. Walter, find three different colored stars."

13. "Who can touch two different things? Three different things?"

14. "I hear the clock ticking, a bell ringing, and Will writing on his slate. How many sounds do I hear? Who can tell of two different sounds?"

1. Outline of Lesson on the Words and the Schemas.—"What is this, children [●] [pointing to it on the blackboard]?" "A dot." "How many dots?" "One dot." "Say again the word which tells how many dots; say it slowly. It *sounds* like the tone of a great bell. Would you like to see how it *looks*?" The teacher prints slowly, and in large letters, the word *one*, and then calls upon individuals to point to it and pronounce it. Then, "Show me one book; one slate," etc. "Show me [pointing to the word but not pronouncing it] [one] pencil; [one] desk," etc.

In the same way, by showing [●●], the word "two" is introduced. "Sounds like the cry of an owl." The teacher then prints the word, as before, and lets the printed form "tell" how many fingers, hands, books, etc., to be shown or pointed to. Changing the questioning from one thing to two things, she tests their conception of the meaning of the two words. Then, showing *one* and *two* of various articles, she calls upon first one and then another to point to the word which tells how many things she is showing. The class is then permitted to find these words (and show how many) in chart or readers, or any text at hand, and finally to discover both the words and the schemas in their arithmetics.

II. Hints for Language Lesson on "The Conversation."—The general aim of this exercise is to give a liberal training in reading, and expressing the thought contained in pictures, while the special points to be brought out through this medium are a recognition of the number illustrated, first as a whole and then as to its groupings.

This is to be attained by means of a familiar conversation in which the children are encouraged to give full and free expression to the ideas they gain from the picture, their attention being directed to special points by the questions of the teacher. Since the principal aim of this lesson is to stimulate thought and cultivate the imagination, it would not be advisable to throw the child off the track of the thought by insisting upon accurate description, nor by too frequent corrections of language.

The teacher would do well to first bring the children into sympathy with the beauty and spirit of the scene in this first illustration, by noting the softened light of early dawn, the fleecy clouds, the rising sun, the long shadows, and the signs of awakening life. "How many of you ever saw the sun rise? Who ever saw the moon? The stars? How many stars? How many suns? What are the children doing? Do blackberries grow on trees? What is the man doing? Is this place in the city or country? What else do you see in the picture?" This last will call out an enumeration