



# The Curriculum: One Program's Alignment with the NCTM Standards



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To align with the standards in the National Council of Teachers of Mathematics (NCTM) *Principles and Standards for School Mathematics*, an instructional program must fully engage all students in learning, understanding, and applying the content and process standards that describe the mathematics that students should know and be able to do. The first five standards describe the mathematical content goals; they are Numbers and Operations, Algebra, Geometry, Measurement, Data Analysis, and Probability. The next five standards address the processes of mathematics; they are Problem Solving, Reasoning and Proof, Communication, Connections, and Representation. The content and process standards are inextricably linked (NCTM, 2000). Effective, aligned programs reflect this vital link in their teaching and learning of mathematics.

*Houghton Mifflin Math*, a new, coherent and comprehensive K–6 mathematics instructional program, fully aligns with the NCTM standards.

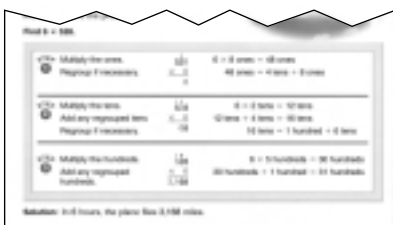
While many programs tout that they are in alignment, not all programs give the rigorous nature of mathematics the careful attention that this program does. Moreover, *Houghton Mifflin Math* helps students understand the underlying meaning of mathematics and provides opportunities for them to develop the skills and master the procedures needed to be successful in school mathematics. Its sequence of lessons and organization encourage students to make the connections necessary for mathematics understanding and success.

## **CONNECTIONS WITH PRIOR UNDERSTANDING**

*Houghton Mifflin Math* provides systematic instruction on the concepts and ideas of mathematics, being careful to draw upon what has been taught and learned previously. The balance between conceptual understanding and computational proficiency is achieved when the curriculum enables and encourages students to build on the mathematics they already know. Quality instructional materials



demonstrate computational algorithms and explain clearly the mathematics involved in each step of the



Student Book, grade 5, page 68

procedures. This helps students make the integral connections that enable them to understand the underlying concepts exemplified in procedures as well as improve their computational proficiency.

Consider, for example, the program's grade 4 measurement lessons wherein students first participate in hands-on activities and games that expose relationships about perimeter and area.

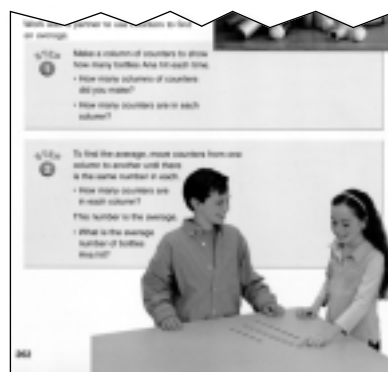


Student Book, grade 4, page 456

Later, when the formulas for perimeter and area are introduced and developed, students are able to connect their previous concrete experiences with the new, symbolic representation. This offers an ideal way for students to utilize what they know and understand, and then recognize and understand the elements (variables) of a formula and why they are what they are. Students have had many opportunities to investigate and learn about perimeter before they learn the formula for the perimeter of a rectangle in this lesson.

### LINKING THE CONTENT STANDARDS WITH THE PROCESS STANDARDS

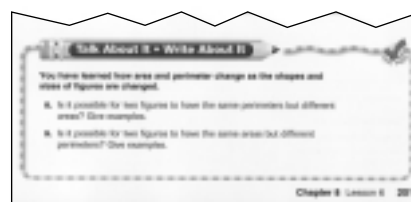
*Principles and Standards for School Mathematics* emphasizes the value and use of modeling in several of its standards, including algebra, geometry, and representation. *Houghton Mifflin Math*



Student Book, grade 4, page 262

uses many powerful models to represent mathematical ideas and procedures, which is a strong feature of the program. In this grade 4 example, the average of whole numbers is represented with counters. The importance of this model is that it enables students to experience the effect of the algorithm for finding the average of a group of numbers. That is, the effect of the addition and division used in the algorithm is demonstrated simply and naturally by using counters.

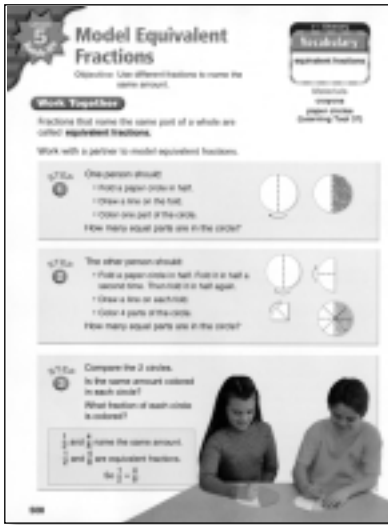
Throughout all grade levels, other process standards are emphasized in the context of content standards. Reasoning and problem-solving skills are routinely



Student Book, grade 6, page 201

developed. Students are asked to communicate about mathematics by talking and writing about what they have learned or what they think about the possibilities of a situation.

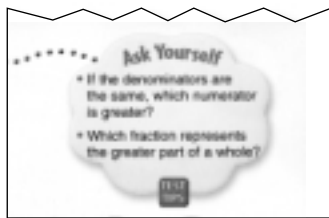
With *Houghton Mifflin Math*, students participate in activities, games, and explorations that challenge their understanding of mathematical ideas and



Student Book, grade 3, page 508

relationships. In these more informal settings, students explain the reasons for the particular actions they take, and plan and strategize in order to be successful at games. Classmates question decisions, making it necessary for students' explanations to be clear and convincing. Hands-on activities that are part of formal lesson instruction can contribute to students' insights about how mathematical ideas are related. For example, in grade 3 students construct fraction models from paper and manipulate them in order to make the connection between the symbols for equivalent fractions and their physical counterparts.

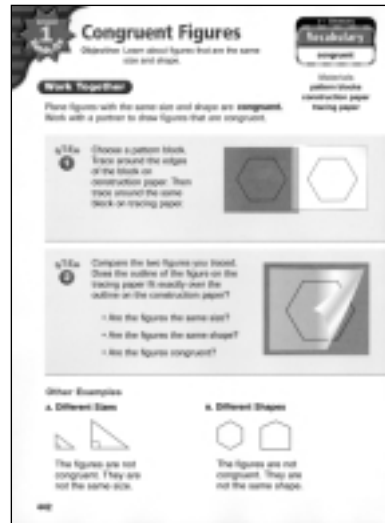
Opportunities for students to reason about mathematics and reflect on their thinking are plentiful in this program. Each lesson requires students to focus on and think about the mathematics they are studying when they answer "Think" or "Ask Yourself" problem-solving and reasoning questions.



Student Book, grade 3, page 521

It is important for students to experience what it feels like to be a mathematician. This is achieved whenever students encounter situations in which mathematical relationships may exist that they can identify. Learning to recognize the commonalities in situations is an important mathematical skill that *Houghton Mifflin Math* promotes.

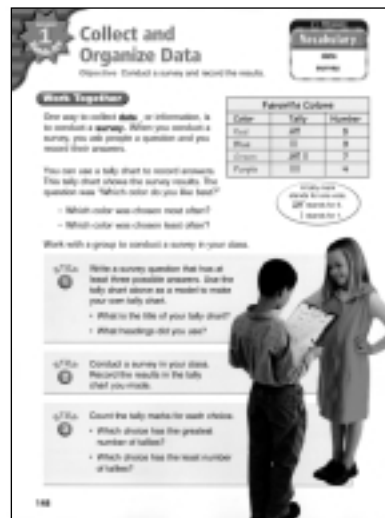
In the lesson below, students manipulate figures to compare them and evaluate whether they are congruent.



Student Book, grade 3, page 442

As new types of figures are considered, it is necessary for students to make conjectures about the qualities of congruent figures. Finding contradictions is a valuable way to identify relevant attributes of concepts and relationships. With *Houghton Mifflin Math*, students learn the need to make and test conjectures, knowing that contradictions provide useful information in that process.

Just as making conjectures allows students to experience mathematical situations and wonder how objects or ideas are related, formulating questions about the world around us promotes mathematics understanding. Often events and situations in our world can be quantified by counting things in which

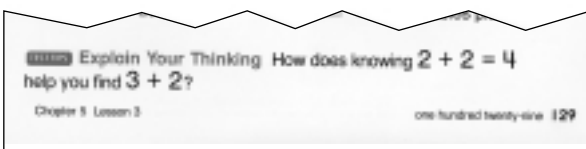


Student Book, grade 3, page 148

students have an interest. For example, how many people like various flavors of ice cream? What is the most popular type of video rented during the summer months? Which sports do girls prefer to play; which do boys? Such

questions are common and require the use of data analysis to analyze the outcomes. It is important for students to recognize that questions must be framed in special ways so that the information obtained is useful and accurate. Hence, it is necessary that students practice both formulating questions and determining the best ways to evaluate the results.

To ensure and deepen mathematics understanding students need to ask themselves questions, explain their thinking, and discuss their reasoning with

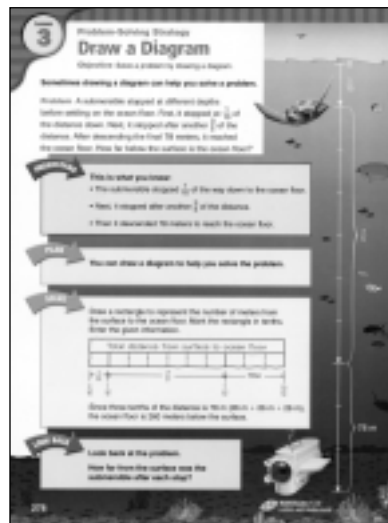


Student Book, grade 1, page 129

others. In *Houghton Mifflin Math* students respond to Why? and How? questions in each lesson's Explain Your Thinking feature. When students think mathematically, they consider multiple approaches to problems and discuss them with others. They write about their solutions and reflect on what they did. When students share their thinking with others, they gain a deeper understanding of the mathematics. This program involves all of these scenarios in highlighted problem-solving and skills practice.

### AN EMPHASIS ON PROBLEM SOLVING

One of the strongest features of *Houghton Mifflin Math* is the way in which problem solving is woven into the fabric of the instruction. Students learn the value of planning to solve problems and the importance of looking back on what they have done. Effective problem solvers constantly monitor and adjust what they are doing (NCTM, 2000). The problem-solving model of Understand, Plan, Solve, Look Back is revisited throughout the program and exemplified in each Problem-Solving Strategy, Application, and Skills lesson. Each regular lesson



Student Book, grade 6, page 278

also includes problem solving and reasoning. Many activities and explorations engage students' problem-solving skills. As a result, one of this program's strengths is its contextualized development of problem solving.

As the NCTM Curriculum Principle states, a curriculum is more than a collection of activities; it must be coherent, focused on important mathematics, and well articulated across the grades (NCTM, 2000). The organized sequence of mathematical topics in *Houghton Mifflin Math* ensures that students form and build upon a strong foundation that is made stronger and expanded by connections with prior understanding and among mathematical topics. Its instruction focuses on the key skills and important mathematical concepts that comprise the content standards. More important, the instruction and applications involve the process standards. This deeper integration of the content and process standards, combined with the extensive connections among standards and with prior understanding, are what bring *Houghton Mifflin Math* into full alignment with the NCTM standards.

### REFERENCE

National Council of Teachers of Mathematics (NCTM). *Principles and Standards for School Mathematics*. Reston, VA: NCTM, 2000.