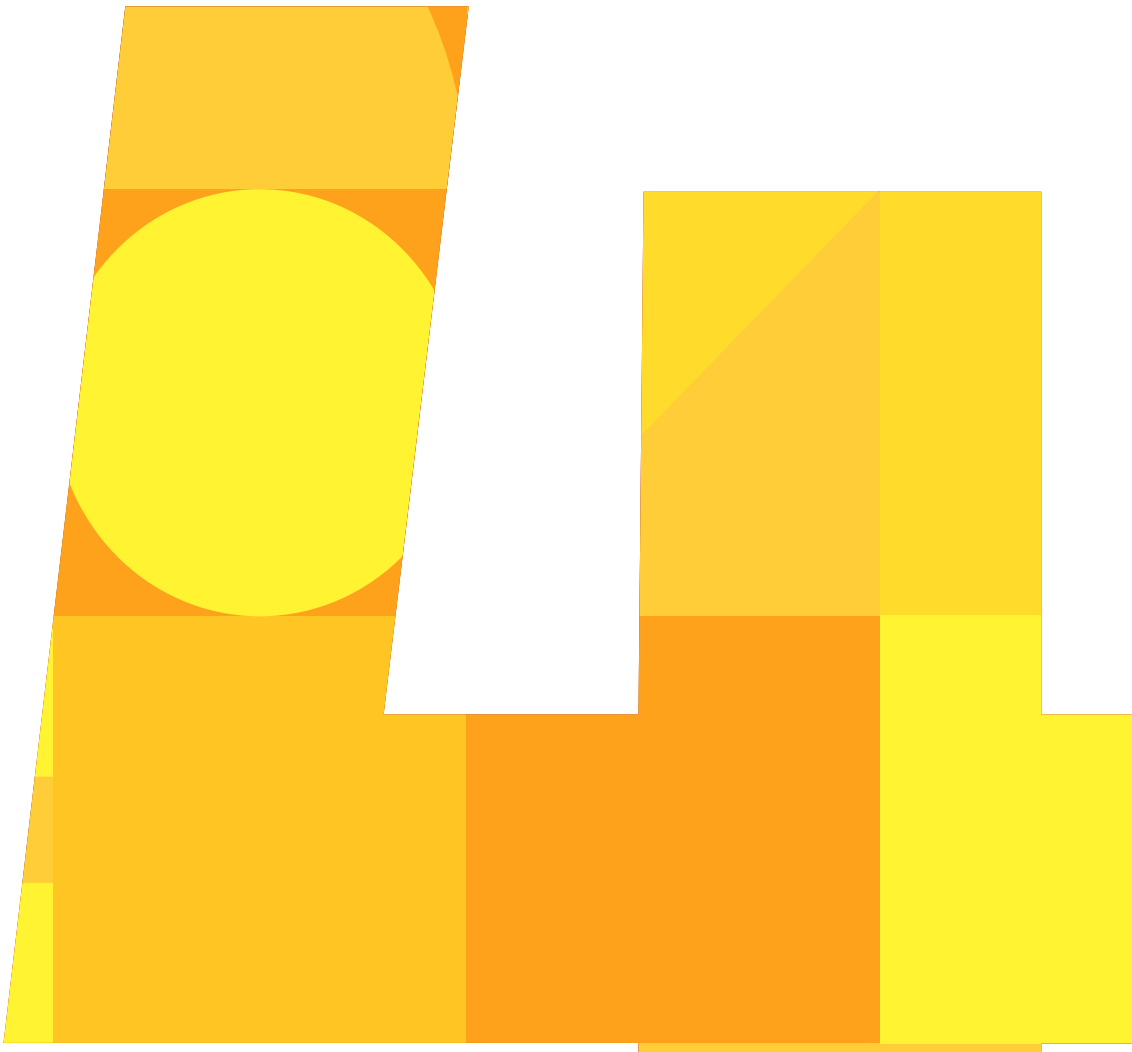
Susan O'Connell • Donna Boucher • Mary Trinkle



MATH BY THE BOOK

FOURTH GRADE

Heinemann
Portsmouth, NH

Heinemann
145 Maplewood Avenue, Suite 300
Portsmouth, NH 03801
www.heinemann.com

Offices and agents throughout the world

The author and publisher wish to thank those who have generously given permission to reprint borrowed material:

Standards for Mathematical Practice from the Common Core State Standards. © Copyright 2010. National Governors Association Center for Best Practices and Council of Chief State School Officers. All rights reserved.

From *Sweet Potato Pie* by Kathleen D. Lindsey, illustrated by Charlotte Riley-Webb. Text copyright © 2003 by Kathleen D. Lindsey. Illustrations copyright © 2003 by Charlotte Riley-Webb. Permission arranged with Lee & Low Books Inc., New York, NY 10016. Learn more at www.leeandlow.com.

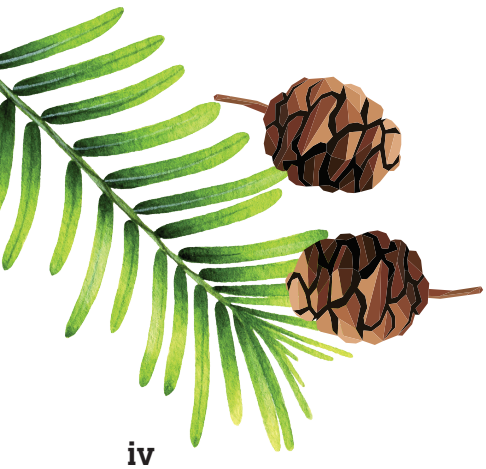
Stock images: Ch. 1: fire hydrants © Adobe Stock/Anna Terleeva, soccer balls © Adobe Stock/nanyasem, pigeons © Houghton Mifflin Harcourt/HIP. Ch. 2: snowflakes © Houghton Mifflin Harcourt/HIP, dog sleds and Iditarod map by Vita Lane. Ch. 3: beans © Adobe Stock/lnsdes. Ch. 4: dandelions © Adobe Stock/Xenia Snowstorm, acorns © Adobe Stock/Valentina Gurina, U.S. map © Cartarium/Shutterstock/HIP. Ch. 5: peaches © Adobe Stock/Sofia Stasyuk. Ch. 6: tree seedlings © Adobe Stock/Kaya Gach. Ch. 7: bracelets © Adobe Stock/Unclesam. Ch. 8: rice © Adobe Stock/arxichtu4ki, chessboard © Shutterstock/olgers. Ch. 9: doors © Adobe Stock/Siawi-art. Ch. 10: soybeans © Adobe Stock/Ekaterina Glazkova. Ch. 11: sweet potatoes © Adobe Stock/dariaustiugova, pie crust/rolling pin © Adobe Stock/angela 0982. Ch. 12: baseballs © Adobe Stock/nanyasem, water balloons © Adobe Stock/perisuta. Ch. 13: bagels © Adobe Stock/nataliahubbert. Ch. 14: Olympic medals by Vita Lane. Ch. 15: paint brushes and paint pots © Adobe Stock/Alexandra. Ch. 16: Ghanaian tribal symbols by Vita Lane. Ch. 17: moth © Shutterstock/Jena_Velour, goby fish © Shutterstock/Valentina Rusinova. Ch. 18: gardening tools © Adobe Stock/Alina. Ch. 19: cowboy hat © Adobe Stock/Poltavska, space helmet © Adobe Stock/alinaosadchenko, pirate hat © Adobe Stock/maltiase, knight's helmet © Adobe Stock/katerinas39. Ch. 20: pinecones © Shutterstock/Silviemiskova.

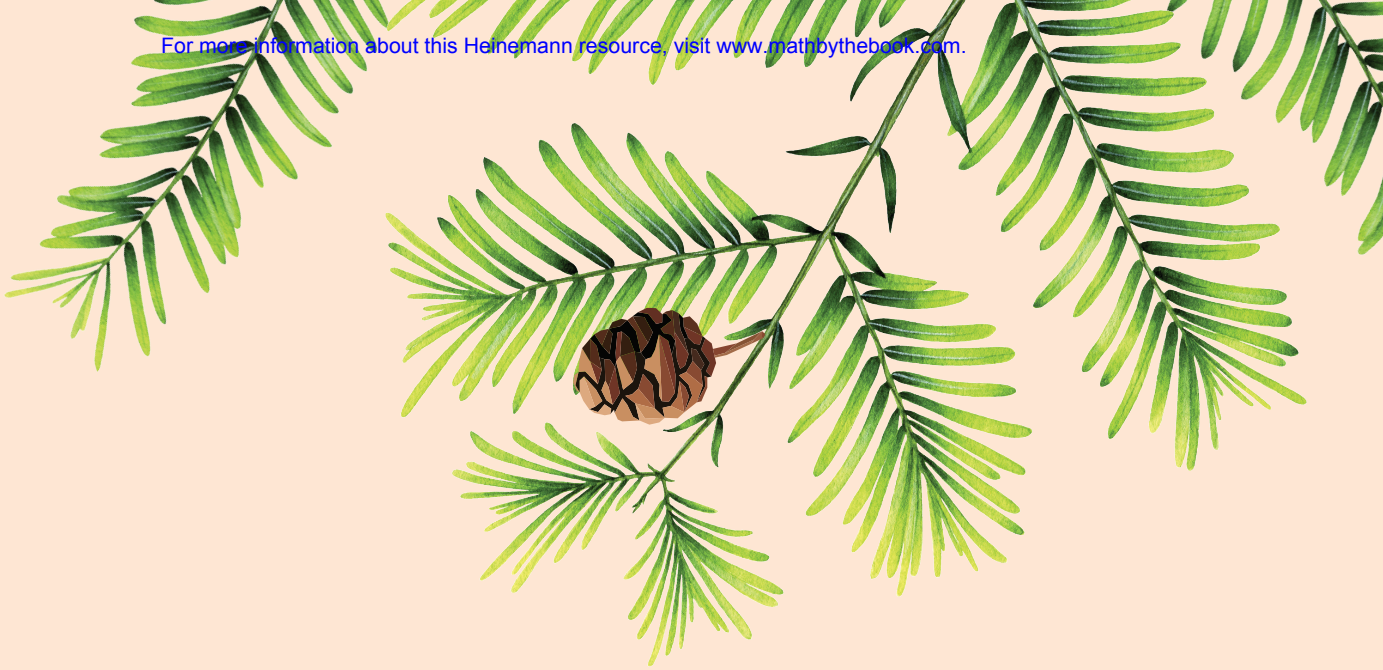
Library of Congress Control Number: 2021939164
ISBN: 978-0-325-12025-6

Editors: Katherine Bryant, Tobey Antao
Production: Hilary Goff, Melissa L. Inglis
Cover design: Monica Ann Cohen
Interior design: Suzanne Heiser
Typesetter: Publishers' Design & Production Services, Inc.
Manufacturing: Veronica Bennett, Gerard Clancy

Printed in the United States of America on acid-free paper
1 2 3 4 5 MPP 25 24 23 22 21
August 2021 Printing

Contents





Number and Operations—Fractions

Geometry

Measurement and Data

Online Resources

Operations and Algebraic Thinking

1 * *How Tall? Wacky Ways to Compare Height*
- 1–4 Spinner
- Wacky Comparisons Game Board

2 * *Togo*
- Dog Sled Problem Data Sheet
- How Long Is the Iditarod Course? Recording Sheet
- Iditarod Race Distance Chart
- Planning Our Drop Bags Recording Sheet

3 * *Bean Thirteen*
- Centimeter Grid Paper
- Points for Prime Recording Sheet
- Sieve of Eratosthenes Recording Sheet

Number and Operations in Base Ten

4 * *How Much, How Many, How Far, How Heavy, How Long, How Tall Is 1000?*
- Round and Round We Go! Game Board
- Round and Round We Go! Spinners

5 * *In the Land of Milk and Honey*
- Boxes of Tomatoes Recording Sheet
- Dueling Differences Cards
- Dueling Differences Recording Sheet
- Train or Car Recording Sheet

6 * *Wangari's Trees of Peace: A True Story from Africa*
- Closest to 100 Recording Sheet
- From Tiles to Drawings Grid Paper
- Planning a Seedling-Planting Event

7 * *A Gift for Amma: Market Day in India*
- 1–9 Spinner
- Fill the Market Bag Game Board

8 * *The King's Chessboard*
- 0–9 Spinner
- Centimeter Grid Paper
- Double Up Game Board

9 * *The House That Jane Built: A Story About Jane Addams*
- Division Choice Board
- Hull House Museum Recording Sheet
- Focus on the Question Data Sheet
- Mind Your Remainder Cards
- Mind Your Remainder Sorting Mat

Number and Operations—Fractions

10 * *Auntie Yang's Great Soybean Picnic*
- Fractions in a Row Game Board
- A Letter from Auntie
- Soybean Equivalents Recording Sheet
- Unit Fraction Spinner

11 * *Sweet Potato Pie*
- Who Got More Pie? Recording Sheet

12 * *Enemy Pie*
- Fraction Pie Subtraction Spinner

13 * *Jalapeño Bagels*
- Fraction Battle Recording Sheet
- Fraction Battle Spinners

14 * *Wilma Unlimited: How Wilma Rudolph Became the World's Fastest Woman*
- 0–9 Digit Cards
- 10 × 10 Grids
- Closer to . . . Recording Sheet
- Comparing Wilma's Times Data Sheet
- Olympic Greats Recording Sheet
- Roll It True Recording Sheet

Geometry

15 * ***Maybe Something Beautiful***
- Ladder Images
- Shape Cards
- Triangle Cards

16 * ***Nana Akua Goes to School***
- More Quilt Designs
- Quilt Images
- Quilt Shapes Sort Cards
- Three Shapes Template

Measurement and Data

17 * ***Actual Size***
- Animal Height and Weight Table
- Comparing Animal Heights Recording Sheet
- Conversion Tables Recording Sheet
- King of the Animals Cards
- Talk and Write Data Tables

18 * ***Harlem Grown: How One Big Idea Transformed a Neighborhood***
- Centimeter Grid Paper
- Framing Each Garden Recording Sheet
- The Gathering Spot Image
- Greater Gardens Cards

19 * ***Are We There Yet?***
- Quick Trip Recording Sheet
- Time Cards

20 * ***Redwoods***
- Heights of Saplings Recording Sheet
- Hiking Trails Data Sheet
- Redwoods by the Numbers Cards
- Spin and Plot Fraction Spinner
- Spin and Plot Recording Sheet
- Talk and Write Line Plot

To access online resources for *Math by the Book*:

Go to http://hein.pub/mbtb4-login.

* 1. Log in with your username and password. If you do not already have an account with Heinemann, you will need to create an account.
* 2. On the Welcome page, choose **"Click here to register an Online Resource."**
* 3. Register your product by entering the code: (be sure to read and check the acknowledgment box under the keycode).
* 4. Once you have registered your product, it will appear alphabetically in your account list of **My Online Resources.**

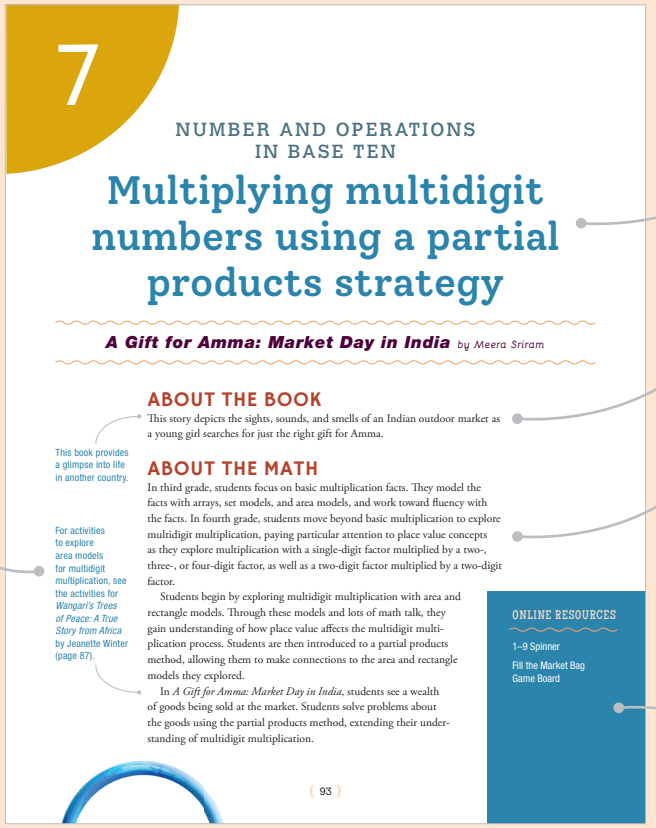
Note: When returning to Heinemann.com to access your previously registered products, simply log into your Heinemann account and click on "View my registered Online Resources."

Literature Menus by Math Topic

What You Will Find in the Literature Menus

Throughout the remainder of this book, you will find a wealth of tasks, strategies, and tips for carefully selected pieces of children's literature that correlate to grade-specific math topics. The tasks appear in a menu format, to allow you to select the tasks that fit the needs of your students. For each piece of literature, the following menu items appear:

Notes for you about how to use this lesson most effectively: insights about how to make concepts easier to grasp, reminders of what to watch for as you formatively assess, simple strategies for managing materials, and more. These notes are the coach beside you as you teach.



7

NUMBER AND OPERATIONS IN BASE TEN

Multiplying multidigit numbers using a partial products strategy

A Gift for Amma: Market Day in India *by Meera Sriram*

ABOUT THE BOOK

This story depicts the sights, sounds, and smells of an Indian outdoor market as a young girl searches for just the right gift for Amma.

This book provides a glimpse into life in another country.

ABOUT THE MATH

In third grade, students focus on basic multiplication facts. They model the facts with arrays, set models, and area models, and work toward fluency with the facts. In fourth grade, students move beyond basic multiplication to explore multidigit multiplication, paying particular attention to place value concepts as they explore multiplication with a single-digit factor multiplied by a two-, three-, or four-digit factor, as well as a two-digit factor multiplied by a two-digit factor.

For activities to explore area models for multidigit multiplication, see the activities for *Wangari's Trees of Peace: A True Story from Africa* by Jeanette Winter (page 87).

Students begin by exploring multidigit multiplication with area and rectangle models. Through these models and lots of math talk, they gain understanding of how place value affects the multidigit multiplication process. Students are then introduced to a partial products method, allowing them to make connections to the area and rectangle models they explored.

In *A Gift for Amma: Market Day in India*, students see a wealth of goods being sold at the market. Students solve problems about the goods using the partial products method, extending their understanding of multidigit multiplication.

ONLINE RESOURCES

1–9 Spinner

Fill the Market Bag Game Board

93

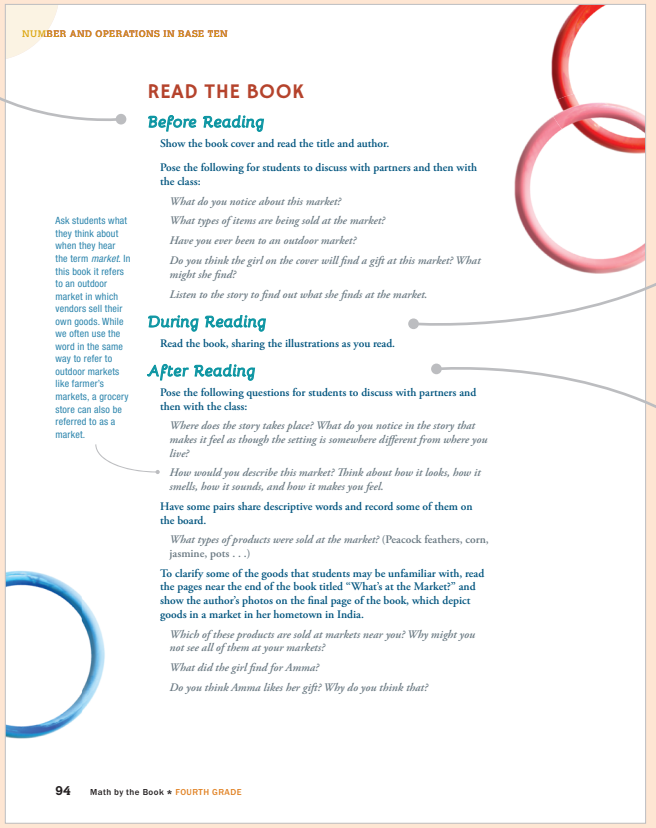
The **grade-specific math topic** addressed in this chapter.

An introduction to the **authentic children's literature** used in this chapter.

An **explanation of the math topic** and how it contributes to children's understanding of mathematics as a whole.

Upfront list of **online resources** for this chapter.

Ideas for introducing the book to students and questions to set a purpose for reading.



NUMBER AND OPERATIONS IN BASE TEN

READ THE BOOK

Before Reading

Show the book cover and read the title and author.

Pose the following for students to discuss with partners and then with the class:

What do you notice about this market?

What types of items are being sold at the market?

Have you ever been to an outdoor market?

Do you think the girl on the cover will find a gift at this market? What might she find?

Listen to the story to find out what she finds at the market.

Ask students what they think about when they hear the term *market*. In this book it refers to an outdoor market in which vendors sell their own goods. While we often use the word in the same way to refer to outdoor markets like farmer's markets, a grocery store can also be referred to as a market.

During Reading

Read the book, sharing the illustrations as you read.

After Reading

Pose the following questions for students to discuss with partners and then with the class:

Where does the story takes place? What do you notice in the story that makes it feel as though the setting is somewhere different from where you live?

How would you describe this market? Think about how it looks, how it smells, how it sounds, and how it makes you feel.

Have some pairs share descriptive words and record some of them on the board.

What types of products were sold at the market? (Peacock feathers, corn, jasmine, pots . . .)

To clarify some of the goods that students may be unfamiliar with, read the pages near the end of the book titled "What's at the Market?" and show the author's photos on the final page of the book, which depict goods in a market in her hometown in India.

Which of these products are sold at markets near you? Why might you not see all of them at your markets?

What did the girl find for Amma?

Do you think Amma likes her gift? Why do you think that?

94 Math by the Book ★ FOURTH GRADE

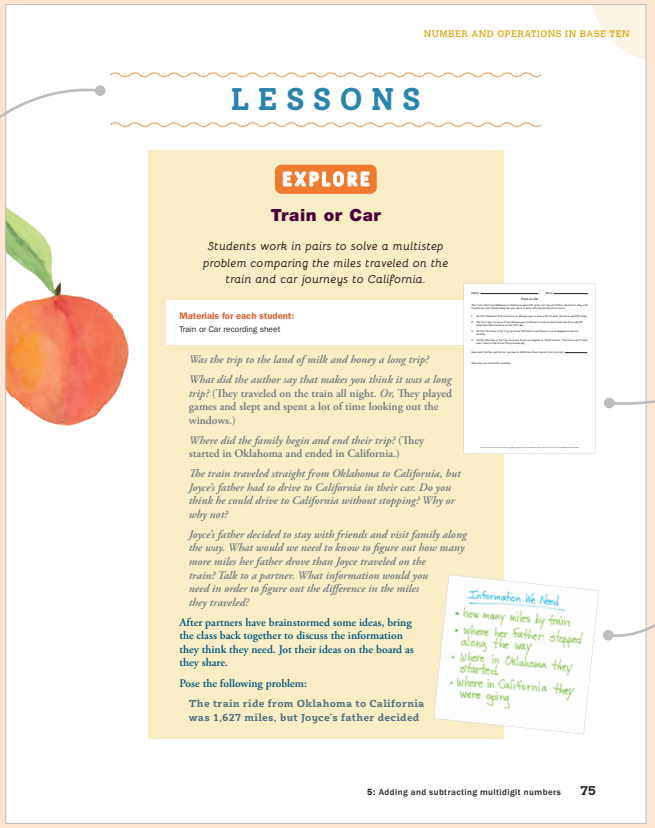
Questions and suggestions to use during reading to build interest without interrupting the flow of the literature.

Reflection and discussion ideas to use after reading to honor students' own responses to the literature before moving into math discussions.

Lessons to explore skills and concepts with manipulatives or physical activity, **investigate them** using data and discussion, **and apply them** to problem situations.

Opportunities for practice and support that provide differentiation, offer invitations for discussion and writing, share engaging and interactive tasks or games, and launch extension projects.

Additional ideas to support students who may benefit from another way to think about, or more exposure to, the skill or concept, or a challenge for students who are ready to further explore the math topic.



NUMBER AND OPERATIONS IN BASE TEN

LESSONS

EXPLORE

Train or Car

Students work in pairs to solve a multistep problem comparing the miles traveled on the train and car journeys to California.

Materials for each student:
Train or Car recording sheet

Was the trip to the land of milk and honey a long trip?

What did the author say that makes you think it was a long trip? (They traveled on the train all night. *Or,* They played games and slept and spent a lot of time looking out the windows.)

Where did the family begin and end their trip? (They started in Oklahoma and ended in California.)

The train traveled straight from Oklahoma to California, but Joyce's father had to drive to California in their car. Do you think he could drive to California without stopping? Why or why not?

Joyce's father decided to stay with friends and visit family along the way. What would we need to know to figure out how many more miles her father drove than Joyce traveled on the train? Talk to a partner. What information would you need in order to figure out the difference in the miles they traveled?

After partners have brainstormed some ideas, bring the class back together to discuss the information they think they need. Jot their ideas on the board as they share.

Pose the following problem:

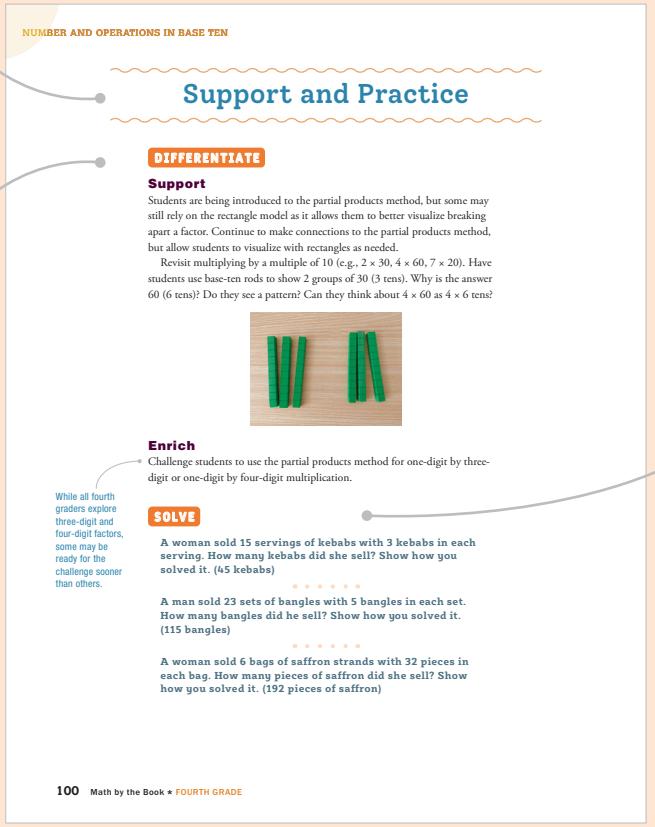
The train ride from Oklahoma to California was 1,627 miles, but Joyce's father decided

Information We Need
- how many miles by train
- where her father stopped along the way
- where in Oklahoma they started
- where in California they were going

5: Adding and subtracting multidigit numbers 75

Glimpses of some **ready-to-use materials** to support the lesson.

Student work and photos of materials to help you envision what this lesson looks like in the classroom.



NUMBER AND OPERATIONS IN BASE TEN

Support and Practice

DIFFERENTIATE

Support

Students are being introduced to the partial products method, but some may still rely on the rectangle model as it allows them to better visualize breaking apart a factor. Continue to make connections to the partial products method, but allow students to visualize with rectangles as needed.

Revisit multiplying by a multiple of 10 (e.g., 2 × 30, 4 × 60, 7 × 20). Have students use base-ten rods to show 2 groups of 30 (3 tens). Why is the answer 60 (6 tens)? Do they see a pattern? Can they think about 4 × 60 as 4 × 6 tens?

Enrich

Challenge students to use the partial products method for one-digit by three-digit or one-digit by four-digit multiplication.

While all fourth graders explore three-digit and four-digit factors, some may be ready for the challenge sooner than others.

SOLVE

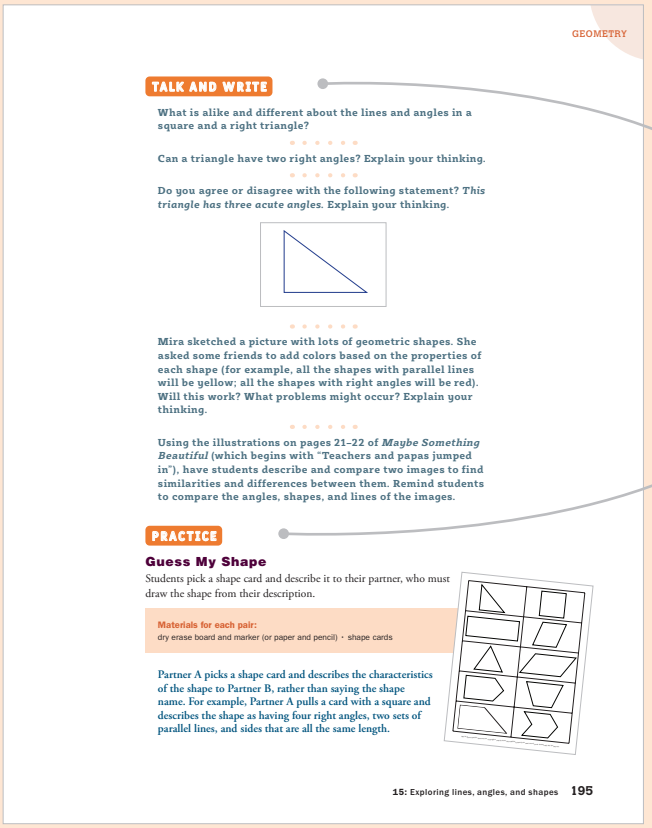
A woman sold 15 servings of kebabs with 3 kebabs in each serving. How many kebabs did she sell? Show how you solved it. (45 kebabs)

A man sold 23 sets of bangles with 5 bangles in each set. How many bangles did he sell? Show how you solved it. (115 bangles)

A woman sold 6 bags of saffron strands with 32 pieces in each bag. How many pieces of saffron did she sell? Show how you solved it. (192 pieces of saffron)

100 Math by the Book ★ FOURTH GRADE

A selection of problems, from which you can choose, that offer opportunities for students to apply the skill or concept.



GEOMETRY

TALK AND WRITE

What is alike and different about the lines and angles in a square and a right triangle?

Can a triangle have two right angles? Explain your thinking.

Do you agree or disagree with the following statement? *This triangle has three acute angles.* Explain your thinking.

Mira sketched a picture with lots of geometric shapes. She asked some friends to add colors based on the properties of each shape (for example, all the shapes with parallel lines will be yellow; all the shapes with right angles will be red). Will this work? What problems might occur? Explain your thinking.

Using the illustrations on pages 21–22 of *Maybe Something Beautiful* (which begins with "Teachers and papas jumped in"), have students describe and compare two images to find similarities and differences between them. Remind students to compare the angles, shapes, and lines of the images.

PRACTICE

Guess My Shape

Students pick a shape card and describe it to their partner, who must draw the shape from their description.

Materials for each pair:
dry erase board and marker (or paper and pencil) • shape cards

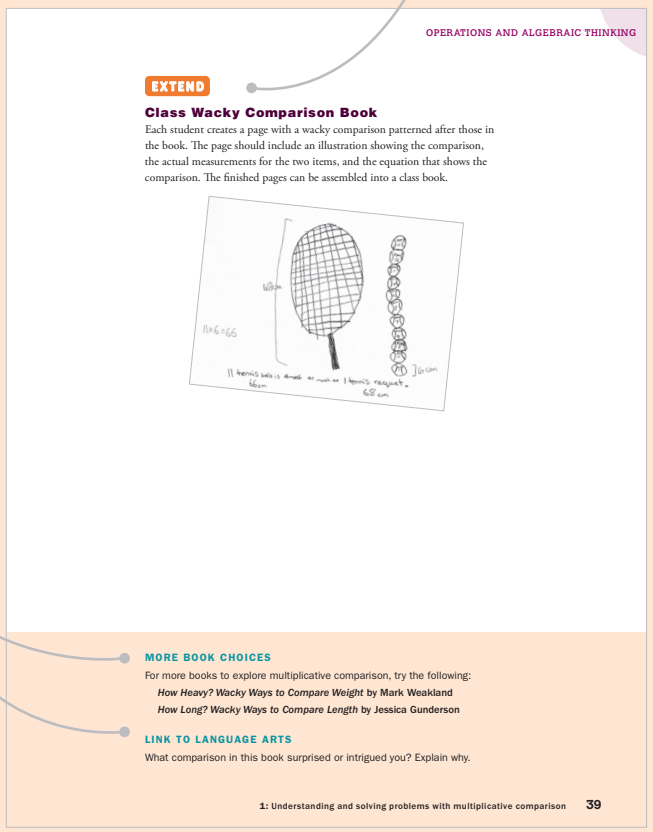
Partner A picks a shape card and describes the characteristics of the shape to Partner B, rather than saying the shape name. For example, Partner A pulls a card with a square and describes the shape as having four right angles, two sets of parallel lines, and sides that are all the same length.

15: Exploring lines, angles, and shapes 195

Multiple prompts to get students **talking or writing to explore** the math concepts and show their math understandings.

Interactive tasks for engaging practice of the skill.

A creative way to further explore the skill through art, writing, experiments, or team projects.



OPERATIONS AND ALGEBRAIC THINKING

EXTEND

Class Wacky Comparison Book

Each student creates a page with a wacky comparison patterned after those in the book. The page should include an illustration showing the comparison, the actual measurements for the two items, and the equation that shows the comparison. The finished pages can be assembled into a class book.

MORE BOOK CHOICES

For more books to explore multiplicative comparison, try the following:

How Heavy? Wacky Ways to Compare Weight by Mark Weakland
How Long? Wacky Ways to Compare Length by Jessica Gunderson

LINK TO LANGUAGE ARTS

What comparison in this book surprised or intrigued you? Explain why.

1: Understanding and solving problems with multiplicative comparison 39

Recommendations for additional children's literature to provide alternative options, continue the explorations, or allow students to compare multiple texts that relate to similar math concepts.

A prompt to connect the literature to language arts, asking students to talk, draw, or write about the story.

Let's Get Started!

On the following pages you will find a wealth of ideas for integrating children's literature into your mathematics lessons. Start by reviewing the description of the highlighted math skill. This will provide focus to your lessons. Then, use the menu to select tasks that show the mathematics in context, deepen your students' understanding, and bring energy to your lessons. These high-quality math tasks guide students to their learning goals. While they are exploring and learning the mathematics, the stories help them see the math in context and keep them engaged, active, and thinking like mathematicians.

Have fun with the stories! Dive deeply into the math!

18

MEASUREMENT AND DATA

Finding the area and perimeter of complex figures

Harlem Grown: How One Big Idea Transformed a Neighborhood *by Tony Hillery*

ABOUT THE BOOK

A littered, empty lot in New York City is transformed into a city garden with the help of a neighborhood man and the children at a local school.

In this true story, students work together to learn how to grow fruits and vegetables and then share their harvest with their community.

ABOUT THE MATH

In third grade, students learn about the concepts of area and perimeter. In fourth grade, they apply their understanding to more challenging tasks. They use their understanding of the formulas for the area of a rectangle ($A = l \times w$) and the perimeter of a rectangle ($P = 2l + 2w$) to find solutions when a side length is missing. They explore the area of irregular shapes, reasoning that area is additive and knowing that sectioning the irregular shape into rectangles allows them to find the total area.

These lessons are designed to be used after students have begun to explore two-digit by two-digit multiplication. If they haven't yet done so, you can simplify the data to use single-digit numbers.

This story focuses on creating a garden on a vacant lot. Through the context of the story, students explore various problems related to area and perimeter as they consider the creation of raised beds for the plants.

ONLINE RESOURCES

- Centimeter Grid Paper
- Framing Each Garden Recording Sheet
- The Gathering Spot Image
- Greater Gardens Cards

READ THE BOOK

Before Reading

Pose the following questions for students to turn and share:

Do you have a garden or do you know someone who has a garden? What grows in the garden?

Why do people plant gardens?

Do you need a lot of land to plant a garden? Why or why not?

Show the book cover and read the title and author.

What do you think this story will be about?

Where is Harlem?

Do you think it is easy to have a garden in the city? Why or why not?

Listen to this true story about the making of a city garden.

During Reading

Read the story, sharing the illustrations.

Read the page following the story that describes the garden project.

After Reading

Pose the following for students to discuss with partners and then with the class:

Why do you think Tony decided to use the lot for a garden?

What had to be done to get the lot ready for a garden? Who did it?

How did the schoolchildren help?

What problems did they face? What did they do when faced with problems?

In what ways did Tony's idea change the neighborhood?

LESSONS

EXPLORE

Design a Community Garden

Students use their understanding of the concept of area to explore dividing the vacant lot into garden plots for the neighbors.

Materials for each pair:
paper (for solving problems, designing gardens, and writing comments during the gallery walk)

Have students turn and talk with partners about the following:

When in the story might Tony and the children have used math?

Have some pairs share their ideas.

What did Tony do when the plants weren't growing well? (He made raised beds for the plants.)

How did he know how big to make the raised beds? What would you consider when deciding what size to make the raised beds? (The size of the lot. *Or,* How many beds need to be made.)

How might Tony and the children measure the lot to begin to figure out how to split it among the children?

What measurement tells us the amount of land on which they can plant? (Area.)

Share the following information and ask students to solve the problem:

The vacant lot was 20 feet wide by 95 feet long. What was the area of the lot? (1,900 square feet)

Have students share their solutions. If needed, revisit the formula for finding the area of a rectangle.

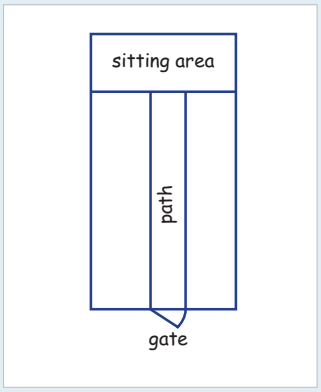
Tony had an idea for how the neighborhood might use the lot. He thought the land could be used to teach students about gardening and provide food for the community, but that the

neighbors might also like a place to sit and enjoy the beauty of the garden. His plan called for the following:

1. *Since the lot was 95 feet long, he thought they could leave the last 15 feet of the lot for a sitting area to all enjoy the gardens together.*
2. *To get to the sitting area at the back of the lot, he suggested they put a 4-foot-wide path through the center of the lot from the front gate to the start of the sitting area.*

Tony sketched his plan.

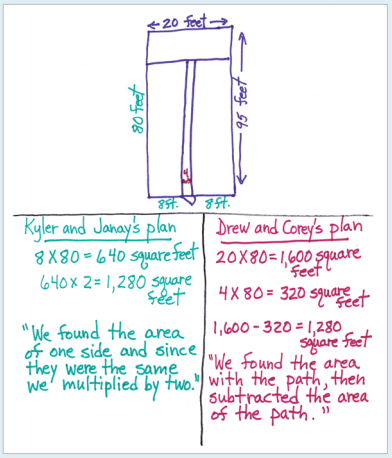
Create a similar sketch on the board.



Tony knew the area of the whole lot but wondered how many square feet would be left for their gardens after they put in a path and a sitting area. Work with a partner to figure it out.

Circulate through the room to watch as partners discuss and model the lot.

Record some of their ideas on the board as they explain their solutions and how they calculated them.



Pose the following:

Tony decided to make 8 raised garden beds. Some would be small plots of land and others would have more space.

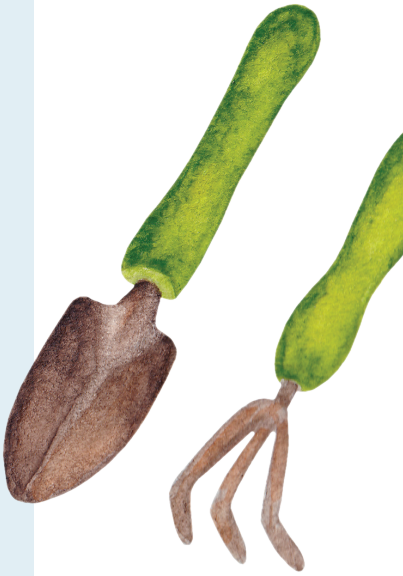
Work with your partner to come up with a plan for 8 garden beds (4 smaller and 4 larger) that would fit in the garden areas on the two sides of the path.

Be sure to put at least 2 feet between each raised bed so the children can walk around them and tend to the plants. Draw a diagram to show the dimensions of the 8 raised garden beds and the area of each one.

Have students work in pairs to design the 8 garden beds.

When the students are done, put each garden plan on a desk around the room and have a gallery walk so students can see one another's designs. Leave a paper and pencil by each design so visitors can jot down comments about what they love or questions about any part of the design.

Partners go back to their own designs, read the comments, and answer any questions that were left for them.



EXPLORE

Framing Each Garden

Students work with partners to figure out the perimeter of each raised garden bed in order to know how much wood to buy to frame the beds.

Materials for each student:
Framing Each Garden recording sheet

Tony went to the hardware store to buy wood to make the raised garden beds. What measurement does he need in order to know how much wood to buy? (perimeter of each garden bed)

Tony brought the measurements with him, but when he looked at his paper he realized that he had jotted down the areas of

each of the 8 garden plots, not the perimeters. He remembered that he and the students had decided to make each garden 6 feet wide. He looked at the measurement for the raised bed for the broccoli garden and saw that its area was 66 square feet. Does this help him know how much wood to buy to frame the broccoli garden? Talk with your partner about whether he has enough information to figure out the perimeter. Consider sketching a model of his broccoli garden to see the data more clearly.

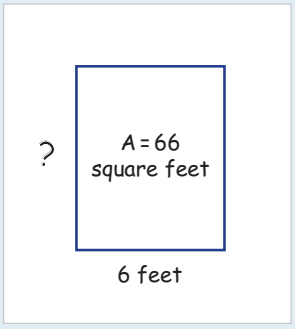
Record on the board:

Area = 66 square feet

width = 6 feet

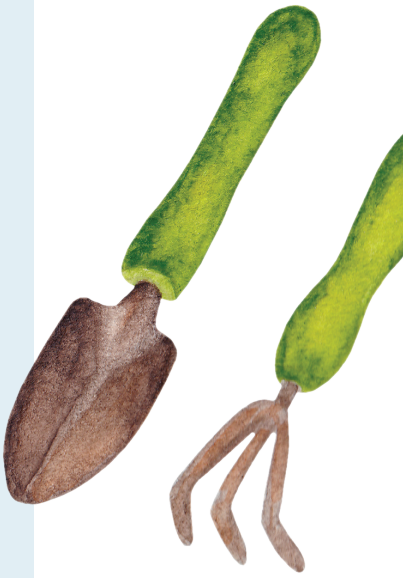
Have pairs share their thinking.

What information is missing? (The length of the garden. *Or,* The perimeter of the garden.)



Do you have any data that might help you find the missing side length? If so, explain how. (The area is l × w, so 66 = *n* × 6, so the missing side length is 11 feet.)

How does that help us find the perimeter of the broccoli garden? (Now we know the missing side length, so we know 6 + 11 + 6 + 11 = 34 feet.)



Give each student a Framing Each Garden recording sheet and have them record the data for the broccoli garden. Then have them find the perimeters of the 8 garden plots and the total length of wood needed to frame all 8 gardens.

The strawberry garden and the tomato garden are the same size:

A = 84 square feet

width = 6 feet

P = ___ (40 feet each)

The garden for collard greens and the garden for kale are the same size:

A = 72 square feet

width = 6 feet

P = ___ (36 feet each)

The garden for peas, the garden for eggplant, and the garden for peppers are all the same size:

A = 78 square feet

width = 6 feet

P = ___ (38 feet each)

What were we trying to find out? (The total wood needed to frame all the gardens.)

Talk with your partner and find the solution.

Have students share their solutions and methods. (The total wood needed to frame the 8 gardens is 300 feet.)

EXPLORE

The Gathering Spot

Students find the area and perimeter of a complex garden shape.

Materials for the class:
the gathering spot image to project

Materials for each student:
centimeter grid paper • paper for computations

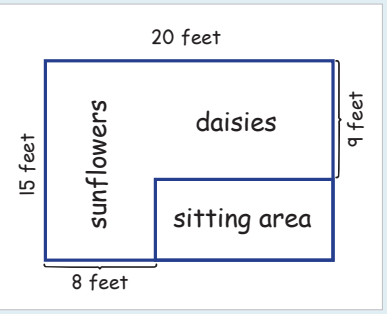
Pose the following:

The children decided to make a community gathering spot on a plot of land at the back of the lot that was 15 feet wide by 20 feet long. What is the area of the gathering spot?

Have students calculate, then share the area (300 square feet).

They decided to combine a place to sit with a space to grow flowers.

Project the gathering spot image on the screen:



Tony had an old bench that was 8 feet long and 3 feet wide and wondered if it would fit in the sitting area. Work with your partner to decide if it fits and be ready to justify your answer.

Have students share their thinking, including how they know the area of the sitting area (it fits because the sitting area is 12 feet × 6 feet).

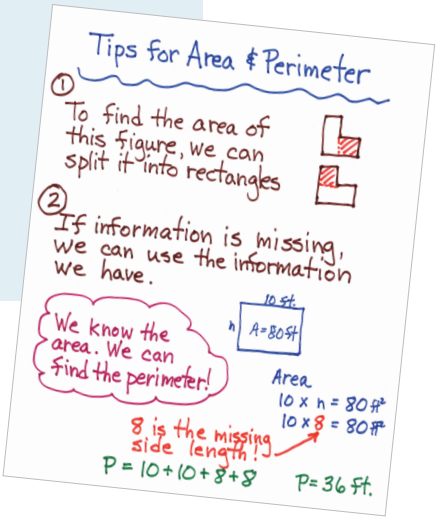
Pose the following:

The children decide to plant sunflowers and daisies in the flower section of the plot of land. In order to figure out how much soil to spread across the flower areas and how much wood to buy to frame around the L-shaped area, the children need to know the area and perimeter of the flower garden. Since it is not a rectangle, they are confused about how to do it. Work with a partner to find the area and perimeter and be ready to explain how to do it. (P = 70 feet; A = 228 sq. ft.)

Circulate as students work, watching and listening for the ways in which they find the missing side measurements and their strategies for finding the area and perimeter. Select a few pairs to share different ideas.

To summarize, have students turn and tell a partner a tip for finding the area or perimeter when the garden is not a rectangle or when some data are missing.

Have them share their tips with the class.

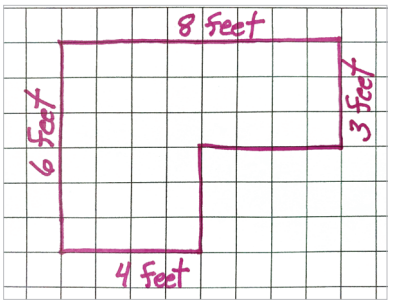


Support and Practice

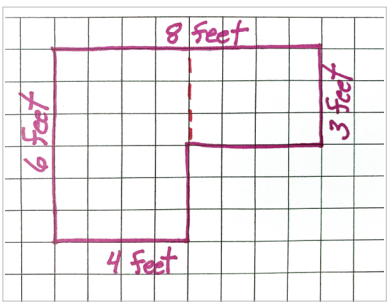
DIFFERENTIATE

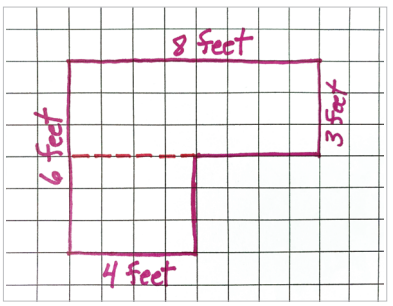
Support

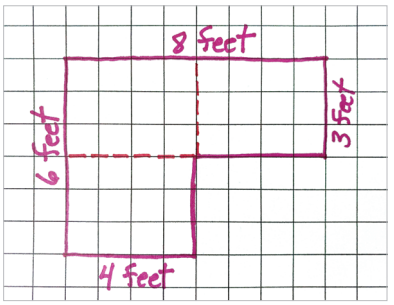
Grid paper helps students visualize missing side lengths to determine area or perimeter.



When focusing on area, discuss and sketch various ways the grids can be split to create rectangles, find the area of each rectangle, and then add them back together to find the total area.

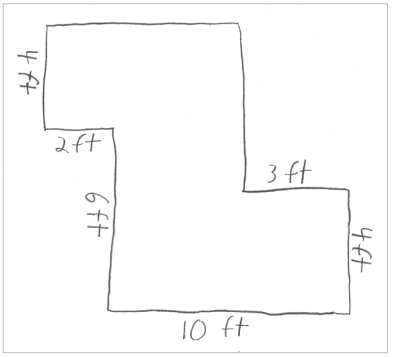






Enrich

Challenge students to design area and perimeter problems by sketching complex figures that must be decomposed into two or more rectangles. Provide enough of the dimensions so that the area and perimeter can be solved, but leave some side measurements unknown. Have them trade tasks with partners to solve each other's challenges.



SOLVE

The area of a rectangular garden is 72 square feet. The length is 9 feet. What is the width? Explain how you know. (8 feet)

The perimeter of a square garden is 32 feet. What is the side length? Explain your thinking. (8 feet)

A square garden is split in half horizontally to create 2 gardens. The new gardens are rectangles with perimeters of 12 yards. What was the area of the original square garden? Prove your answer. (In order to have perimeters of 12 yards, two sides of the smaller gardens must be 4 yards long and the other two sides must be 2 yards long. That means the original square had sides that were 4 yards long, so the area of the original square garden was 4 × 4 = 16 square yards.)

TALK AND WRITE

How do you know when a problem situation requires you to find the area or the perimeter?

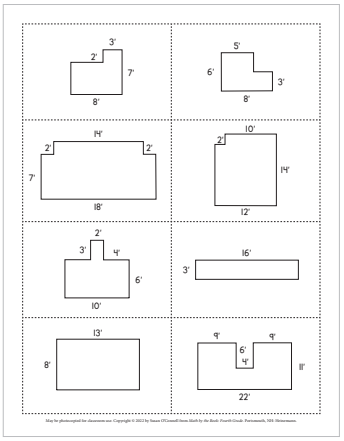
Write a problem in which you need to find the area and a problem in which you need to find the perimeter. Include a model, with measurements labeled, for each problem.

PRACTICE

Greater Gardens

Students compare area cards to see who has the garden with the greater area.

Materials for each pair:
Greater Gardens cards



The deck of fourteen Greater Gardens cards consists of different models of gardens, some with missing data.

The cards are placed in a pile, facedown.

Partners each pick a card from the pile and then determine the area of the garden on their card.

The player who has the greater area wins that round and gets to keep the cards.

Then players pick another card and play again.

The winner is the student who has collected more cards by the end of the game (seven rounds).

EXTEND

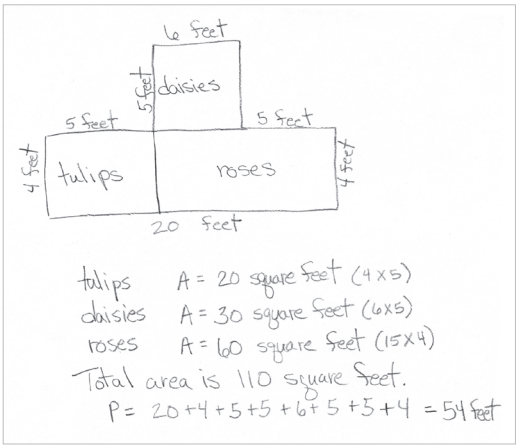
Our Garden Plan

Students create a plan for their own flower garden. The garden must meet these criteria:

* It must have more than one type of flower (e.g., they might grow tulips, daisies, and roses).
* Each flower must have its own rectangular section of the garden.

* The section for each flower must have a different area.

Students create a diagram of their garden to include the area of each flower section in the garden, the area of the whole garden, and the perimeter of the whole garden. Measurements should be clearly shown on the diagram.



MORE BOOK CHOICES

For more books about city gardens to set a context for exploring area and perimeter, try the following:

City Green **by DyAnne DiSalvo-Ryan**

One Little Lot: The 1-2-3s of an Urban Garden **by Diane C. Mullen**

LINK TO LANGUAGE ARTS

Imagine you found a vacant lot that would make a great city garden. Write a letter to city hall to convince officials that giving the land to the local school is a good idea. Give reasons why it is a good idea, including how it will benefit the school and the community.