TEACHER GUIDE A

FOCUS on

BUILDING NUMBER SENSE

CURRICULUM ASSOCIATES®, INC.

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INTRODUCTION

What is the *FOCUS* series?

FOCUS is a mathematics-strategy practice series. Each student book in the series provides brief instruction and concentrated practice for students in one targeted Mathematics Strategy. ***FOCUS*** also allows students the opportunity for self-assessment of their performance. It allows teachers the opportunity to identify and assess a student's level of mastery.

6 Mathematics Strategies featured in the *FOCUS* series:

- Building Number Sense
- Using Estimation
- Using Algebra
- Using Geometry
- Determining Probability and Averages
- Interpreting Graphs and Charts

The ***FOCUS*** series spans eight grade levels, from first grade through eighth grade. The introductory passages in each lesson are written at or below grade level, allowing students to focus on the mathematics without struggling with the reading.

Book	Reading Level
Book A	at or below 1st grade readability
Book B	at or below 2nd grade readability
Book C	at or below 3rd grade readability
Book D	at or below 4th grade readability
Book E	at or below 5th grade readability
Book F	at or below 6th grade readability
Book G	at or below 7th grade readability
Book H	at or below 8th grade readability

What is Building Number Sense, the Mathematics Strategy featured in this *FOCUS* book?

Number sense is an understanding of numbers and the relationships between them. As students build number sense, they become familiar with a variety of representations for whole numbers and parts of whole numbers.

Students learn to express numbers in a variety of forms. Three common ways to express numbers are in standard form, in word form, and in expanded form. Students in the upper grades learn to use exponents, in addition to the other common forms, to express numbers.

Students in grades 1 to 3 develop counting skills and become familiar with ordinal numbers. They practice counting to identify numbers that come before or after another number. They also learn to use ordinal numbers to identify an item's position in a row or a list.

Students in grades 4 through 8 learn several ways to represent the parts of a whole. Students in grade 4 are introduced to fractions. They learn to understand the parts of a fraction and to recognize the quantity represented by a fraction. Students in the upper grades examine the relationship between fractions, decimals, and percents. They also learn to perform mathematical operations with fractions and decimals.

Students in grade 8 are introduced to prime and composite numbers, and they learn to determine a number's prime factorization. They also practice following the order of operations when solving problems with parentheses, exponents, or square roots.

What is in each student book?

There are 48 student books in the ***FOCUS*** series. There is one student book for each of the 6 Mathematics Strategies, at each of the 8 mathematics levels. Each student book contains:

- *To the Student*
  This introduces the program and should be read and discussed with students to make sure they understand what they are to do in the book.

- *Table of Contents*

- *Learn About* **(Modeled Practice)**
  These two pages provide basic instruction and modeling in the understanding and application of the Mathematics Strategy. The Learn About should be read and discussed with students to make sure they understand the Mathematics Strategy. Additional tips for helping students understand and use the Mathematics Strategy are included in the Mathematics Strategy Tips for the Teacher on pages 12–13 of this teacher guide.

- *Lesson Preview* **(Guided Practice)**
  These two pages include a sample problem and two selected-response questions with explanations of why each of the eight answer choices is correct or not correct. The Lesson Preview should be read, worked through, and discussed with students to make sure they understand how to answer strategy-based questions.

- *20 Lessons* **(Independent Practice)**
  Each two-page lesson contains one passage, four strategy-based selected-response questions, and one strategy-based constructed-response writing question.

  Selected-response questions: In each lesson, students apply the Mathematics Strategy and then choose the correct answers for four selected-response (multiple-choice) strategy-based questions. You should model how to answer these kinds of questions using information on the Lesson Preview pages.

  Constructed-response writing questions: In each lesson, students apply the Mathematics Strategy to solve a strategy-based question. You should model how to answer these kinds of questions by using one of the sample answers provided in the Answer Key.

- *Tracking Chart*
  Students use this chart for noting their completion of and performance in each lesson.

- *Self-Assessments*
  These five forms allow students the opportunity for self-assessment of their performance.

- *Answer Form*
  Students may use this form to record their answers to the eighty selected-response questions and to indicate that they have answered each of the twenty constructed-response writing questions.

RESEARCH SUMMARY

The following is a summary of the research upon which the ***FOCUS on Mathematics*** series is based. The full research report for this title may be downloaded from the Curriculum Associates Research Internet page at http://www.CAinc.com/research.

Overview

The ***FOCUS on Mathematics*** series is a targeted math-strategy practice program geared toward both on-level and off-level math students. The research summary is based on a literature review of academic monographs, journals, and reports by content-area researchers and education experts.

The summary covers the following topics in support of the series ***FOCUS on Mathematics***:

- Introduction to the Series
- What Is the Need for ***FOCUS on Mathematics***?
- How Is ***FOCUS on Mathematics*** Supported by Research?
- How Does Research Support the Assessments Found in ***FOCUS on Mathematics***?
- Quick-Reference Chart: From Research to Application: Strategies and Features in ***FOCUS on Mathematics***

Introduction to the Series

FOCUS on Mathematics is a series designed for on-level and struggling math students who need repeated practice. ***FOCUS on Mathematics*** centers on brief instruction and concentrated practice with targeted math concepts and strategies in the context of word problems.

The ***FOCUS on Mathematics*** series covers:

Building Number Sense	Using Geometry
Using Estimation	Determining Probability and Averages
Using Algebra	Interpreting Graphs and Charts

What Is the Need for *FOCUS on Mathematics*?

There is a current drive in mathematics education to meet 21st century skills so that today's students will be competitive in tomorrow's workforce. Several expert panels and mathematical organizations have sounded the alarm bell for improving students' mathematical understanding (National Mathematics Advisory Panel (NMAP), 2008; National Council of Teachers of Mathematics (NCTM), 2006). Recent tests also show that students' mathematical progress is slowing.

- The 2007 Education Statistics Digest stated, "Barely a third of American students can be considered proficient today in many basic math skills [on the 2007 National Assessment of Educational Progress (NAEP) mathematics assessment]" (National Center for Education Statistics (NCES), 2007).
- The 2006 PISA (Program for International Student Assessment) is administered every 3 years in reading, math, and science literacy. According to the latest assessment, American teenagers scored 24 points below the international average among the 30 participating industrialized countries (Baldi, Jin, Skemer, Green, & Herget, 2007).

- Congress passed AMERICA COMPETES Act in 2007 calling for more investments in science, technology, and mathematics education. This action was initiated by the report, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Committee on Science, Engineering, and Public Policy, 2005). The push continues as legislators, non-profit organizations, and private investors continue to hold summits and conferences in support of improving math and science education (see National Science and Math Initiative at http://www.nationalmathandscience.org).

Push for Algebra

Several major organizations and expert panels have emphasized that mastery of algebra is a major goal in mathematical instruction.

- The National Math Panel listed several "benchmarks for critical foundations in prekindergarten through 8th grade math, leading to algebra." (NMAP, 2008).
- The NCTM Curriculum Focal Points highlights algebra as a focal point in math instruction in grades 1–8 (NCTM, 2006).

In answer to these concerns about students' lackluster mathematical performance, math experts and researchers have joined forces to combat the slowing of mathematics progress.

The release of several major reports has named algebra as a "gateway to higher mathematics," which then leads to greater successes in both the academic and working lives of students (NMAP, 2008; NCTM, 2006). In response to this joint effort, these experts have also laid a pathway for students to follow in order to develop the mathematical skills and knowledge to master algebra. The ***FOCUS on Mathematics*** series may be an effective tool to help students along this pathway of proficiency to algebra.

The ***FOCUS on Mathematics*** series provides students with explicit instruction of key mathematical concepts and strategies combined with targeted practice in the context of word problems.

Additionally, the National Math Advisory Panel completed a survey of Algebra I teachers regarding student's readiness for Algebra I. These surveyed teachers report that student performance in algebra is negatively affected by students' lack of knowledge or understanding of these topics: rational numbers, word problems, and study habits. ***FOCUS on Mathematics*** addresses the following concerns.

Algebra I teachers say these areas cause student performance shortcomings due to lack of preparation in:	***FOCUS on Mathematics* helps with these areas through:**
Rational Numbers	the strategies Using Algebra, Building Number Sense, and Using Estimation.
Word Problems	a total of 800 word problems provided in the series.
Study Habits	Student Self-Assessments that promote self-monitoring and goal-setting.

This drive for algebra-readiness by the end of eighth grade coupled with non-stellar test results have shown that instruction focusing on repeated practice of specific math strategies is needed. With repeated practice, students can achieve the level of automaticity that is needed in order to proceed onto more complex mathematical concepts.

How Is *FOCUS on Mathematics* Supported by Research?

FOCUS on Mathematics is supported by research from mathematical researchers and organizations, including the National Math Advisory Panel and National Council of Teachers of Mathematics. Much of the research on effective instruction for mathematical students parallels the recommendations of the NMAP (2008). Many of these recommendations are integrated into the ***FOCUS on Mathematics*** series, including: word-problem focus, explicit instruction with modeling and focused practice.

Word-Problem Focus

Word problems are the proving ground for students to demonstrate their mastery of mathematical fluency and conceptual understanding. Having the ability to transfer what they have learned to new problem-solving situations is one of the major endgoals for mathematical education (NMAP, 2008; NCTM, 2006). "The issue of transfer, that is, the ability to use skills learned to solve one class of problems, such as similar triangles, to solve another class of problems, such as linear algebra, is a vital part of mathematics learning" (NMAP, 2008, p. 30). And yet, students, on average, have the most difficulty solving word problems.

The ***FOCUS on Mathematics*** series provides repeated and focused practice of key math strategies in the context of word problems. With more than 800 word problems in the series, students gain multiple opportunities to practice core math concepts and strategies.

Explicit Instruction with Modeling

Explicit instruction is a hallmark for effective instruction for struggling and on-level students. The NMAP recommends explicit instruction as one of the instructional methods that research has proved to be effective. "By the term *explicit instruction*, the Panel means that teachers provide clear models for solving a problem type using an array of examples, that students receive extensive practice in use of newly learned strategies and skills, that students are provided with opportunities to think aloud (i.e., talk through the decisions they make and the steps they take), and that students are provided with extensive feedback" (p. 23). Each of these features, as defined by the NMAP can be found in the ***FOCUS on Mathematics*** series. With explicit instruction and teacher modeling, skill efficiency is nearly guaranteed by students (Hiebert & Grouws, 2008).

FOCUS on Mathematics uses explicit instruction in the teaching of the mathematical strategies. The explicit instruction occurs in the Learn About section and the Lesson Preview section. Through the Learn About section, students receive explicit instruction consisting of a definition, semi-concrete and visual representations of the math concepts, and a usage rule for the math strategy. Additionally, ***FOCUS on Mathematics*** is a perfect vehicle for struggling students because it does not overwhelm students with the presentation of information. In the Learn About lesson, students initially experience the math concepts in short presentations, usually three to seven sentences long. A Remember box text feature is a point of reference for students to use while attending to lessons. The Remember box is consistently placed in each book of the series. Struggling or novice math students usually skip or gloss over text features, which are valuable tools. With repeated exposure and external prompting by the teacher, students learn to pay attention to the text feature.