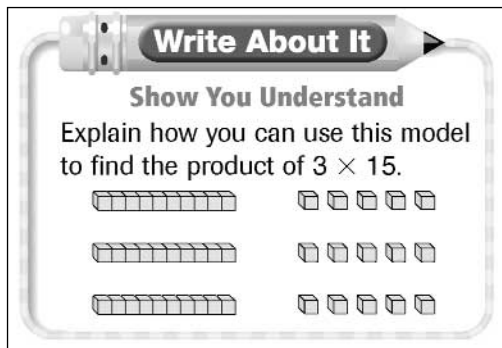


Assessing Mathematical Proficiency

In *Houghton Mifflin Math*, assessment of mathematical proficiency includes assessment of all five stages of mathematical proficiency. (See page 4.) Just as the five strands are interconnected or intertwined when students are learning mathematics, the strands of mathematical proficiency are often interconnected when they are assessed.

For example, in *Houghton Mifflin Math*, grade 4, *conceptual understanding*, *procedural fluency*, and *adaptive reasoning* are all assessed when students are asked on a Chapter Test to explain how to use models to find the product of 3 and 15.



Student Book, grade 4, page 168

This type of assessment is suggested by Hiebert and Carpenter (1992) in their paper, "Learning and Teaching with Understanding."

One of the most pressing problems in education is the development of procedures for assessing higher-order thinking...One type of connection that could be assessed is the connection between symbols and symbolic procedures and corresponding referents. For example, students can be asked to validate procedures using appropriate physical representations, and then to explain how their symbolic procedures correspond to actions on physical referents.

Another example of integrating the strands of proficiency in assessment can be found on a Grade 2 Unit Test in *Houghton Mifflin Math*. Students are asked to explain, without adding, why these two sums are the same.

10. Are both sums the same?

$\begin{array}{r} 25 \\ + 36 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ + 25 \\ \hline \end{array}$
-----------------------------------------------------	-----------------------------------------------------

Explain how you know without adding.

Student Book, grade 2, page 316

Writing the explanation requires conceptual understanding of the commutative Property of Addition as well as adaptive reasoning.

USING ASSESSMENT TO IMPROVE INSTRUCTION

There is much research to support the idea that assessment should be used not only to evaluate students' progress but also to make instructional decisions.

Black and Wiliam (1998) reviewed about 250 research studies and concluded that the learning of students is generally enhanced in classrooms where teachers include attention to formative assessment in making judgments about teaching and learning.

Because students learn by connecting new ideas to prior knowledge, teachers must understand what their students already know (NCTM, 2000, p. 17).

Information about students is crucial to a teacher's ability to calibrate tasks and lessons to students' current understanding and skills (NRC, 2001, p. 349).

Studies show that when teachers learn to see and hear students work during a lesson and to use that information to shape their instruction, their instruction becomes clearer, more focused and more effective (Fennema et al, 1996).

Assessment should not merely be done to students; rather, it should also be done for students, to guide and enhance their learning... teachers should be continually gathering information about their students' progress through informal means, such as asking questions during the course of a lesson, conducting interviews with individual students, and giving writing prompts (NCTM, 2000, p. 21–22).

Houghton Mifflin Math provides numerous

opportunities for teachers to use assessment to shape their instruction. Here are a few of them.

- Each chapter has a Pretest to assess students' prior knowledge of the content of the chapter. This helps the teacher to know how much emphasis on review will be necessary in teaching the lessons.
- In instructional lessons, Guided Practice exercises occur before the independent practice section. Teachers can use these exercises to assess how well students understand what was taught in the lesson. Each Guided Practice section includes an Explain Your Thinking question which zeroes in on misconceptions students may have or mistakes they might make. It helps teachers check students' conceptual understanding, not just their procedural fluency.

Guided Practice

Compare. Write $>$, $<$, or $=$ for each.

1. 0.6 \bullet 0.8

2. 0.25 \bullet 0.80

Ask Yourself

- Which decimal is greater?
- Which decimal is less?

LES1 TIPS Explain Your Thinking \blacktriangleright Which is greater, 0.8 or 0.08? Explain.

Student Book, grade 3, page 549

- For Quick Checks (which occur twice each chapter), Chapter Tests, and Unit Tests, suggestions for reteaching are provided in the Teacher's Edition.
- For all instructional lessons, the Teacher's Edition provides suggestions for addressing common errors, assessment questions to use at the close of each lesson, and journal prompts.

MULTIPLE APPROACHES FOR ASSESSMENT

Research suggests that teachers need to use a wide variety of types of assessments.

To make effective decisions, teachers should look for convergence of evidence from different sources...Because different students show what they know and can do in different ways, assessments should allow for multiple approaches, thus giving a well-rounded picture and allowing each student to show his or her best strengths (NCTM, 2000, p. 22).

Asking a student to actually measure the length of an object with a ruler is more authentic than presenting the students with a drawing of a ruler and an object to be measured. Systematic observations of students doing mathematics as they work on a project supported by their responses to probing questions are more authentic indicators of their ability to do mathematics than a test score compiled by totaling the number of correct item responses (Webb, 1992).

<p>3 Practice</p> <p>Independent Practice Children complete Exercises 1–10 independently.</p> <p>Algebra Readiness After children complete Exercise 11, call on volunteers to explain how they arrived at their answer. Use the Talk About It in Exercise 12 to have children identify what the numbers in the subtraction sentence represent.</p> <p>Common Error</p> <p>Writing the Wrong Difference Have children use cubes to model all exercises when they do not remember a fact.</p>	<p>4 Assess and Close</p> <p>Your friend has a pizza that is cut into 8 pieces. You eat 2 pieces and your friend eats 2 pieces. How many pieces are left? (4 pieces) If there are 7 birds on a branch and 5 birds fly away, how many birds are left? (2 birds)</p> <p>Keeping a Journal</p> <p>Write a subtraction story about 8 people. Write the subtraction sentence that goes with your story.</p>
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Teacher's Edition, grade 1, page 74

Writing the Wrong Difference
Have children use cubes to model all exercises when they do not remember a fact.

Based on this research, *Houghton Mifflin Math* has included Decision Making tasks and Performance Assessment tasks. Rubrics are provided to help teachers score the Performance Assessment tasks. These scoring rubrics can also help students.

Feedback from assessment tasks can also help students in setting goals, assuming responsibility for their own learning, and becoming more independent learners...rubrics...help students understand the characteristics of a complete and correct response (NCTM, 2000, p. 22).

Name _____ **Performance Assessment**

1 Tell if the number 17 is odd or even. Explain how you know.

Student Book, grade 2, page 167

Performance Assessment

TASK
1 **A Block Party** (Chapters 3, 4)

Neighbors are planning a block party for 48 people. All the families on the street are bringing supplies.

Package Sizes	
Items Needed	Number in Package
Hamburgers	4
Hamburger buns	8
Paper plates	96
Plastic cups	20

a. There will be one hamburger and one bun for each person. If three families each buy the same amount of hamburgers and buns, how many packages will each family buy?

b. One family will buy cups and a package of paper plates. They expect each person to use 1 plate and 2 cups. How many packages of cups are needed? How many extra cups and plates will there be?

Student Book, grade 4, page 136

Decision Making

3 in. 10 in.

9 in.

$4\frac{1}{2}$ in. $4\frac{1}{2}$ in.

9 in.

$1\frac{1}{2}$ in. $7\frac{1}{2}$ in.

9 in.

Task You want to make and sell specialty cakes. Use the diagrams above. Decide which cake to make. Identify and classify the shapes in your cake.

Make a life-size drawing of your cake, using the measurements given in the diagram. Use what you know about constructing perpendicular lines to explain.

Student Book, grade 6, page 411

STANDARDIZED TESTS AND STATE COMPETENCY TESTS

Mathematical assessments fall into two categories: internal and external. Internal assessments are those used by teachers. External assessments, in contrast, come from outside, from projects gathering comparative research data or mandated by state or local districts as part of their evaluation project (NRC, 2001, p. 39, 40).

Houghton Mifflin Math exposes students to a wide variety of questions similar to those used on standardized tests and state competency tests.

Standardized tests have traditionally been kept secret so that questions can be reused. In recent years, this practice has come under fire. If students are to reach publicly accepted standards,...they need to know what type of performance is expected of them....They should have an opportunity to learn the mathematical content and processes on which they will be examined. At the same time, they need to become familiar with the instructions, the organization of the assessment, and the format of the items, so that such nonmathematical considerations do not prevent them from showing what they know (NRC, 2001, p.43).

Multiple Choice

1. Kendra earned \$40 and Lenny earned \$19. In this equation, n represents the number of dollars more than Lenny that Kendra earned.

$$19 + n = 40$$

What is the value of n ?

- A 11 B 21 C 31 D 59

(Chapter 2, Lesson 5)

The authors of *Houghton Mifflin Math* have carefully reviewed standardized tests and state competency tests to be sure the program covers the mathematical content that will be tested. In addition, the authors have included many different types of assessments that are representative of the different types of external assessments. These include multiple-choice questions, free-response questions, and extended-response questions.


Free Response

5. Tracy collected these data on the number of calories consumed by classmates at lunch.
640, 570, 710, 640, 720, 690, 700
What is the median of her data?
(Chapter 8, Lesson 2)

6. Stuart has a piece of wood that is 135 inches long. How many blocks, each 1.5 inches long, can he cut from the wood?
(Chapter 14, Lesson 7)

7. Paolo wants to fence in a square patch of basil plants. The patch measures 500 centimeters on a side. How many meters of fencing will he need?
(Chapter 10, Lesson 3)

8. Rose wants to cover this gift box with wrapping paper. What is the least number of square inches of wrapping paper she'll need?
(Chapter 17, Lesson 4)

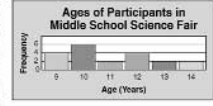


9. The original price of a DVD was \$50. Hugo bought the DVD on sale and paid 75% of the original price. How much did Hugo pay for the DVD?
(Chapter 13, Lesson 5)


Extended Response

10. Use the bar graph above to answer the following questions:
(Chapter 7, Lesson 2 and Chapter 8, Lesson 3)

Agos of Participants in Middle School Science Fair



A How many students were at least 11 years old?
B How many students were under 12 years old?
C What is the mode of the data?
D What is the median of the data? Explain how you found the answer.
E Find the mean of the data to the nearest whole number. Explain how you found the answer.

 eGlossary.com
Check out eGlossary.com at eGlossary.com/kids/m5/ for more prep practice.

Unit 7 Cumulative Test Prep 559