Core Knowledge® MATHEMATICS

Connecting Math to Our World:

The Power of Math

Teacher Support

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GRADE 5

The Power of Math
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About This Series

Everyone uses math every day, but many people don't realize it! The Core Knowledge Connecting Math to Our World series underscores the ubiquity of math and encourages learners to "find the math" in familiar situations. When learners see situations where math skills are used to solve problems, they develop an understanding of why learning math skills is important. The instructional focus for this series is not on *practicing* math skills but on recognizing *where*, *when*, and *why* we use math.

Through both fiction and nonfiction readings, this series seeks to help learners see when and how math skills can be useful and increase their overall understanding of and interest in math. Students do not need to have achieved proficiency in specific skills to understand the importance of math. Mathematical thinking is a part of countless aspects of day-to-day life. Math appears throughout nature. Individuals, groups, and governments use math to plan and make decisions. Math is also embedded throughout creative endeavors—in poetry, music, visual art, and design. Math is integral to all sorts of discoveries. Math supports our understanding and appreciation of culture and helps us function as active and engaged citizens.

Each chapter tells a story or explores a situation in which a mathematical idea plays a role. It's important to note that these chapters are *not* intended to be a complete lesson. Instead, they can serve as a flexible resource throughout the school day and beyond.

- Because the chapters do not need to be read in order, you may wish to use a chapter to foster interest in a math idea before or after a skill is taught in your core math curriculum. Chapters are adaptable enough to be used in any situation, including enrichment or remediation, depending on the teacher's approach.
- These chapters can be used as a cross-curricular extension to support reading skills such as following lines of text as it is read aloud, asking students to read chapters or sections of chapters, and making inferences about content from the engaging images on the pages.
- This series is recommended to parents looking to enhance engagement with both reading and math at home.

No matter when or how you choose to use the readings or the order in which the chapters are read, introduce learners to the Student Reader with a reading of the invitation that appears on page 1.

Making the Most of the Student Reader

Preparing to use a chapter.

1. ***Read the chapter's Teacher Support.*** Reviewing the Teacher Support will alert you to the math connections and applications being made in the chapter, allowing you to better point them out when sharing the chapter with the class.
2. ***Preview the chapter.*** Identify where and how math is being used in the selection.
3. ***Identify vocabulary for which students may need support.*** This may include reviewing math vocabulary or providing context for non-math vocabulary.
4. ***Choose a reading routine.*** We suggest using the Student Reader as part of a reading routine with your students. Students who have successfully mastered the skills taught in K–4 CKLA now have the code knowledge needed to decode and read nearly all possible sound spellings in the English language. If and when students encounter words with the few sound spellings that may not have been taught explicitly, they should be able to analyze these words based on existing code knowledge and make sense of the text using contextual clues. Several whole-class routines appropriate for students in this grade are listed below. Of course, based on your students' reading levels and other factors, you may wish to read a given chapter aloud, allowing students to concentrate on listening and looking at the images.
    - **Echo Reading** The teacher models reading a short section of text, and then students repeat the reading, echoing the teacher's pronunciation, pacing, and inflection.
    - **Partner Reading** One student reads aloud while the other listens. Roles then reverse with the partner reading the same passage again.
    - **Quiet Reading** Students quietly read a passage to themselves, and the teacher then questions students on comprehension.
    - **Reading Discussions** Students read silently with a partner. Partners then discuss the passage with each other, pointing out important details.
    - **Dramatic Reading** Students are assigned characters and read that character's lines.
5. ***Activity Pacing.*** Depending on the depth of your question-and-answer facilitation with students during and after reading, any given chapter could take as little as 10 minutes or might be extended to 30 minutes or more.

Making the Most of the Teacher Support

For each chapter, the Teacher Support pages provide several sections:

1. **Prepare to read** includes a chapter summary, the math connection, and the chapter identifier.
2. **Focus student attention** provides a strategy for setting the scene with students.
3. **Read together** includes reading prompts and strategies for helping students identify the math in the selection.
4. **Emphasize the Main Idea** focuses on how the selection connects everyday life to math.

The following chart identifies which Core Knowledge Sequence Skills are covered in each chapter. You can use the chart to determine which chapters best match your curriculum throughout the year.

Chapter	Math Connection
1. Bailey Starts Banking, page 5	**Number and Operations in Base Ten** • Perform operations with multi-digit whole numbers and with decimals to hundredths
2. A Balancing Act, page 6	**Number and Operations in Base Ten** • Perform operations with multi-digit whole numbers and with decimals to hundredths
3. The Mathematical Minds of Animals, page 7	**Geometry** • Classify two-dimensional figures into categories based on their properties.
4. My Dear Aunt Sally, page 8	**Operations and Algebraic Thinking** • Write and interpret numerical expressions
5. Ocean-Traveling Ducks, page 9	**Operations and Algebraic Thinking** • Analyze patterns and relationships.
6. Cracking the Code, page 10	**Operations and Algebraic Thinking** • Analyze patterns and relationships.
7. The Development of Number Systems, page 11	**Number and Operations in Base Ten** • Understand the place value system.
8. Binary Code, page 12	**Number and Operations in Base Ten** • Understand the place value system.
9. Ada and the Analytical Engine, page 13	**Operations and Algebraic Thinking** • Analyze patterns and relationships.
10. Lemonade for Sale, page 14	**Number and Operations in Base Ten** • Perform operations with multi-digit whole numbers and with decimals to hundredths.
11. Paradox in a Box, page15	**Number and Operations—Fractions** • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
12. Fed Up!, page 16	**Number and Operations—Fractions** • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
13. The Community Garden Greenhouse, page 17	**Number and Operations—Fractions** • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
14. Ahoy, Matey!, page 18	**Number and Operations—Fractions** • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

15. Mars Measurement Mix-Up, page 19	**Measurement and Data** • Convert like measurement units within a given measurement system. • Represent and interpret data.
16. Ice Cores, page 20	**Measurement and Data** • Represent and interpret data.
17. Eratosthenes, the Polymath, page 21	**Geometry** • Graph points on the coordinate plane to solve real-world and mathematical problems.
18. Maps and Screens, page 22	**Geometry** • Graph points on the coordinate plane to solve real-world and mathematical problems.
19. Plotting to Win, page 23	**Geometry** • Graph points on the coordinate plane to solve real-world and mathematical problems. • Classify two-dimensional figures into categories based on their properties.
20. M. C. Escher, page 24	**Operations and Algebraic Thinking** • Analyze patterns and relationships.
21. The Oldest Computer, page 25	**Operations and Algebraic Thinking** • Analyze patterns and relationships.
22. Little Math Dramas, page 26	**Number and Operations in Base Ten** • Perform operations with multi-digit whole numbers and with decimals to hundredths. **Measurement and Data** • Represent and interpret data.
23. The Mathematics of Music, page 27	**Number and Operations—Fractions** • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Chapter 1: Bailey Starts Banking, Student Reader page 2

1. Prepare to read.

Chapter Summary: Bailey earns money doing chores. She keeps this money in a metal box. Her mom suggests opening a bank account. Bailey gets a state ID for identification. She and her mom open a checking account and a savings account for her at the local credit union. She receives a debit card and learns how to use the credit union app and ATM. Her mom advises her to manage her spending carefully and to track her transactions with receipts.

Math Connection: Using a bank account requires math skills in addition, subtraction, and percentages, as well as attention to detail.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Bailey Starts Banking." Explain to students that the chapter is about a girl named Bailey. Bailey keeps her money in a metal box under her bed. Bailey's mom suggests that Bailey open an account at a credit union. As they read, ask students to think about the advantages of having a bank account. Ask students where they keep their money.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Why would Bailey's mom want Bailey to change how she is saving money and open an account at a credit union? (*Bailey's mom knows an account will help her keep track of her money, will allow her to purchase items without carrying money around, and will allow money to be transferred into Bailey's account.*)
- What is the difference between a checking account and a savings account? (*A checking account is where you keep money that you can spend. A savings account is where you keep money that is not going to be spent right away. The money in a savings account earns interest.*)
- What might happen if Bailey used her debit card without tracking her spending or how much money she has in her account? (*She could use all the money in her account without knowing.*)

4. Emphasize the Main Idea.

Keeping track of money is an important life skill.

- Have students explore an online bank simulator, such as https://www.ngpf.org/bank-sim, and compare how money in the account changes when they transfer money, pay a bill, or deposit a check.

Chapter 2: A Balancing Act, Student Reader page 8

1. Prepare to read.

Chapter Summary: Bailey is excited about managing her new bank account, using her debit card, and tracking her spending. She learns to check her balance, track transactions, and save receipts. Bailey transfers money between her accounts, earning interest on her savings. When Bailey sees a bike she wants to purchase, she checks her balance and sees she doesn't have enough money in her checking account. She explores her options and decides to wait on purchasing the bike.

Math Connection: Using a bank account requires math skills in addition, subtraction, and percentages, as well as attention to detail.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "A Balancing Act." Explain to students that they are going to read about how Bailey manages her bank accounts. Remind them to pay special attention to the things Bailey does to keep track of the money in her account.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Bailey feels proud when she pays for the milkshakes because it shows she is responsible with her money. How is she demonstrating responsibility? (*She looks over the bill and gets the receipt. She determines the tip to leave for the server.*)
- How does having a checking account help Bailey as she earns money? (*If someone knows the account's routing number, they can transfer to her account electronically.*)
- Why does Bailey decide to transfer money to her savings account? (*She transfers money so that she won't spend it and so that she can receive interest.*)
- Why does Bailey compare her receipts to her account statement? (*Sample answer: She needs to ensure that the statement and receipts match.*)
- How does Bailey know if she has enough money to purchase a bike? (*Bailey uses the credit union's app to check the balance in her account.*)

4. Emphasize the Main Idea.

Tracking how much money you have and how much you spend helps you meet your goals.

- Give each student an imaginary amount of money to use on a make-believe shopping spree. Provide them with flyers or circulars from local stores, catalogs, or links to online shopping sites. Have them determine what they can purchase. Remind students that they may need to figure out the sales tax on the purchases.

Chapter 3: The Mathematical Minds of Animals, Student Reader page 14

1. Prepare to read.

Chapter Summary: This chapter explores the different ways and reasons animals use math to help them make choices. Like humans, animals need to differentiate and compare values, determine distances and direction, and build secure structures. These math skills help the animals survive and thrive.

Math Connection: This chapter demonstrates how math concepts are used by some animals.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "The Mathematical Minds of Animals." Explain to students that they are going to read about how animals use math. Ask them to pay special attention to the types of math being described. Before reading, ask students to discuss why and how animals might use math.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- After page 14: What are some other ways that different animals use math to help them solve problems? Are these similar to how people problem-solve using math? (*Answers will vary.*)
- What do the chick experiments tell us about how chicks are using math? (*The chicks can identify which group has a greater number of balls. They are able to identify which group of balls was being added to or subtracted from.*)

On each page, point out that each of the animals they have read about uses math but that each does so for different reasons. Ask:

- What is similar and different about how or why these different animals use math? (*Sample answers: They both differentiate between larger and smaller values. They both use it for survival. Chicks use it because they have imprinted on the balls and view them as safe objects. Fish use math to find food or avoid predators.*)
- Can you think of times that humans use math in a similar way? (*Sample answer: Yes, humans can use the position of the sun to figure out in which direction they are traveling.*)

4. Emphasize the Main Idea.

Some animals do things that show they make choices using math skills.

- Assign groups to research other animals that use math, such as frogs, gray wolves, or African lions. Each group should develop a short presentation that describes how the animals use math to support the choices that they make.

Chapter 4: My Dear Aunt Sally, Student Reader page 20

1. Prepare to read.

Chapter Summary: In this chapter, a classroom teacher explains that the order of operations is important to establish a standard sequence for performing calculations. She introduces the class to a mnemonic that will help them remember the correct order. She shares a story about Aunt Sally, who is a stickler for following the correct order for certain tasks.

Math Connection: This chapter focuses on the importance of the order of operations.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "My Dear Aunt Sally." Explain to students that they are going to read about a class learning about the order of operations used to solve math problems. Ask students to think of things they do that must be done in steps that follow a specific order, for example, brushing their teeth. Ask: What happens if the steps aren't done in order?

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- On page 20: Why did the students have an incorrect answer when they solved the math problem? (*They did not follow the order of operations.*)
- Why do we use mnemonics? (*They help us remember a phrase.*)
- What is the phrase *My dear Aunt Sally* used for? (*It is used to remind you to do the multiplication and division in a math equation before the addition and subtraction.*)
- How is following a recipe like doing math? (*If you don't follow the correct order of steps in a recipe, the result might not be what you wanted.*)

Emphasize how, if people didn't follow the correct order, their answers would be incorrect.

- How does following the correct order in math compare to the tasks Aunt Sally and her niece did? (*In some tasks, like finding the total amount of money you have, not following the correct order results in a wrong answer. In other tasks, like eating desert before the main course of a meal, the order doesn't matter, and the results would be the same or similar.*)
- Why would it be okay to start a book of poems in the middle but not a novel? (*Sample answer: Novels have a beginning, middle, and end to the story. You would miss important parts if you skipped ahead. A book of poems is a collection of unrelated poems that often aren't connected.*)

4. Emphasize the Main Idea.

Following a set order of operations ensures that everyone finds the correct answer when solving a math problem.

- Have students write their own mnemonic for the order of operations and share with the class.

Chapter 5: Ocean-Traveling Ducks, Student Reader page 26

1. Prepare to read.

Chapter Summary: This chapter describes a real situation from 1992, in which a cargo ship traveling through a storm lost a container that held 28,800 rubber ducks and other plastic bath toys. Scientists used the opportunity to track the toys to study and model ocean currents. The floating bath toys also provided information to help scientists study some of the biggest problems facing Earth's oceans, such as tracking pollution and the spread of marine debris.

Math Connection: Scientists use math to study problems in the oceans.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Ocean-Traveling Ducks." Explain to students that this chapter describes a real-life situation in which rubber ducks and plastic bath toys were accidentally spilled into the ocean. Ask students to predict what happened after the spill. Have them look for how math is used as they read the chapter.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Would you expect the toys to still be coming ashore 15 years after they spilled? Why or why not? (*Accept supported answers.*)
- How were scientists able to take advantage of the spill? (*Scientists would never release the toys on purpose because they could be harmful, but they were able to use the toys to study and monitor ocean currents. The accident turned into a lesson on the impact of human activity on the seas.*)
- What math skills do you think the scientists used as they studied the floating toys? (*Accept supported answers. Sample answer: The scientists would have to measure the distance that the toys traveled.*)

4. Emphasize the Main Idea.

Math can be used to evaluate and model a problem by looking for patterns and using the right tools to gather information.

- Have students research physical oceanographers and what methods they use to study ocean currents.

Chapter 6: Cracking the Code, Student Reader page 32

1. Prepare to read.

Chapter Summary: Jenna and Nico receive a strangely written letter from their friend Pete. They attempt to figure out the meaning of the coded letter by looking for patterns in the writing and then using even more patterns to figure out what the code means.

Math Connection: People use mathematical patterns to write and break codes.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Cracking the Code." Explain to students that they are going to read about Jenna and Nico, who get a message from a friend. They figure out that the message is written in code. Ask students to pay special attention to how Jenna and Nico problem-solve and break the code.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- On page 32: What is unusual about the letter? (*Accept all answers that analyze the letter.*) Encourage students to guess what they think the letter may be about and how they might find out.
- On page 34: What do Jenna and Nico think about the code? (*They both think the capitalized letters are used in a code. Nico thinks the letters make words that are the code, but Jenna thinks the letters represent other letters.*)
- On page 36: As Jenna and Nico decipher the code, have students solve it individually or as a class by calling out the letter that corresponds to the cipher.
- What are some reasons that someone would want to send a message using a code? (*Accept supported answers.*)
- Why do you think Pete sent his message in a cipher? (*Sample answer: He did it for fun.*)

4. Emphasize the Main Idea.

Codes often use mathematical patterns.

- Invite students to share times when they have learned about or used a code. Discuss why cryptography is important.
- Challenge students to write and solve a code using the ROT13 cipher or to develop and use their own cipher to write a letter using code. What patterns are they using to develop and solve the code?

Chapter 7: The Development of Number Systems, Student Reader page 38

1. Prepare to read.

Chapter Summary: This chapter explores different number systems that have been used throughout history. Roman, Maya, and Hindu-Arabic number systems are described. The Maya number system is a base-20 number system. The Hindu-Arabic system that we use today is a base-10 number system.

Math Connection: Number systems are based on the number of unique digits used to represent numbers.

Choose a Reading Routine: Based on your students' reading levels and other factors, identify how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "The Development of Number Systems." Explain to students that they are going to read about different number systems that have been used throughout history. Remind them to pay special attention to why these different systems were developed. Ask them to think about how these number systems are similar and different.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Why did the way that people write numbers change as time went by? (*As civilizations became more advanced, people needed to be able to do more with numbers. They needed to be able to represent larger numbers and to solve mathematical problems using operations.*)
- Why was each system useful for its time? (*Sample answer: When developed, each system served society's purposes. As trade and business grew, new number systems were developed that could represent larger numbers.*)
- Which of the number systems in this chapter use the position of the symbols to determine the value of a number? Explain your answer. (*The Roman number system, the Maya number system, and the Hindu-Arabic system all use the position of a symbol to show value. Accept reasonable explanations.*)
- How is the Maya number system different from the Hindu-Arabic system we use today? (*Sample answers: The Maya number system has 3 symbols and is a base-20 number system. The Hindu-Arabic system has 10 symbols and is a base-10 number system.*)

4. Emphasize the Main Idea.

Number systems have evolved throughout history based on human needs.

- Challenge students to write their birth year or the current year in Roman/Maya numerals. Ask them to share their answer and the way they used math to come to it.

Chapter 8: Binary Code, Student Reader page 44

1. Prepare to read.

Chapter Summary: Binary code is used in many ways in our lives. While developed hundreds of years ago, this base-2 number system is used by computers. Morse code also uses binary code for communication. The simplicity of these systems is what makes computers and Morse code communication efficient and useful.

Math Connection: We use a base-2 number system for computer programing.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Binary Code." Explain to students that they are going to read about how binary code is used today. Remind them to pay special attention to what makes binary code so useful.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- How is the binary code different from the base-10 system? (*It is based on only 2 characters instead of 10.*)
- On page 48: Think about how computers use binary code and the chart. Do you think this number system would be useful for humans to use in our everyday lives? (*Student answers should consider that bytes are lengthy.*)
- Play an audio clip of the Morse code message for SOS for the class. Next, show them SOS in binary code: 01010011 01001111 01010011. Discuss why Morse code is a good fit for human communication.
- Why do you think computer programmers use binary code instead of other systems that use more symbols? (*Look for answers that discuss its simplicity in only having two options and how it allows for computers to work efficiently and quickly.*)

4. Emphasize the Main Idea.

Computers and electronics use binary code, which is a base-2 system.

- Morse code can be used as an assistive device for people with significant physical disabilities. Hold a class discussion about how Morse code can be used to support those with physical disabilities, often through switches or specialized input devices like sip/puff devices.

Chapter 9: Ada and the Analytical Engine, Student Reader page 52

1. Prepare to read.

Chapter Summary: Charles Babbage, a mathematician in the 1800s, designed machines that made solving math problems easier and faster. The machines he designed were the first computers. The initially simple machine he called the Analytical Engine soon became more complex, leading to computer programming ideas in use today. It was very large and used punch cards to input information. Ada Lovelace became a partner in Babbage's work. She was the first to realize that the Analytical Engine had applications beyond math computations.

Math Connection: This chapter explores one of the first computers.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Ada and the Analytical Engine." Explain to students that they are going to read about computer programming. Remind them to pay special attention to how computer developers use math. What are some tasks that a computer might be asked to do?

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What gave Charles Babbage the idea to design a machine that could solve math problems? (*Sample answer: He saw that machines were being used to make life easier.*)
- On page 52: Look at the image of the punch cards. Describe how these compare to binary code described in Chapter 8. (*Sample answers: It is a simple system where dots represent the characters in a code. Different cards, or code, meant different things.*)
- How do you think the Mill and the Store worked together? (*Sample answer: I think the Store held the information in code. This information got sent to the Mill, which would do the actual work.*)
- Ada Lovelace had a background in writing but is also considered to be the first computer programmer. How are writing and computer programming similar? (*They both use characters or symbols to convey a message. They both need to be very clear and specific.*)
- Do you think computer programmers today would agree with Ada Lovelace's idea that a machine is only as capable as the people who designed it? (*Answers will vary.*)

4. Emphasize the Main Idea.

The principles of computer programming we use today are built on ideas from the early 1800s.

- Have students construct simple code by punching or drawing holes in paper strips to represent instructions for basic tasks like drawing a picture. Assign a hole position on the paper strip to each direction (e.g., top hole = up, middle hole = right, bottom hole = down) that the pencil will be moved. Test the code by using the punch card to draw on a separate sheet of paper by following the hole pattern (e.g., when a top hole is punched, move the pencil up.)

Chapter 10: Lemonade for Sale, Student Reader page 58

1. Prepare to read.

Chapter Summary: In this chapter, Leanna decides she wants to sell lemonade at an upcoming fair. She determines her ingredients, figures out her expenses, and estimates how much lemonade she will need for four days. After the fair is over, Leanna figures out her profit.

Math Connection: People who make things to sell use math to determine how profitable their projects will be.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Lemonade for Sale." Explain to students that the chapter is about Leanna and her lemonade stand at a local fair. Remind them to pay special attention to how Leanna uses math to make plans for selling her lemonade and what types of things Leanna must consider.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What materials does Leanna need for her lemonade? (*She needs lemons, water, sugar, and fruit for flavors. She also needs cups.*)
- How does Leanna determine how much of each ingredient she needs? (*She figures out how much of each ingredient she needs for a batch. Each batch makes 10 servings. She decides how many servings she will need to sell. She uses powers of 10 to figure out how much of each ingredient she needs.*)
- What are some other expenses that Leanna may need to consider when she sees how much profit she makes? (*Some things Leanna needs to consider when she is figuring out her profit are the cost of a booth, tables she may need, equipment to make the lemonade, containers to store the lemonade, the cost of ice and coolers, and her time.*)

4. Emphasize the Main Idea.

We can use powers of 10 and decimals to solve real-world problems about money.

- Provide students with a grocery flyer listing common supermarket items. Have students imagine that they are preparing a meal of their choice that they will have to scale up using powers of 10. Have students price the cost of scaling up their fantasy meal, consider what they might charge for patrons to eat it, and calculate their profits.

Chapter 11: Paradox in a Box, Student Reader page 64

1. Prepare to read.

Chapter Summary: At first glance, paradoxes can be confusing and make no sense! However, as demonstrated in this chapter with the example of Zeno's paradox, using logic to think deeply about a problem, especially a math problem, can help us figure out new and interesting ideas in math.

Math Connection: A paradox can be used to explain fractions, measurement, and division.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Paradox in a Box." Explain to students that they are going to read about how math can sometimes be thought of as a riddle. Remind them to pay special attention to what their first thoughts are and how these thoughts change as they read. Ask them to make sense of phrases like "Less is more" and "The more you know, the more you don't know."

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- On page 64: Do the paradoxes seem true or false? What does this tell you about paradoxes? (*When we first see them, they seem wrong. Paradoxes are like puzzles.*)
- Some other examples of Greek dichotomies are mind and body, hero and villain, and order and chaos. Why are these good examples? Can you think of any others? (*They show that there are two different, opposite groups. Love and hate and war and peace are other examples.*)
- Write or say the market paradox in your own words. How does this paradox use logic? (*Sample answers: You keep getting closer to the end, but there is no real end. A finite trip is also infinite. This used logic because he used measurements and fractions to describe the trip.*)
- On page 66: How is this image related to the paradox? (*It shows that each section of the trip will be divided in half.*)
- On page 69: Why is the image shown here a paradox? (*While it seems that the area should get smaller because you are making smaller squares, you are just dividing the area into more pieces. You are not changing the overall area or space occupied by the original shape.*)

4. Emphasize the Main Idea.

Math can be used to explain the contradictions in a paradox.

- Have students conduct research and choose a paradox to share with others. What is the dichotomy? How can you use logic to understand the paradox?

Chapter 12: Fed Up!, Student Reader page 70

1. Prepare to read.

Chapter Summary: In this interview, a chef helps a listener scale down her recipe for Every Bean Salad. To do so, you must determine how much to scale down a recipe and use division to determine the new amounts of ingredients, some of which are in fractions. Sometimes, the new measurements need to be converted into simpler fractions. Visualizing amounts is a helpful tool in the kitchen as well!

Math Connection: Scaling recipes uses the math skills of multiplication and division of fractions and converting measurements.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Fed Up!" Explain to students that they are going to read an interview with a chef who is sharing tips and tricks. A listener would like to know how to scale down a favorite recipe. Ask students to look out for all the times when math is being used.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- On page 71: Why is this recipe a bit tricky to scale up or down? (*Sample answers: This recipe contains fractions. You must know how many people you want to make the recipe for to figure out how to make less or more.*)
- Why do you have to divide *all* of the ingredients and not just some of the more or least tasty ones? (*If you don't adjust each ingredient, the recipe will taste different.*)
- Describe why kitchen conversions are a helpful thing for cooks to understand. (*Sample answer: In case you don't have the correct measuring cup, you can still figure out how to measure correctly using another tool.*)
- On page 74: What types of math thinking is Marcie using when describing how to round the vinegar? (*Marcie is using estimating, fractions, conversions, comparisons, measurement, and multiplication/division.*)

4. Emphasize the Main Idea.

Recipes can be scaled down by dividing or scaled up by multiplying the quantities of each ingredient.

- Have students find a recipe and write steps to scale the recipe up or down. Note that they do not have to do the conversions but should instead direct readers when the different types of math are to be used.

Chapter 13: The Community Garden Greenhouse, Student Reader page 76

1. Prepare to read.

Chapter Summary: In this chapter, Tamara is helping her community make plans for a greenhouse to add to the community garden. A greenhouse will extend the growing season. Once the committee decides how big the greenhouse will be, Tamara uses math to decide how many planters they need in the greenhouse and how they should be placed.

Math Connection: We use math to decide the best use of space within an area.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "The Community Garden Greenhouse." Explain to students that the chapter is about a new greenhouse that a town is adding to its community garden. Tamara is on the committee for the new greenhouse. Her job is to determine the best planters to use in the greenhouse and how they should be spaced. Ask students to look for ways that Tamara uses math.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Why does the committee want a greenhouse for the community garden? (*A greenhouse will extend the growing season.*)
- How does Tamara decide which size planters to use and where to place them? (*She uses the length and width of the planters to draw a plan. She knows the size of the greenhouse, and she must place the planters so that the gardeners can work around them.*)
- Why is temperature an important aspect of the greenhouse? (*The greenhouse is designed to use the sun to heat the greenhouse. Warmer temperatures help plants grow. The greenhouse can get too hot, so there must be a way to vent it to let the heat out.*)

4. Emphasize the Main Idea.

We use math to design a space and decide how to best arrange objects inside it.

- Have students make a plan for a bedroom. Ask students to decide what furniture they would like in the bedroom and use measurements to place the furniture in the room.

Chapter 14: Ahoy, Matey!, Student Reader page 82

1. Prepare to read.

Chapter Summary: This chapter uses a passage from *Treasure Island* by Robert Louis Stevenson to introduce currencies used in the past. Throughout history, there have been many different currency systems, many of which used the weight of gold and silver to determine value. This chapter describes the problems pirates might have had in figuring out how much their treasure was worth when they had coins from different currency systems.

Math Connection: Fractions can be used to describe and compare different kinds of coins.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Ahoy, Matey!" Explain to students that they are going to read about pirates. Pirates took coins from different countries. They needed to figure out the value of these coins. Ask students to pay special attention to how the pirates determined how much the coins were worth. What types of math did the pirates use to calculate the value of their treasure?

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What problems did pirates face when trying to determine how much treasure they had? How did they use math to solve this problem? (*Different countries had different coins, which had different values. The pirates had to count and organize their coins by country and type. They had to add to find the number of coins. They had to weigh the coins to determine how much they were worth.*)
- Why did knowing that certain coins were the same value as others make trade easier? (*It was easier to determine how much each coin was worth. Conversions were easier.*)
- How can you use fractions to describe the difference in coins? (*The different coins are broken down into different parts of a whole. For example, a shilling is* $\frac{1}{20}$ *of a pound.*)˝
- Have students use information from the chapter to make a diagram that compares the value of the different coins to each other. Ask them to describe how math helped them.

4. Emphasize the Main Idea.

The value of old coins was based on the weight of gold and silver, and they could be cut into fractions if less money was needed.

- Have students research different types of currency systems and present their findings to their classmates. How is the value of the currency determined? How can fractions be used to describe the differences among the different currencies?

Chapter 15: Mars Measurement Mix-Up, Student Reader page 88

1. Prepare to read.

Chapter Summary: During the 1990s, NASA commissioned Lockheed Martin Astronautics and the Jet Propulsion Laboratory (JPL) to develop the Mars Climate Orbiter and the Mars Polar Lander. After much hard work, they launched the spacecrafts, but soon problems ensued. The teams used math throughout the project, and they realized that each team had used different units of measurement!

Math Connection: It is important to use the same system of measurement when working on a project.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Mars Measurement Mix-Up." Explain to students that they are going to read about how scientists developed spacecrafts to travel to Mars. NASA's goal was to study the climate of Mars. Remind students to pay special attention to how the scientists used math.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What ways did scientists use math on this mission? (*Accept supported answers. Scientists used math to design and build the spacecrafts. They used math to determine distance, weight, and the amount of fuel they would need for the trip. They planned to use math to make observations about Mars.*)
- On page 91: How did they determine when the spacecraft would be launched? (*They had to measure the distance between planets at different times and determine when they were closest to each other.*)
- Why is it a problem that different teams used different units of measurement? (*Different units of measurement were not the same, so the calculations and measurements were wrong.*)
- How do you think the problem of teams using different units of measurements could be prevented? (*Accept reasonable answers.*)

4. Emphasize the Main Idea.

Being accurate when you measure and share data is critical for the success of projects.

- Watch the NASA video *"Becoming Astronauts: Are You Next?"* Ask students to consider and discuss the many different examples of both astronauts and engineers communicating and different things they might measure and ways they might use math to support their mission.

Chapter 16: Ice Cores, Student Reader page 96

1. Prepare to read.

Chapter Summary: Scientists who study ice cores are looking for clues to Earth's past. They study the ice layers by looking for patterns that show signs of extreme weather and changes to Earth's atmosphere. These scientists take careful measurements using specialized tools to gather data. They have been able to show that carbon dioxide has increased since the beginning of the Industrial Revolution.

Math Connection: Scientists can measure layers in ice cores to learn about changes to Earth's atmosphere.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Ice Cores." Explain to students that they are going to read about ice cores that are collected from ice sheets in Antarctica, Greenland, and North America. These ice cores can tell scientists about changes in Earth's climate and atmosphere. Remind students to look for places where math skills are used in this chapter.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Why is knowing the process of ice sheet formation important to researchers? (*Knowing that the ice formed in layers over thousands of years helps them know that each layer tells different things about Earth's past.*)
- What could happen if scientists did not take accurate measurements of ice temperature or know how deep they want to drill? (*The tool they chose might be the wrong one and not work.*)
- What patterns have scientists identified in ice layers that help their understanding of Earth's history? (*They have seen that the oldest ice is at the bottom of the ice core and the youngest is at top. Thicker layers show more freezing. Thinner layers show warming.*)
- Describe how scientists concluded that there is more carbon dioxide in the atmosphere now than in the past. (*The scientists looked at ice core samples from before the Industrial Revolution up to the present day. They analyzed and compared the amounts of carbon dioxide in the ice layers and found that newer ice layers had more trapped carbon dioxide than earlier ones.*)
- Why does displaying the results in a graph make the data easier to understand than just reading the data in a paragraph? (*In a graph, you can compare the data more easily.*)

5. Emphasize the Main Idea.

Scientists measure and study the layers in ice cores to learn about Earth's climate history.

- Show students other examples of layers that scientists can study to learn about the past, for example, tree rings and soil layers. Encourage them to take measurements and hypothesize what the different sizes in layers tell us.

Chapter 17: Eratosthenes, the Polymath, Student Reader page 102

1. Prepare to read.

Chapter Summary: This chapter describes how Eratosthenes estimated Earth's circumference with remarkable accuracy using observations of shadows cast by the sun at two locations. He also used astronomical observations to determine the length of Earth's year, and he invented a way to identify prime numbers.

Math Connection: Eratosthenes used geometry and basic proportions to estimate Earth's circumference.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Eratosthenes, the Polymath." Explain to students that they are going to read about a famous polymath. A polymath is a person with a wide range of knowledge across many subjects. Eratosthenes was a polymath who was the first person to estimate the circumference of, or distance around, Earth. Remind students to pay special attention to how he calculated this measurement.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- Why was it important for Eratosthenes to know the distance around Earth? (*He was making a map of the world, and he wanted to know how far apart places should be on the map.*)
- What steps did Eratosthenes take to calculate Earth's circumference? (*First, he compared the shadow cast by the sun on a sundial at the same time of the day in two different places. He determined that the distance between the two places was 1/50 of Earth's circumference. Then he measured the distance between the two places and multiplied by 50.*)
- Why do you think Eratosthenes's estimate was not quite right? (*A stadion could be a slightly different length if the size of the steps of the different bematists are not the same.*)

4. Emphasize the Main Idea.

Eratosthenes was an ancient polymath who used math to determine Earth's circumference.

- Challenge students to determine and describe the distance between two locations in the school without a measuring tool. Ask them to describe their techniques and compare results.

Chapter 18: Maps and Screens, Student Reader page 108

1. Prepare to read.

Chapter Summary: This chapter illustrates how coordinates are used to define the precise location of a point. Cartesian coordinate systems are used in the planning of both large- and small-scale projects, such as cities and transit systems. Computer screens use the Cartesian coordinate system to determine the position of things such as icons, videos, and images.

Math Connection: Cartesian coordinate systems can be used to design and map out cities.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Maps and Screens." Explain to students that they are going to read about Cartesian coordinate systems. These systems are grid systems that are used to locate a point. Remind students to pay special attention to how the systems are laid out.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- On page 108: Why is watching a fly move around tiles an example of having a mathematical mind? (*Descartes watched the fly and used math to describe the location of the fly.*)
- How would you describe the location of the fly on the tiles using coordinates? (*Accept all answers, as this question is intended to access prior knowledge.*)

Model using coordinates to describe position as discussed in the text on page 109. Ask:

- What is geometry? How might using a coordinate system help solve geometry problems? (*Geometry is the study of shapes and how they fit together, including their lines, angles, and sizes. Using a coordinate system helps us more precisely describe shapes.*)
- Why do you think city planners opted to move to a grid system? (*It made locating and describing locations easier. It helped make decisions about transit easier, too.*)
- How do you think using a coordinate system helps computer programmers develop things like video games or home screens? (*Sample answer: It helps them remember where to place icons on different screens to make sure they are the same size and location.*)

4. Emphasize the Main Idea.

A Cartesian coordinate system can be used to find a specific point.

- Challenge students to develop a coordinate scavenger hunt. Have students write the coordinates for several different landmarks around the classroom or schoolyard. They can trade their scavenger hunts and see if others are able to locate and identify the landmarks.

Chapter 19: Plotting to Win, Student Reader page 114

1. Prepare to read.

Chapter Summary: Two friends learn to play a new video game. This game challenges them to construct shapes using a grid. In the game, they are transported onto the screen and become two-dimensional! To win, they must work together to construct shapes and reach different coordinates on the grid.

Math Connection: You can construct shapes using a coordinate system.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Plotting to Win." Explain to students that they are going to read about Jenna and Nico, who are gifted with a video game. As they begin to play, they are sucked into the game and onto a grid where they travel through the two-dimensional space. Remind students to pay special attention to the way Jenna and Nico use the coordinate system to travel through the game.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What does the phrase "a two-dimensional game for three-dimensional players" mean? (*It means that the game is two-dimensional. It is on a flat screen. On the screen, the characters have height and width. In real life, people are three-dimensional, which means we have height, width, and depth.*)

Analyze the grids on page 117. Point out the axes and the locations provided by the coordinates (6, 6) and (14, 8). Remind students that the first number indicates the location on the *x*-axis and that the second number indicates location on the *y*-axis.

- Why do Jenna and Nico need to know which axis each number in the coordinate pair is associated with? (*If they don't know that the first number of the coordinates indicates location on the* x*-axis and the second number indicates the location on the* y*-axis, they could incorrectly make the shapes and end up in the wrong location.*)
- On page 119: Can you think of any other way that Jenna and Nico could have beaten Level 3? (*Answers will vary.*)

4. Emphasize the Main Idea.

We can use points on a coordinate plane to produce two-dimensional shapes.

- Have students construct a simple drawing of a two-dimensional shape on graph paper. Ask them to describe their picture to a partner (without showing it). Have the partner draw the picture based on the description. Repeat, but describe using coordinate pairs. Discuss the pros and cons of each method.

Chapter 20: M. C. Escher, Student Reader page 120

1. Prepare to read.

Chapter Summary: M. C. Escher is known for using math concepts in his artwork. After viewing tessellations in the Alhambra, Escher began incorporating and using mathematical principles to design his own complex tessellations. Later, he explored how to make a visual paradox with tessellations that change and how, even on flat surfaces, you can demonstrate changes in perspective.

Math Connection: Patterns, regular and irregular shapes, rotation, and symmetry can be used to create art.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "M. C. Escher." Explain to students that they are going to read about the artwork of this artist. Remind them to pay special attention to the different ways math is reflected in Escher's artwork. How did he use the plane, or the flat surfaces he worked on, to showcase different math concepts?

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What math concepts might Escher have seen as he traveled around? (*Accept all answers. He saw patterns and shapes.*)
- On page 122: What patterns do you see? (*Students should describe the repeating shapes, colors, lines, or angles.*)

Project Escher's *Regular Division of the Plane with Birds* for students to examine.

- What mathematical principles do you think Escher used in this work? (*He used simple counting of features, repeated patterns, irregular shapes, rotation, and division to divide the space into equal numbers of birds*).
- How are patterns that repeat and change a paradox? (*Patterns should always stay the same and never change.*)
- On page 123: How is the art in the museum entrance both a paradox and tessellation? (*It uses repeating shapes, but these shapes change over the space.*)

4. Emphasize the Main Idea.

M. C. Escher used tessellations and other mathematical principles to create original works of art.

- Challenge students to create their own tessellations using simple polygons. Encourage them to explore rotating the shapes to produce a paradox like Escher. Ask them to list the different math concepts that they use.

Chapter 21: The Oldest Computer, Student Reader page 126

1. Prepare to read.

Chapter Summary: When it was first discovered on a shipwreck from 60 BCE, scientists couldn't figure out what the Antikythera mechanism was used for. After many years, the development of different technologies helped scientists determine that it was used to calculate the movement of the sun, moon, and planets. This chapter highlights how different fields can come together to help answer questions about the past.

Math Connection: People have used math to calculate the movements of objects in space for a long time.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "The Oldest Computer." Explain to students that they are going to read about a machine that helped calculate the movements of objects in space. Remind them to pay special attention to what problems were solved by using the machines mentioned in this chapter.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- How is the Antikythera mechanism similar to and different from the computing devices we use today? (*Sample answers: All of these machines have some internal mechanism and use characters. They are made of different materials. None are electronic.*)
- What clues do you think Price used to develop his idea that the Antikythera mechanism was a computer used for astronomy? (*Answers will vary. Emphasize that gears were present. Maybe he thought that since gears are spaced out regularly, they were meant to help time or keep track of the movement of stars.*)
- Why do you think Price thought the machine showed the movement of the moon? (*Sample answer: Maybe he thought this because there were 30 gears and this is about the number of days for the moon to go through a full cycle of phases.*)
- Why can the Antikythera mechanism be considered a calculator? (*It uses patterns and other math calculations to track calendars and cycles and make predictions.*
- What are some different examples of technology used throughout this chapter? (*Answers will vary. Emphasize that this is an example of technology being developed and used to study other technology.*)

4. Emphasize the Main Idea.

The Antikythera mechanism used math and science to calculate the movements of the sun, moon, and planets.

- Assign students to research a different moment in the history of computers. Have them share their findings and discuss how these devices helped solve problems and used math to do so.

Chapter 22: Little Math Dramas, Student Reader page 132

1. Prepare to read.

Chapter Summary: Students read three scenarios in which kids are presented with problem-solving challenges. IN the first story, Uncle Tony asks his niece and nephews to help him decide on a garden size, within certain parameters. The second story challenges students to use their knowledge of multiplication and division and logic to win a game. In the third story, math is used to figure out how many posts are needed to build a fence.

Math Connection: We use math skills in everyday activities.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "Little Math Dramas." Explain to students that they are going to read three different stories in which math is used to solve everyday problems. Remind them to pay special attention to the different types of math used to solve each problem. In each story, what information do the kids gather to help them solve the problems?

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world:

- What problem is Uncle Tony asking his niece and nephews to help him solve? (*He wants the biggest area of garden possible, but the perimeter can't be more than 65 feet, and it must fit within a space that is 20 feet by 15 feet.*)
- Why does Uncle Tony choose Giovanni's suggestion and not Marco's? (*Uncle Tony has 65 feet of fencing, and Giovanni's plan uses 64 feet of fencing. Marco's uses only 60 feet.*)
- On page 134: Why is paying for clues a good idea? Will the clues be helpful if Malik and Phoebe don't understand the math used in the clues? (*It is a good idea because they keep eliminating possibilities. The clues won't be helpful if Malik and Phoebe don't understand the math.*)
- On page 137: Why do the girls draw a picture of the fence? (*The picture helps them visualize the fence and the posts that they will need.*) Was the picture helpful? (*Sample answer: I think so because it helped them figure out how to use math to solve the problem.*)
- Grandpa thought he was tricking the girls. What was the tricky part of the problem? (*They had to remember to count the first post and not just divide 350 by 5.*)

4. Emphasize the Main Idea.

Math ideas and operations can be used to figure out problems and puzzles.

- Invite students to develop their own math puzzles similar to the ones presented in the chapter. Ask them to share the puzzles with the class or a classmate.

Chapter 23: The Mathematics of Music, Student Reader page 138

1. Prepare to read.

Chapter Summary: Musical notation helps us know how songs are supposed to sound. Before it existed, written instructions only showed the melody, or how the song would go up and down. Because of musical notation, we can tell the pitch of a note. The tempo of a song describes how fast the notes are played. A time signature uses fractions to identify how many beats are in each measure and which type of note gets one beat.

Math Connection: Music uses fractions, patterns, and counting.

Choose a Reading Routine: Based on your students' reading levels and other factors, decide how this chapter will be read.

2. Focus student attention.

Before You Read: Point out the chapter title: "The Mathematics of Music." Explain to students that they are going to read about math in music. Remind them to pay special attention to how math is used to describe the music. As they read, encourage them to clap or count aloud to hear the time signature in action.

3. Read together.

Use questions such as these to facilitate student engagement as well as to help students make connections to the use of math in the world. As you read through the chapter, have students help you make a list that shows the different elements musical notation indicates, e.g., pitch, time the note should be held, and so on. Emphasize how each uses a math concept, such as intervals or beats.

- On page 130: How does a half note compare to a quarter note? (*The half note is held twice as long as the quarter note.*)
- How can you use math to describe the difference between types of notes? (*You can use fractions such as* $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, *and* $\frac{1}{16}$ *or use multiples like 2 and 4.*
- On page 140: How does a song change if you change the tempo? (*The song is played faster or slower depending on the tempo.*)

4. Emphasize the Main Idea.

Musical notation uses fractions to create a relationship between the lengths of each note.

- Play music for students, and have them count out the beat as the music plays. Help them identify the measures in the song and places where they hear quarter notes, half notes, and whole notes.

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