JUNIOR HIGH SCHOOL MATHEMATICS; BOOK II

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BOOK II

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TO THE TEACHER

In this book, as in Junior High School Mathematics, Book I, the subject is presented in a natural psychological way. As in Book I, the treatment is also in accordance with the accepted views of a great majority of educators who have made exhaustive investigation of the ways and means available to get the most value out of mathematics in the organized junior and senior high school courses.

The work for the seventh year found in Book I has been connected by indissoluble bonds with the work of the eighth year found in this succeeding book, Book II, and the work found here will in turn be connected with the work to be found in Book III by equally close and strong connecting ties. The author, for the purpose of providing a continuous stream of consecutive work for a three-year course, has adopted the same basic method. It is best described, perhaps, by calling it without fear or favor the topical plan spiralized. Each topic is treated at sufficient length to create a lasting impression, and ever thereafter at intervals is brought up in reviews. The need of this eternal vigilance in review work, and the special demand of modern business and industry for greater facility in the handling of the four fundamental operations, is met by introducing this second book with the four fundamental operations with integers. As in Book I, these reviews are elastic, and can therefore be made to fit the needs of any particular class. Short cuts, approximations, and checks are given due im-

portance throughout the computations. The value of new associations and the application of principles studied in engaging the pupil's interests is recognized. For these reasons the approach is varied from that in Book I, and new elements are introduced, as, for instance, horizontal addition, abbreviated multiplication and division, and simplified addition.

Decimals being merely an extension of our number system to fractions, and the pupil being already familiar with the use of decimals, these are treated in connection with integers. Literal numbers introduced in Book I are now studied much more fully. The equation and formula are accepted as the chief literal mathematical tools, and work is provided as needed for extended development of these two main elements. Much of the literal work that is often given, like complicated factoring and operations with several sets of grouping signs, has been eliminated, because they occur only in very technical matters. It has also been found that only a few exercises are needed to make some principles and operations clear and to fix them in the memory. In providing exercise material this was taken into account, thus saving time and energy. Literal fractions are naturally studied with numerical fractions, and the same curtailment practised as with integers. The pupil who has completed the literal number work of this volume can successfully handle third semester algebra.

Graphs are first studied as a new mathematical language, for the comparison of quantities. Some of these sets of quantities are unrelated, as, for instance, the wheat yield in the various states for a certain year, while others are connected by a functional relationship, as the radius and area of a circle. In order to bring out this use of the graph, much attention is given to the reading of graphs as well as to their

construction. The second use of graphs is in the solution of equations. They are made the chief means of solving simultaneous quadratic equations.

The two forms of number comparisons, majorities and ratios, are treated together in the same chapter. Considerable attention is paid to the language usually met, as well as to the various forms of comparison that arise under either majorities or ratios. Among the forms studied are the simple, practical, trigonometric ratios which can be used in a multitude of interesting problems.

A chapter is devoted to that useful time-saving instrument of calculation, logarithms. They are treated as exponents, and are developed easily from the known laws of exponents. The pupil is not mystified by the meaningless words "characteristic" and "mantissa," but is given the perfectly intelligible words "whole number" and "decimal part" instead.

The tables have again been placed together in the back of the book. Any material in the tables can be found there much more easily than if scattered throughout the book. Of greater importance still is the fact that the pupil should learn how to use tables intelligently, and it is in this collective form that he will always meet with tables after his school hours are ended.

The problems and projects used in this volume as vehicles for putting operations and principles into practice are such as arise in the pupil's daily life, and have been selected from things which are within his comprehension, and which appeal to his interest. A variety of such motive material has been used in order to teach the pupil that a mathematical instrument is useful in securing a needed result, the need for which may arise under widely varying conditions. Thus and thus only will the pupil retain command of the prin-

ciples he has applied to interesting subjects and material, and will be able to use these principles to meet varying questions and problems requiring some form of mathematical statement and solution, as they arise in after life. This motive element has been drawn largely from sports, from past and contemporaneous history, from thrift, economy and social work, and from widely diversified interests associated with the development of good and useful citizenship.

Suggestions are made throughout for the application of principles and operations to local situations, and the teacher will greatly increase the value of the pupils' work by appealing to them to become interested in the particular local conditions surrounding them, and from these to select and contribute to the recitation period questions of point and of importance. While this at first may seem an extra burden for the teacher, local problems and projects will soon suggets themselves as a natural consequence of classroom and other daily activities, and will socialize the recitation, which invariably makes for better results.

The pupil should also be led to study everything in which he is interested from the quantitative standpoint. In this correlation of subjects a fund of valuable instruction will be found. Of course care should be taken, and the pupils should never be asked or permitted to pry into private affairs, such as asking each pupil to tell his father's income. Before assigning any outside work, the teacher should make certain that it can be successfully carried out by the class.

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