



USING CHILDREN'S LITERATURE TO BUILD MATHEMATICS LITERACY

Lesson plans organized by grade band

Abstract

In this resource, several lessons are provided for classroom teaching based on children's literature and equitable practices. These lessons can be implemented at a variety of grade levels and suggestions for scaling lesson up or down to adjacent grade levels are given. Each lesson includes a reference to a book to use for the lesson, an overview of how to implement the lesson, and virtual copies of supplemental material to use throughout the lesson.

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Introduction

Literature and mathematics are two topics that are rarely related in the elementary school setting. Often, they are viewed as completely disjointed from each other. However, there are numerous efficacious methods to merge the topics into an enriching and dynamic lesson. One common approach is to have the literature introduce a context for a mathematics problem. Often mathematics is seen as without context or is simply reduced to procedures for getting numerical answers. Embedding mathematics in the context of a story accentuates the notion that it is more than just mindlessly repeating an algorithm. This can also be connected to literature aspects by having students foreshadow what is to come later in the book by applying mathematical reasoning skills. Books were chosen from *Picture Books with a Mathematical Focus: Annotated Bibliography* by Dr. Trini Lewis (2021) so that they would be age-appropriate for each of the grade bands.

PK-1 (Ages 5-7)

Round is a Tortilla was recommended for this age group by Lewis (2021). This book is strongly correlated to mathematical content for this age group such as the geometry content standards for kindergarten and first grade in the Common Core State Standards. Language mechanics are structured at age-appropriate levels with shorter sentences and less complex wording. Words introduced are concretely related to the images provided as well. These factors qualify this book for this range of student levels.

Round is a Tortilla: A Book of Shapes Introduction

Round is a Tortilla was chosen for this age group because the mathematical content (e.g., shapes) is appropriate for this grade level. For younger students, emphasis can be placed more on simply identifying the shapes (standard K.G). For older students, more focus can be placed on identifying which characteristics define those shapes (standard 1.G). When priming, or introducing, the book, this is a terrific opportunity to introduce mathematical vocabulary and/or concepts. Below provides some examples of terms you may introduce. Some words may be new to students, especially if they are not familiar with the Spanish language. Through these text rich conversations students will be exposed to different vocabulary, experiences, and perspectives while also developing mathematical vocabulary and reasoning.

Round is a Tortilla Lesson Plan

Grade Level	PK-1
Content Area	Early Math
National Standard	Common Core K.G, 1.G
Clearly state the objective or purpose of the lesson in a student-friendly language* below.	

Students will be able to identify geometric shapes including circles, ovals, triangles, rectangles, and squares.

Students will be able to describe some characteristics of distinct types of shapes such as number of sides or if there are curved sides.

Below explain how the concept, skill, or strategy to the class is introduced.

Tell the students that you will be reading/playing a story that has some words that might be new for them. Explain that people sometimes use different words to describe things. Some of the words in the story will be Spanish and most will be English. If appropriate, ask if any students in the classroom know any Spanish words and allow them time to share.

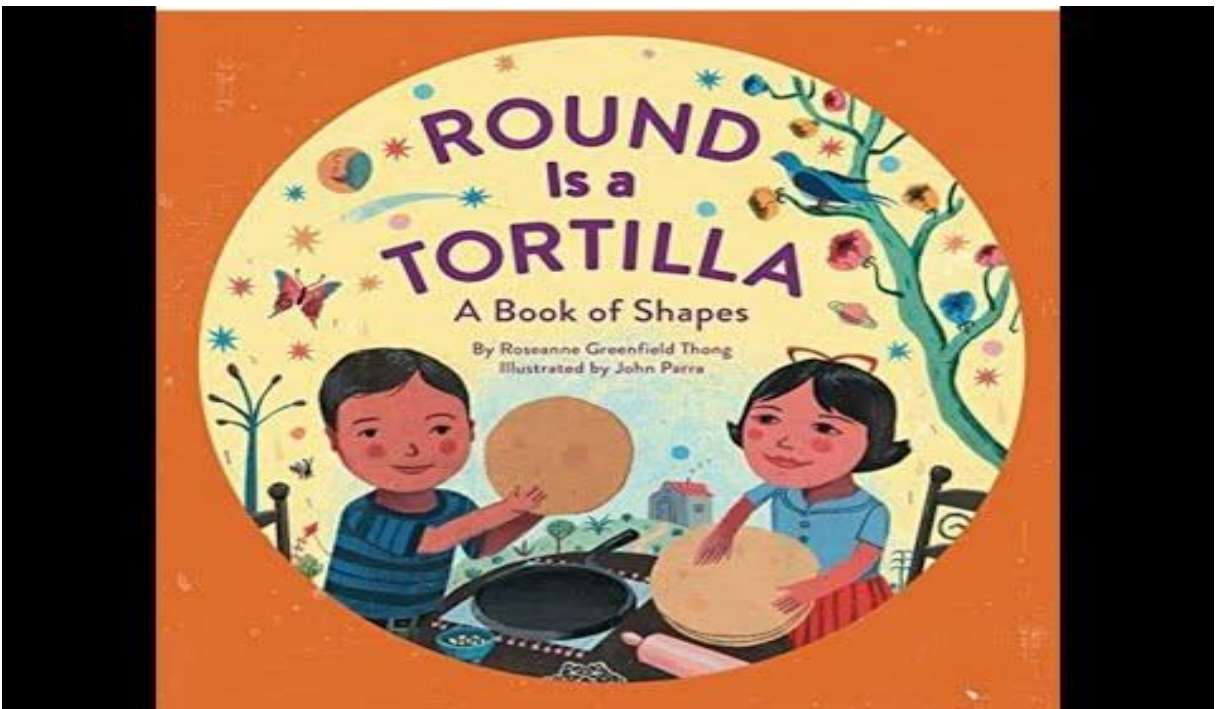
Preview the key lesson terms below:

Spanish Terms with English Translation	Math Terms
<ul style="list-style-type: none">• Sombreros / Hats• Campanas / Bells• Abuela / Grandmother• Ventana / Window• Zócalo / Public Square• Paletas / Popsicle• Metates / A Stone for Grinding Grain• Casa / House• Masa / Dough used to make Tortillas and Tamales• Guacamole / A Dip made from Avocado• Sandías / Watermelon• Huevos / Eggs	<ul style="list-style-type: none">• Round• Square• Rectangle• Triangle

Below explain how the concept, skill, or strategy is demonstrated to the class.

Once you have previewed the key lesson terms below, play the video or read the book and stop at the pages that correspond to the given time stamp and discuss the questions with the students.

Round is a Tortilla [Round Is a Tortilla](#)



Use the chart below to stop and explore the terms using the following questions at each timestamp.

Timestamp	Questions
Pause at 1:04	<ul style="list-style-type: none"> • What do you think a sombrero is? • What do you think campanas are? • Who do you think abuela is? • Why do you think these are round? • What are some round things that you can name?
Pause 1:26	<ul style="list-style-type: none"> • What do you think a Ventana is? • Are clocks always square? • What do you think a zócalo is? • Why do you think these things are squares? • What are some square things that you can name?
Pause at 1:48	<ul style="list-style-type: none"> • What do you think paletas are? • What do you think metates are? • What do you think a casa is? • What do you think masa is? • Why do you think these things are rectangles? • What are some rectangles that you can name?
Pause at 2:14	<ul style="list-style-type: none"> • What is guacamole? • What do you think sandías are? • Why do you think these things are triangles?

	<ul style="list-style-type: none"> • What are some triangle things that you can name?
Pause at 2:27	<ul style="list-style-type: none"> • What do you think huevos are? • What does galore mean? • Why do you think these are called ovals? • What are some oval things that you can name?
End of Video	<ul style="list-style-type: none"> • What other shapes can you describe? • What makes these shapes different from the shapes in the book?

Below share the opportunities for the class to practice the concept, skill, or strategy below.

After reading/playing the story and discussing it, break students up into small groups. Give students each a shape scavenger hunt card and allow them to explore an area to find different shapes they see and draw them in each section. Bring students back and have them share their drawings. Discuss with them why they label certain shapes the way they did. Ask if they know more than one name for any of the shapes they drew. Have students fill in the blanks for how they can determine what shape it is.

Circle	Square
Rectangle	Triangle
Oval	Other Shapes

- For developing students, focus more on identifying the shapes and having visual recognition. The focus of the assessment would be more if they are correctly sorting the shapes.
- For more advanced students, encourage students to focus more on being exact about what is different between these different shapes. The focus of the assessment would be more on how they justify sorting the shapes. For example, having students count the number of sides or talk about how long the shape is.

Explain how students’ cultural/linguistic background and social emotional needs are considered throughout the lesson below.

This lesson highlights Latino/a culture by using words in Spanish that describe things from that culture. Students who are not familiar with these terms can expand their worldview by learning about cultures other than their own. For example, it could be expanded by looking deeper into some of the cultural aspects relating to some of the terms (such as bringing in the item or showing how it is used in culture). Students who are from this culture can benefit by making connections that are not often explicitly made in lessons as well as by taking a leadership role in helping other classmates better understand (if they desire to do so).

Grades 2-3 (Ages 7-9)

Students in this age group are laying their foundations for understanding arithmetic operations as well as developing strategies for solving problems. The books selected for these lessons were chosen because they were easily related to these critical elements of mathematics instruction as well as used age-appropriate vocabulary for students in these grades.

One Grain of Rice: A Mathematical Folktale Introduction

Lewis (2021) recommended this book for ages 4-8. Much of the vocabulary used in the story could be understood by younger students. The story is set in India and some terms specific to Indian culture may need to be explained depending on the demographics of the classroom. This activity is recommended for grades 2-3 since it is starting to build ideas that will lead to multiplication by analyzing patterns. Also, students in lower grades, while able to understand the story, would have more difficulty understanding and thereby comparing large values. This story introduces pattern concepts by showing how quickly doubling an amount can grow. This story is set in India. The mathematics used includes patterns, multiplication (or addition of the same value), comparing large numbers, and algebraic reasoning.

One Grain of Rice Lesson Plan

Grade Level	2-3
Content Area	Early Math

National Standard	<p>CC 2.0a: Work with equal groups of objects to gain foundations for multiplication.</p> <p>CC 2.NBT Understand place value.</p> <p>CC 3.0a: Represent and solve problems involving multiplication and division. Solve problems involving the four operations and identify and explain patterns in arithmetic.</p> <p>CC 3.NBT: Use place value understanding and properties of operations to perform multi-digit arithmetic.</p>
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Clearly state the objective or purpose of the lesson in a student-friendly language* below.

Students will be able to double a value.
 Students will be able to compare the size of two different values.
 Students will be able to make predictions based on patterns.

Below explain how the concept, skill, or strategy to the class is introduced.

Tell the students that you will be reading/playing a story that has some words that might be new for them. Explain that people sometimes use different words to describe things. Some of the words in the story will be Hindi and most will be English. If appropriate, ask if any students in the classroom know any Hindi words and allow them time to share.

Preview the key lesson terms below:

Hindi Terms with English Translation	Math Terms
<ul style="list-style-type: none"> • Raja / King 	<ul style="list-style-type: none"> • Double • Just

Below explain how the concept, skill, or strategy is demonstrated to the class.

Once you have previewed the key lesson terms below, play the video or read the book and stop at the pages that correspond to the given time stamp and discuss the questions with the students.

Play [One Grain of Rice](#)



Use the chart below to stop and explore the terms using the following questions at each timestamp.

Timestamp	Questions
Pause at 2:40	<ul style="list-style-type: none"> • What is a raja? • Was the raja fair and just as a raja should be? Why or why not? • Why was rice important? Is there a food that you usually eat every day or every week?
Pause at 6:04	<ul style="list-style-type: none"> • How can we double an amount? • Do you think Rani's plan was clever or do you think she should have kept the original amount of rice instead? Why? • How much rice do you think Rani will receive by the last day? How could we figure this out?

Pause at 9:19	<ul style="list-style-type: none"> • Did Rani receive the amount of rice you expected? Why or why not? • Do you think Rani’s plan was clever or do you think she should have kept the original amount of rice instead? Why?
End of Video	<ul style="list-style-type: none"> • Did the Raja learn to be fair and just? Why do you think so?

Below share the opportunities for the class to practice the concept, skill, or strategy below.

During the pause at 6:04, students are asked to make a prediction as to how much rice Rani will receive. When asking students to produce a way to predict the amount of rice, you can provide students with a table or even a partially filled table to help organize information if they are having difficulty producing a plan. More advanced students can be encouraged to develop their own table to determine the number of grains of rice. Some students may struggle with the concept of multiplying by two and can be encouraged to add the number to itself. Students who are more comfortable with multiplying larger numbers by two can use that approach instead. Below is a table provided at the end of the book/video that tells how much Rani receives each day.

Day 1 1 grain of rice	Day 2 2 grains of rice	Day 3 4 grains of rice	Day 4 8 grains of rice	Day 5 16 grains of rice
Day 6 32 grains of rice	Day 7 64 grains of rice	Day 8 128 grains of rice	Day 9 256 grains of rice	Day 10 512 grains of rice
Day 11 1,024 grains of rice	Day 12 2,048 grains of rice	Day 13 4,096 grains of rice	Day 14 8,192 grains of rice	Day 15 16,384 grains of rice
Day 16 32,768 grains of rice	Day 17 65,536 grains of rice	Day 18 131,072 grains of rice	Day 19 262,144 grains of rice	Day 20 524,288 grains of rice
Day 21 1,048,576 grains of rice	Day 22 2,097,152 grains of rice	Day 23 4,194,304 grains of rice	Day 24 8,388,608 grains of rice	Day 25 16,777,216 grains of rice
Day 26 33,554,432 grains of rice	Day 27 67,108,864 grains of rice	Day 28 134,217,728 grains of rice	Day 29 268,435,456 grains of rice	Day 30 536,870,912 grains of rice

Students may need explanation that the total amount of rice she had is even larger than 536,870,912 since it would be the sum of all 30 days.

This can also be expanded to ideas that are more relevant to students’ lives. For example, students in this age group are developing their sense of money. You could have students have the option of receiving \$100 or receiving \$1 on one day and twice as much for each day after for 10 days (this would be 1 + 2 + 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512 or \$1023. This could be started before reading the book to help students be prepared for the larger problem of doubling over 30 days or afterwards for

independent practice. This could also be expanded for older students by asking them to determine at what point the doubling option becomes better (in the example above, it would be on day 7).

Explain how students’ cultural/linguistic background and social emotional needs are considered throughout the lesson below.

The story connects to the culture of India which is not a frequent connection made in curriculum in the United States. Ideas around who a raja is and what they do may not be immediately clear to students and will need to be discussed. Also, the story is focused on ideas of justice. Students in this age group are very aware of both just and unjust systems. While discussing the story, there are several points that we ask if the raja is fair and just. This can easily be related to concepts that are more relevant to students as well.

Seven Golden Rings Introduction

Lewis (2021) recommends this book for ages 6-9 which aligns well with grades 2 and 3. This book is set in India as well and connects with concepts of poverty and justice. This book would help students develop problem-solving skills using simple arithmetic as related to the Common Core State Standards mathematical practice 1: “Make sense of problems and persevere in solving them.”

Seven Golden Rings Lesson Plan

Grade Level	2-3
Content Area	Early Math
National Standard	CC 2.MD: Relate addition and subtraction to length. CC 3.0a: Solve problems involving the four operations, and identify and explain patterns in arithmetic.

Clearly state the objective or purpose of the lesson in a student-friendly language* below.

Students will be able to relate the lengths of values (rings) to arithmetic operations (add/subtract links).

Students will be able to apply problem-solving strategies to find an appropriate solution when an obvious approach is not apparent.

Below explain how the concept, skill, or strategy to the class is introduced.

Tell the students that you will be reading/playing a story that has some words that might be new for them. Explain that people sometimes use different words to describe things. Some of the words in the story will be Hindi and most will be English. If appropriate, ask if any students in the classroom know any Hindi words and allow them time to share.

Discuss with students some of the terms that they may not be familiar with.

- What is a raja?
- What are rupees?
- What is a sari?

Below explain how the concept, skill, or strategy is demonstrated to the class.

Once you have previewed the key lesson terms below, play the video or read the book and stop at the pages that correspond to the given time stamp and discuss the questions with the students.

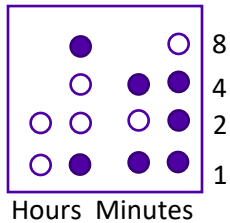
Seven Golden Rings [Seven Golden Rings: A Tale of Music and Math by Rajani LaRocca - Read Aloud](#)

Use the chart below to stop and explore the terms using the following questions at each timestamp.

Timestamp	Questions
Pause at 4:22	<p>Have students break into groups and consider the following questions. Either provide students with at least two lengths of paper made with seven rings each or provide them with the materials to make their own prior to asking the questions below.</p> <ul style="list-style-type: none">• Which link should Bhagat have broken?• Will breaking that link allow Bhagat to pay for the inn without overpaying for up to 7 nights? How?• Use the link your group made to demonstrate how it could be used for each night and draw it on your paper.
Pause at 4:39	<ul style="list-style-type: none">• Which link did Bhagat have broken?• Was it the one that you expected?• Break that link on your second chain. How can you group these links so that each night could be paid for without overpaying? Draw pictures to illustrate.
End of Video	<ul style="list-style-type: none">• What position did Bhagat receive at the palace?• What might a position like that be today?

Below share the opportunities for the class to practice the concept, skill, or strategy below.

Students are encouraged to practice the concept of problem solving by first making a prediction of what Bhagat should do prior to it being revealed in the story. Students can then expand on this idea by considering larger numbers. The problem could be expanded to asking how we could combine lengths of 1, 2, 4, and 8 to make the numbers 1-15. Students could then hypothesize that using links 1, 2, 4, 8, and 16 could be used to make number 1-31 and so on. A wonderful way to make this practical for students is to use a Powers of two clock (example below).



In this example the “ones” column in the minutes is $1 + 2 + 4$ or 7. The “tens” column in the minutes is $1 + 4$ or 5. So this represents 57 minutes. The “ones” column for hours is $1 + 8$ or 9. The “tens” column for hours is 0 so the time is 9:57. (note there are options for 1 and 2 in the tens place for hours so that it can be written in 24-hour notation).

Explain how students’ cultural/linguistic background and social emotional needs are considered throughout the lesson below.

The story connects to the culture of India which is not a frequent connection made in curriculum in the United States. Ideas around who a raja is and what they do may not be immediately clear to students and will need to be discussed. There is a distinct difference between the economic circumstances of Bhagat and the raja. This can be a launching point for a discussion with students about economic differences in populations.

Grades 4-5 (Ages 9-11)

In grades 4-5 students are more able to process more complex language. Words like architecture and creating plans for something are more accessible to older elementary students.

The World is Not a Rectangle Introduction

Lewis (2021) recommends this book for ages 7-11, which aligns well with this grade level. Some of the concepts in this book are more complex than previous books, both socially and mathematically. The idea of creating even a simple architectural plan has multiple steps and requires mathematical reasoning and precision.

The World is Not a Rectangle Lesson Plan

Grade Level	4-5
Content Area	Math
National Standard	CC 4.MD: Solve problems involving measurement and conversion of

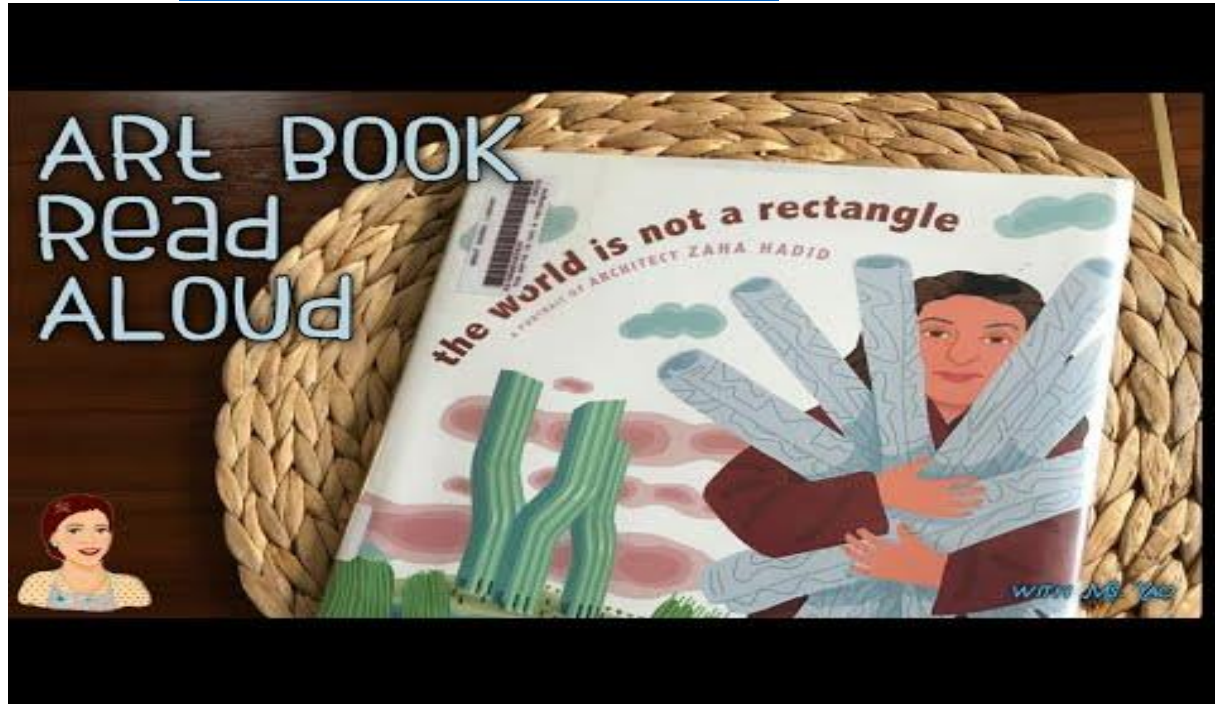
measurements from a larger unit to a smaller unit.
CC 5.MD: Convert like measurement units within a given measurement system.

Clearly state the objective or purpose of the lesson in a student-friendly language* below.

Students will be able to create a design with reasonable measurements.

Below explain how the concept, skill, or strategy to the class is introduced.

Play the video [Art Book Read Aloud: The World is Not a Rectangle](#)



Below explain how the concept, skill, or strategy is demonstrated to the class.

Discuss the questions below with the class. It would be best to have students think about these questions before the discussion and record some thoughts. Students can also be paired into small groups to discuss responses before the whole class discussion.

Where are some places that Zaha draws inspiration from for her designs? What are some places you like that could inspire a design?

- What is an architect? What do you think is involved in being an architect?
- Why won't the city committee build Zaha's designs even after winning a competition? Did that stop Zaha from designing? What concerns do you have about people listening to your ideas? How can you learn from Zaha about how to respond?

Below share the opportunities for the class to practice the concept, skill, or strategy below.

Have students pick one of Zaha's designs and research some information about it. Have them write about or discuss what was the initial motivation, what made the design different or challenging, did anyone not want to have the design built? Why or why not?

Next, have students create their own design. Have them provide measurements for the design as well as illustrations. Have the students write about their inspiration for the design as well as describe how they decided what the measurements should be and how much/what kind of materials would be needed. If time allows, have students meet in a small group and decide on a design they would like to build and work through the process of building the design. Have students reflect afterwards if the design worked as they had expected or if there were unanticipated challenges.

Explain how students' cultural/linguistic background and social emotional needs are considered throughout the lesson below.

In the story, students hear about how Zaha's plans were initially rejected. It is hinted that they were not accepted because of her race and gender. One of the discussion questions asks students to elaborate on this. Students may be able to connect with having their ideas rejected based on these prejudices rather than on the merits of their ideas themselves. In the book, Zaha models perseverance in response to this injustice. This can lead to a rich discussion regarding how students might persevere if they feel their ideas or others' ideas have been rejected due to prejudice.

References

- Demi (1997). *One grain of rice: A Mathematical Folktale*. Scholastic.
- [Imagine5008]. (2020, May 25). *One Grain of Rice* [Video]. YouTube. https://youtu.be/_CdAXYU_LYs
- Larocca, R., Sreenivasan, A. (2020). *Seven golden rings*. Lee & Low Books.
- Lewis, T. (2021). *Picture Books with a Mathematical Focus*. Branch Alliance for Educator Diversity. <https://resources.educatordiversity.org/resources/picture-books-with-a-mathematical-focus-an-annotated-bibliography>.
- [Ms. Meyer Art Teacher]. (2021, January 24). *Art Book Read Aloud: The World is Not a Rectangle* [Video]. YouTube. <https://youtu.be/B-WIMMl0g4k>.
- [Sam Prantl]. (2022, August 22). *Seven Golden Rings: A Tale of Music and Math by Rajani LaRocca - Read Aloud* [Video]. YouTube. https://youtu.be/H_rZAixdUFc.
- [Sankofa Read Aloud]. (2021, September 20). *Round Is a Tortilla* [Video]. YouTube. <https://youtu.be/FSkw3h4AjNI>.
- Thong, R. G., & Parra, J. (2015). *Round is a tortilla: A book of shapes*. Chronical Books.
- Winter, J. (2017). *The world is not a rectangle*. Beach Lane Books.