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Introduction

Approaching Math Content— Today's Standards

The Common Core State Standards address several important goals in education:

- to prepare students for college and careers
- to develop critical-thinking and analytical skills students need for success
- to help teachers measure student progress and achievement throughout the year

The Common Core Mathematics Standards seek to provide teachers and students with focused mathematics instruction. The standards are designed to deepen students' understanding as they progress through grade levels and topics.

Mathematics is a subject in which concepts build in a progression. A strong foundation of basic concepts must be laid, beginning in the early grades. The Common Core State Standards recognize this learning sequence. Mathematical thinking is divided into several broad categories, referred to as "domains." Elementary grades address the same general domains, with specific standards for student understanding and achievement within each domain. For grades 1–5, these domains include Operations & Algebraic Thinking, Number & Operations in Base Ten, Number & Operations—Fractions (begins in grade 3), Measurement & Data, and Geometry.

It is important for students to understand the role mathematics plays in everyday life. The Common Core Mathematics Standards encourage students to apply their mathematical knowledge to real-world problems and situations. Teachers, in turn, assess student understanding and mastery of concepts by asking them to explain their thinking and justify their answers. Word problems provide students with opportunities for the practical application of mathematical concepts.

> This book presents word problems in a realistic setting. Students dig into the content of each "scenario" as they apply math concepts to solve multiple problems. Each unit is designed to encourage students to read for understanding, revisit content on a variety of levels, and use information as a tool for solving more complex problems.

Establishing Mathematical Practices

The Common Core Standards for Mathematical Practice (SMP) describe practices students can implement to help them engage with mathematical content. As your students work through the activities in this book, encourage them to develop these habits as they practice and develop problem-solving skills.

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

These practices help students understand core mathematical concepts so they can apply a variety of strategies for successful problem solving. As students learn underlying principles, they will be able to . . .

- consider similar problems.
- represent problems in ways that make sense.
- justify conclusions and explain their reasoning.
- apply mathematics to practical situations.
- use technology to work with mathematics.
- explain concepts to other students.
- consider a broad overview of a problem.
- deviate from a known procedure to use an appropriate shortcut.
- reason and explain why a mathematical statement is true.
- explain and apply appropriate mathematical rules.

Help your students and their families find success. Work with administrators, other teachers, and parents to plan and hold math-coaching nights for parents. The tips on page 6 may be helpful for parents as they work with students at home. Consider photocopying the page to send home in students' homework folders to aid with math assignments. Additionally, prepare a visual aid to help parents understand students' work in math. Share this aid with parents at back-to-school night or on other occasions when they visit the classroom.

How to Use This Book

This book contains several mathematical problem-solving units. Each unit gives students the opportunity to practice and develop one or more essential mathematical skills. Units are grouped by domains—although within a unit, more than one domain may be addressed. Within each domain, math concepts build on one another, forming a foundation for student learning and understanding. In addition to the Common Core Mathematics Standards covered in this book, the passages that accompany each unit meet one or more English Language Arts Standards as they provide practice reading appropriate literature and nonfiction text.

About the Units

Each unit is three pages in length. Depending on the needs of your students, you may wish to introduce units in small-group or whole-class settings using a guided-to-independent approach. Reading the passages and responding to activities in collaborative groups allows students to share and support their problem-solving results. As an alternative, students can work independently and compare responses with others. Whichever method you choose, the reading and math activities will provide students with the tools they need to build mathematical knowledge for today's more rigorous math standards.

Page 1

All units begin with a reading passage that presents a mathematical problem or situation. Engaging nonfiction and fiction passages are included in the book. Passages are age-level appropriate and fall within a range of 520 to 820 on the Lexile scale.

Each passage incorporates information to be used for solving practical math problems. They also allow students to experience a variety of genres and make meaningful connections between math and reading.

Students practice reading skills as they read for understanding, revisit text on a variety of levels, and use passage information as a tool for solving more complex problems.

Sidebars provide tips to help students think about how to do the math. In addition, they offer tools or strategies students can use throughout the problem-solving process.

Operations & Algebraic Thinking

NAME _____   DATE _____

Eratosthenes: Prime Numbers

Eratosthenes lived in Africa over two thousand years ago. He studied math and other things. At one time, he studied in Athens, Greece. Later, he lived in Alexandria. The city had a famous library, and he became the director.

He calculated the distance around Earth. He looked at the sun's angle at noon in the city where he lived. His number isn't exact, but it's in the right range.

The Greeks had learned about prime numbers. Eratosthenes found a way to figure out if a number is prime. The process takes a few minutes, but it is easy. One doesn't have to know any special rules. He called his process the "sieve" of prime numbers.

Prime numbers have exactly two factors—themselves and 1. No one has counted all the prime numbers. A few prime numbers are 2, 3, 5, and 7.

Write down all the numbers from 1 to the number you want to check. One is not a prime number, so start with 2. Two is a prime number. Count by 2s, and cross out every number. These numbers have 2 as a factor, so they are not prime numbers. Three is a prime number, since it cannot be divided by 2. Start at 3 and count by 3s to find the multiples of 3. Cross these numbers out, since they are not prime numbers. Five is a prime number. Count by 5s to cross out the multiples of 5. Go on to the next prime number (7) and repeat the process.

THINK ABOUT THE MATH

- A product is the result of multiplying two or more numbers. The two numbers are factors of the product.
- A quotient is the result of dividing one number by another.
- A factor is a number that can be divided exactly into a greater number.
- Division is an unknown factor problem.
- A divisor is the number you divided by.
- A dividend is the amount you want to divide up.
- Prime numbers have only 1 and the number itself as factors.
- All even numbers greater than 2 are not prime numbers because they have 2 as a factor.
- Use known multiplication facts to find factors of a number.
- Rewrite a division problem as a multiplication problem with an unknown factor.

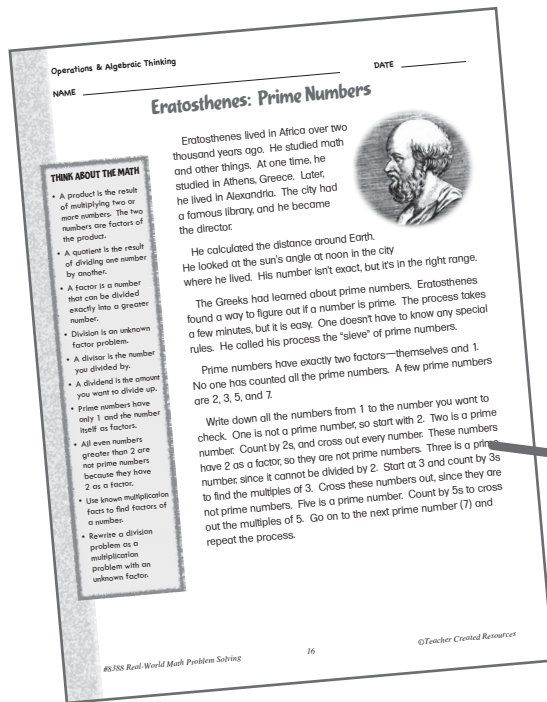## About the Units *(cont.)*

Page 2

The second page of each unit introduces problem-solving tasks. Space is provided for students to draw pictures, work out their answers, write equations, show their work, and explain their thinking. Students are asked to use the unit passage to respond to reading content and investigate the text in order to find solutions to the problems on the page.

The questions require students to look back at the text for clues and information that relates to each question. They must then interpret this information in a way that helps them solve each task on the page. In doing so, students learn to support their responses with concrete evidence.

Page 3

The *Engage* option extends the mathematical situation with questions that allow students to look back at the reading passage and use critical-thinking skills.

The activities in this section strengthen students' comprehension skills by posing questions or situations for which further reflection of the text is required. Questions may be open-ended and require higher-level thinking skills and supported responses. Activities in this section focus on a combination of reading and math skills.

While students can respond independently to the activities on this page, you may wish to have them discuss their answers with a partner, in a small group, or with the entire class. This method can also provide closure to the unit.

NAME _____ DATE _____

Eratosthenes: Prime Numbers

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NAME _____   **DATE** _____

Problem Solving

Directions: Use page 16 to answer these questions. First, skim the paragraphs to find information that might help you solve the problem. Remember to show your thinking as you do the math!

1 What is a factor? _____

_____

2 Write a division equation with a divisor, a dividend, and a quotient. Draw a visual model to illustrate your equation.

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3 What is a prime number? _____

_____

4 Use Eratosthenes' method to find the prime numbers between 1 and 100.

What is the first thing you will do? _____

What is the next step? _____

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NAME _____   DATE _____

> **Engage**
>
> **Directions:** Factors are numbers we multiply together to get a product. We use prime numbers to find factors of numbers. This helps us work with fractions. Practice by creating problems with factors and prime numbers.

1 What are the factors of 9? _____

Is 9 a prime number? _____

2 Is 15 a prime number?

_____

Show how you know.

3 Write two math problems with prime numbers for a classmate to solve.

What are the factors of the numbers that are the answers for your problems?

_____

4 Codes are used to make information sent over the Internet more secure. It is easy to break a code once you know the pattern. People use prime numbers for codes. Prime numbers do not have a pattern, which makes codes harder to break. Most codes have symbols or numbers, one for each letter of the alphabet. Some codes are shorter. They use numbers like a password.

Create a code using prime numbers and other symbols. Explain how someone could use your code or write a secret message for a classmate.

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