



MATH

Basket Math: Calculation and Design

ESSENTIAL UNDERSTANDINGS

- Since time immemorial
- Language
- Identity
- Lifeways

LEARNING OUTCOMES

- Students will be able to read and answer questions about Confederated Tribes of Siletz Indians basketry styles and techniques.
- Students will be able to create investigative questions and consider data from a bar graph.
- Students will be able to use reciprocal teaching practices to solve in-context problems about weaving.
- Students will be able to convert measurements within same systems.

ESSENTIAL QUESTION

Why is it important to appreciate the skills, knowledge, and technical abilities that have been passed down from generation to generation by Siletz weavers?

(Continued on next page)

Overview

This lesson provides students with an opportunity to learn about the use and design of basket caps among the Confederated Tribes of Siletz Indians. This is an integrated lesson that is designed to connect social science, English language arts, and math standards. The activities will introduce students to the history, design, and importance of basket caps while focusing on integrating this knowledge with investigative questions, utilizing a bar graph, and converting measurement units.

Note: This lesson should follow the grade 5 lesson “Siletz Today: Not a Costume.”

Background for teachers

The Confederated Tribes of Siletz Indians comprises dozens of bands and Tribes from across Western Oregon, Northern California, and Southwest Washington, each with its own unique cultural and linguistic background. One commonality among these diverse groups is the centrality of basketry. From utilitarian uses such as storage containers, floor mats, and baby baskets to the highly decorative caps used for ceremonies, baskets form a central part of the material culture of the peoples



LOGISTICS

- **Where does the activity take place?**
Classroom
- **How are the students organized?**
 - ☑ Whole class ☑ Teams: 2 – 4
 - ☑ Pairs ☑ Individually

TIME REQUIRED**Six to seven hours**

removed to the Coast (Siletz) Reservation. For many Siletz peoples, women were the sole masters of fine basketry, such as cooking baskets and caps, while men made larger utilitarian basketry items, such as cone-shaped traps to catch salmon. Today, both Siletz women and men make a great effort to ensure the Tribe's basketry traditions continue into future generations.

Weaving baskets demands year-round preparation and planning. Many materials used in basket construction are only available at certain times of the year and must be carefully processed and stored. In addition, creating beautiful baskets requires meticulous sorting of sticks and other materials by size and careful planning of designs and patterns to ensure symmetry and an even shape. Behind each beautiful Siletz basket are hours of counting, planning, sorting, and designing (hours of math!) before weavers even begin the process of weaving.

¹ Oregon is in the process of revising its social studies standards. This lesson is based on the revised 2018 standards for grade 5.

STANDARDS**Oregon social sciences standards¹**

5.14 - Analyze the distinct way of knowing and living amongst the different American Indian Tribes of North America prior to contact in the late 15th and 16th centuries, such as religion, language, and cultural practices and the subsequent impact of that contact. (*History*)

5.11 - Describe how physical, human, and political features influence events, movements, and adaptation to the environment.

Oregon English language arts standards

5.RL.1 - Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.

5.RL.4 - Determine the meaning of words and phrases as they are used in a text, including figurative language such as metaphors and similes.

2021 Oregon math standards

5.DR.B.2 - Analyze graphical representations and describe the distribution of the numerical data through line plots or categorical data through bar graphs. Interpret information presented to answer investigative questions.

5.GM.C.4 - Convert between different-sized standard measurement units within a given measurement system. Use these conversions in solving multi-step problems in authentic contexts.

5.NBT.B.5 - Fluently multiply multi-digit whole numbers using accurate, efficient, and flexible strategies and algorithms based on place value and properties of operations.

(Continued on next page)



The diversity of plants in the traditional homelands of the Siletz people led to a large variety of basketry traditions. This lesson will focus on the traditions of Dee-ni weavers whose families were forcibly removed from Dene (Athabaskan)-speaking villages in Southwest Oregon and Northwest California. Along with weavers from neighboring Tribes in Northern California, such as Yurok, Hupa, and Karuk, Dee-ni weavers are famous for the intricate and distinctive design of *xee-tr'at* (basket caps).

Additional resources

- Esquivido, V. (2007). Selections from “The social life of basket caps: Repatriation under the Native American Graves Protection and Repatriation Act, in hopes of cultural revitalization.” *Native Women’s Collective*. <https://www.nativewomenscollective.org/regaliastoriesbasketcaps.html>
- McNeel, J. (2018, September 12). Siletz basket maker keeps the art alive. *Indian Country Today*. <https://indiancountrytoday.com/archive/siletz-basketmaker-keeps-the-art-alive>
- Rathe, K. (2019, January 10). A hand-woven history: A cherished basket finds its way back to the Siletz tribe and inspires hope for a replacement. *Oregonian*. <https://www.oregonlive.com/environment/2010/09/basket-few-willing-to-mess-wit.html>

STANDARDS *(Continued)*

Social and emotional learning skills: CASEL competencies

- Relationship skills
- Social awareness
- Self-management
- Responsible decision making

MATERIALS

- Standard size copy paper and drawing materials.
- Access to computers and the internet for reviewing Siletz Dee-ni, online talking dictionary
- Sticky notes
- Dot stickers
- Student whiteboards and whiteboard marker or access to a game program, such as Kahoot!
- Student notebook paper
- Slide deck: “Basket Caps”
- Handouts from files
 - Visual Puzzle Pieces
 - Basket Cap Reading Sheet
 - Math Reciprocal Teaching Chart
 - Math Thinking Map
 - Design Template



- Smithsonian Folklife. (2013, June 25). Alfred “Bud” Lane III, Confederated Tribes of Siletz Indians. [Video]. <https://www.youtube.com/watch?v=weOas5yN6q0>
- Wilkinson, C. (2010). *The people are dancing again: The history of the Siletz Tribe of Western Oregon*. University of Washington Press.)

Key ideas

- Basketry is essential to the history and heritage of all the bands who make up the Confederated Tribes of Siletz Indians and remains an important community tradition to this day.
- Basket caps are a special part of regalia for the Confederated Tribes of Siletz Indians and are not used as containers.
- Weaving intricate baskets requires skill, practice, and design expertise.

Considerations for teachers

Assessment

Students will complete a summative assessment for both social science and math standards in the “Basket Caps Social Science and Math Assessment” handout.

Teachers should monitor for group discussion and correction and completion of group work products, including:

VOCABULARY

Basketry terms

Warp - Vertical strands in a basket.

Weft - Horizontal strands that are woven across the warp.

Basket cap - A woven head cover, often with intricate designs called “marks.”

Hazel sticks - Natural materials used to create the “skeleton” or **warp** of the basket. They are best collected in the spring and meticulously peeled and straightened one by one.

Spruce roots - Natural materials used to create the **weft** of the basket. These can be gathered year-round, but many prefer to do so in the spring or fall when the earth is moist and it is easier to dig for the roots with bare hands.

Bear grass - A natural material used to create overlay designs. Bear grass can be found above 2,000 feet in elevation. Weavers collect bear grass in the summer and lay the material out to bleach in the sun.

Maidenhair fern - A natural material used to create overlay designs. Maidenhair fern is found on the north faces of damp, shaded areas and is responsible for the dark color design on baskets. Dee-ni people call the stalk of the fern the “blue jay’s shin” because of its dark color and slender shape.

Math term

Convert - To change a value or expression from one form to another.

(Continued on next page)



- Basket Cap Reading Sheet
- Mini-poster
- Math Thinking Map

Practices

1. *Visual puzzle* – Documents, pictures, or artwork are cut into puzzle pieces and distributed to students; students first have to find their group, then assemble the puzzle, and finally talk through some guided questions or comments.
2. *Think, pair, share* – Students are encouraged to spend independent time thinking about a question and writing down their thoughts. After independent thinking time, students pair with a partner to discuss their thoughts and identify common ideas, differences, and anything they learned from the discussion.
3. *Vocabulary routine* – The teacher provides student-friendly definitions for important vocabulary words used in the lesson, including a sentence using the word in context. Students are then expected to repeat the definition and create their own sentence for each term. This practice can be extended by providing visual examples, especially if the term represents a tangible object. Some routines include both additional examples and non-examples.

VOCABULARY *(Continued)*

Dene (Athabaskan) terms

Audio recordings of pronunciations can be found on the Siletz Dee-ni Online Talking Dictionary <http://siletz.swarthmore.edu/>

- **Ch'ii-t'u** - Basket making, we are
- **Ch'vsh-t'u** - Basket making, I am
- **Xee-tr'at** - Cap(s), basket

ADAPTIONS FOR DISTANCE LEARNING



- Have students review all the picture puzzle pieces and information and then create a statement about what they have in common, how basket caps are created, and why they are important to the Confederated Tribes of Siletz Indians.
- Have students read the article, “Recalling the making of Siletz baskets in article from nearly 40 years ago,” by Ted Werth, <https://www.ctsi.nsn.us/wp-content/uploads/2021/08/Siletz-News-August-2021.pdf>) and then use the “Basket Cap Reading Sheet” to explain how the Tribe’s basketry traditions are being carried forward.
- Have students complete their mini-posters collaboratively.
- Have students complete the “Basket Cap Design Template.”

Learning targets

- I can describe the importance of basket caps to the Confederated Tribes of Siletz Indians
- I can describe how basket caps are created.
- I can explain what a text says about basketry and basket caps.
- I can define the meaning of words and phrases about basketry and the Confederated Tribes of Siletz Indians
- I can problem solve math division problems related to basket making.
- I can convert time and length measurements into different units.

Reflection/closure

Sum up the lesson by having students think, pair, and share their thoughts to complete this statement “Appreciation for the skills required for designing basket caps is important because _____.”

Have students complete the “Basket Caps Social Science and Math Assessment Sheet” independently.

Options/extensions

- Visit in-person or virtual displays of basket caps and have students describe the differences between basket caps and other types of basketry.
- Have students look at other Tribal regalia across the Pacific Northwest or across the country to compare regalia headcovers.

Appendix

Materials included in the electronic folder that support this lesson are:

- 1_Visual Puzzle Pieces.pdf
- 2_Basket Cap Reading Sheet.pdf
- 3_Math Reciprocal Teaching Chart.pdf
- 4_Math Thinking Map.pdf
- 5_Basket Caps Social Science and Math Assessment.pdf
- Design Template.pdf
- Slides_Basket Math.pptx

Activity 1

How are baskets used?

Time: 2 – 3 hours

Action 1. Visual puzzle

Step 1

Take the pictures from the file “Visual Puzzle Pieces” and cut them into enough sections to distribute one piece to each student. You can choose to limit the number of full pictures so there are four or five students for each full picture. Give each student a puzzle piece.

Step 2

Tell the students they are holding a puzzle piece that is part of an image related to the Confederated Tribes of Siletz Indians. Explain that the class will be exploring traditional Siletz basketry styles and techniques as part of the current math unit.

Step 3

Post these sentence stems for students to use as part of their discussion as they identify elements in the piece they are holding and create the full image:

- I see ...
- I notice ...
- I think this is ...
- I think this relates to the Confederated Tribes of Siletz Indians because ...
- I think this relates to math because ...
- A question I have about this image is ...

Activity 1 *(Continued)*

Step 4

Have students move around the room to find the classmates who have the companion pieces that fit together to create a single image.

Step 5

Ask each group of students to discuss their image using the sentence stems as a guide. Monitor the discussions as necessary.

Step 6

Use the “Visual Puzzle Pieces” handout to share the appropriate information about each picture. Optionally, you can choose to print the picture on one side and the information about the photo on the back side prior to cutting them into puzzle pieces, and then let students read the information as they complete the puzzle.

Step 7

Give students several minutes to plan how they will present their completed puzzle to the whole class. Have them choose three or more sentence stems to describe what they have pictured and have them share how they think it relates to the Confederated Tribes of Siletz Indians or math.

Action 2. Read and understand about basket caps

Step 1

Review previous lessons.

Say:

In previous lessons, we’ve learned a little bit about the Siletz Tribe’s Nee-dash and regalia traditions.

Activity 1 (Continued)

Ask:

Can someone remind the class what we learned in those lessons?

Key point: Nee-dash is an important ceremonial celebration in which Tribal members wear special regalia.

Say:

Awesome! One of the important pieces of regalia for Nee-dash are xee-tr'at or "basket caps." Making a basket cap is a special skill done by the most accomplished and experienced weavers. Today, we're going to learn a little bit more about the knowledge, techniques, and skills that go into making a basket cap and how Siletz weavers use some of the very same math strategies that we've been learning about in our class this year. First, let's talk more about basket caps.

Step 2

Use a vocabulary routine to introduce the basketry terms. Write the student-friendly definition on the board. You can also choose to write an example sentence on the board.

Step 3

Pass out the "Basket Cap Reading Sheet" to students. Allow them to read and answer the comprehension questions on the sheet. Have students circle additional words they might not understand or write in questions they have about the text.

Step 4

Allow students to pair up and discuss the article and any questions they may have. Encourage them to check with each other for understanding of the article.



Activity 1 (Continued)

Step 5

Share the Athabaskan language terms and Siletz Dee-ni Online Talking Dictionary <http://siletz.swarthmore.edu/> Allow students time to practice speaking the words and writing them.

Step 6

Have student pairs create a mini-poster that includes a summary of the information from the picture puzzles and reading sheet. They should include an illustration related to the reading sheet. They should also include a sentence using at least one of the Athabaskan terms related to basket caps. Have each pair of students write their names on the back of their mini-posters and hang them up in the room where their peers can see them.

Action 3. Collaboration among groups

Step 1

Tell students about Siletz community weavers.

Say:

Weaving a basket takes lots of individual skill and practice, but weavers also rely on each other and the larger community. Younger weavers learn by watching elders and picking up techniques and guidance. Elder weavers often rely on younger family members to help do the hard work of collecting and preparing basketry materials. Let's think about how we work together in our classroom.

Step 2

Have students provide examples of how they are able to collaborate and get along with their peers, even when it is difficult.

Activity 1 *(Continued)*

Step 3

Ask students to share examples of collaborative activities they participated in by choice (voluntarily). Have them write a list of those activities (sports, school projects, and so on). Have them write about how participating in those activities made them feel.

Step 4

Next, ask students to share examples of collaborative activities they participated in without being given a choice (involuntarily). Have them write a list of those activities (class projects, chores, and so on). Have them write about how participating in those activities made them feel.

Step 5

Ask students what they notice about the two lists and the feelings. Often, students will feel more reluctant about the involuntary activities, some may even feel anger or resentment. Let students know it's OK to feel angry or upset; it's our actions that are most important.

Step 6

Ask students what they did to turn involuntary situations that seemed problematic into something good and positive. Create a list to share with the whole class. Facilitate the conversation to identify ways students shifted their thinking or identified positive ways to work together, even when it was not by choice.

Activity 1 *(Continued)***Action 4. Acknowledge strengths in individuals****Step 1****Say:**

One strategy that helps when working together is to acknowledge that each person has something good to contribute to the work. Some people are really good at listening to others, while others are really good at doing a specific task. As we think about basket weaving, some people are really good at weaving fine basket caps while others are really good at weaving large baskets, like baby baskets. Each person has a special asset or skill that they can use to benefit others. I want you to create a list of things that you are really good at. Some may be skills such as dribbling a basketball or setting a hook on a fishing line, while others may be writing poetry or taking care of animals. You have many skills, but you may not stop to think about what they are. I want you to take this opportunity to do that. What are your assets?

Step 2

Have students put a star by the assets they identified that can help a group. Encourage them to write more if they need to.

Step 3**Say:**

Now that you have each thought about your own assets, we're going to think about the assets of those around us. As you think about each of your classmates, consider: What are the positive assets each person brings to a group?



Activity 1 *(Continued)***Step 4****Say:**

On a sheet of paper, write down the name of each classmate, then write a positive asset they bring to a group. Maybe you like reading with them because they read with expression. Maybe they always make space for you at the lunch table. Or maybe they have really great math skills. You might say they are just a nice person that makes you laugh or feel good to be around. You will make a list to share these positive attributes and why they make a good group partner.

Step 5

Have students complete the list. It is best to compile all the attributes students listed for the individuals in a document that doesn't show handwriting or other names. You may choose to have the students add into a shared document that is visible to all and developed by all. As the teacher, you will need to monitor statements that are shared to ensure they are all positive and that every student has a list of positive attributes contributed by their peers.

Share each student's list of positive attributes directly with them. After all students have had an opportunity to review their peer-created list of positive attributes, ask them to share how it made them feel.



Activity 2

Appreciating Native design

Time: 2 hours

Action 1. Examine basket cap designs

Step 1

Have students review the puzzle piece pictures and note the pattern and design on the caps. Acknowledge the skill required to create these patterns, especially as part of a cap.

Share slide 2. Ask students to look closely at the pictures of the basket caps.

Say:

We've been discussing basketry and basket caps in particular. These basket caps are prized because of their beautiful designs, their durability, and the skill needed to create them. Some people who are not familiar with basket caps think they are storage baskets and display them upside down! As you look at the photos, notice the woven patterns and consider the math and art skills needed to make those patterns, which aren't flat, but rather on a curve. To get the right shape weavers must constantly add in sticks to the basket. But, adding sticks means that as the weaver moves up the basket cap, the number of sticks in the pattern changes. Weavers have to plan this change out ahead in order to keep the mark looking symmetrical even as the number of sticks in the design may be changing. This can take a lot of planning—and math—to figure out just the right number of sticks to add in so that the pattern will stay even.

Share slide 3. Ask students to compare the designs on the beaded bag with the designs on the basket caps. Ask students to imagine how the weavers and bead makers created the respective patterns.

Activity 2 (Continued)

Say:

Part of planning a basket design is being able to make a design (or “mark” as many weavers call it) from lots of little individual pieces. Each mark is made up of many individual overlays of design material that create the color in just the right place. This is a common skill in Native American art in general—and Indigenous art from around the world. Compare the basket marks we looked at earlier with this example of a beaded bag that was also made at Siletz.

Step 2

Ask students to pair and share their observations about the designs.

Step 3

Have students share with the class elements of the basket cap designs that stood out to them and why.

Action 2. Plan a design

Step 1

Introduce the design activity and remind students that it is important not to copy or mimic Native designs or artwork.

Say:

We talked last time about how pretending to make regalia can be hurtful and offensive for Native people. We want to avoid doing that today. We’re not going to mimic (or copy) Native designs, but we are going to practice the skill of making a larger image from lots of smaller shapes, similar to how Native weavers and bead makers make basket caps or other regalia.

Share slide 4. Ask students what is different about this basket compared to the ones that they have seen so far.



Activity 3

Planning for weaving and converting measurements

Time: 2 hours

Action 1. Model the use of reciprocal teaching

Say:

We've seen how much design work goes into planning a basket design. But there is actually a lot of additional planning that involves counting, sorting, and calculating. It turns out that weaving a basket can require a lot of math!

Step 1

Post the following problem in a place that is visible to all students. [Note: This problem is a slight adaption of the following task from Illustrative Mathematics: <http://tasks.illustrativemathematics.org/content-standards/5/MD/A/1/tasks/293>]

Mrs. Rhoan is teaching a group of new learners the basics of how to weave using rattan, a long skinny reed imported from southeast Asia that can be easier for beginning weavers to use. She's modeling with materials that are not traditional so that students can practice their weaving technique. She has a bundle of rattan that is 75 feet long and wants to give each of the 18 students in her class an equal length of rattan. How long will each piece be?

Say:

Let's work together to solve this problem. Just as we talked about how each one of us has many positive attributes that we bring to a group, we will consider how our team members have great assets to use in solving a math problem. We will be using reciprocal teaching role cards to help us build our understanding and strategy to solve this problem. Let's identify the question, then think about things we already know to solve for the question being asked.

Activity 3 (Continued)

Step 2

Use the “clarifier” reciprocal role to pull out the details and information to begin addressing the problem.

Step 3

Use the “planner” reciprocal role to plan ways to solve the problem. Encourage multiple methods in which to address this problem. Students may identify a strategy to divide the total amount by students. Another strategy may include drawing a number line and separating it into 18 parts. Another strategy may be to convert feet to inches and then divide the inches by 18. Acknowledge that there may be multiple ways to approach the problem, but also discuss whether they make sense for this specific problem. Finally, solve the problem using the strategy of division: 75 divided by 18 is 4 with a remainder of 3, which is $4\frac{3}{18}$ feet, which is equal to $4\frac{1}{6}$ feet.

Step 4

Use the “questioner” reciprocal role to assist in justifying and explaining how that solution is correct.

Action 2. Allow teams to practice reciprocal teaching

Step 1

Organize students into groups of four and provide each group with the “Math Reciprocal Teaching Chart” and “Math Thinking Map.”

Say:

I’m going to give you a thinking map. In the center is the math question I want your team to explore and answer together using the reciprocal teaching approach. In your team, decide which role you will play to support answering the question. Then, use the prompts to help your team. On the thinking map, write

Activity 3 (Continued)

the questions you ask and the answers you receive. When your team determines the solution and justification, write it on the back side of the map. Every team member should be ready to share with the class.

Step 2

Monitor and support group discussion. Clarify thinking and support corrections as needed.

Step 3

After all student groups have finished, have students participate in a gallery walk to review their group thinking maps.

Step 4

Facilitate a class discussion on the process used to determine the correct answer.

Step 5

Have students develop questions similar to the modeled example and team example using the context of gathering, preparing, or creating a basket cap.

Action 3. Convert measurements into smaller units

Step 1

Let students know that they will be converting from one unit to another. Acknowledge that there are multiple ways to measure the same amount but in different units and explain that they will be playing a game to practice this. Students may use white boards to display independent answers quickly or may use a computer application such as Kahoot!

Activity 3 (Continued)

Say:

You've done a great job problem solving, and now we're going to step it up by converting equally within measurement systems. For example, if I measure something that is 12 inches, that is the same as 1 foot. If I measure something that is 15 inches, I can say it is equal to 1 foot, 3 inches. Now let's play a game of conversions. I'm going to give a measurement. On your board, write an equivalent conversion and how you know. The first measurement is: 18 inches.

Students should write 1 foot 6 inches. Be sure students are writing the correct unit. Students may have multiple methods to solve the problem, such as subtraction ($18 - 12 = 6$), using a unit bar, equivalent fractions, or another method. Acknowledge the methods and justifications. Correct any misconceptions.

Step 2

Continue playing the game with various units of length and time. In grade 5, students are provided the conversion of 1 mile = 5,280 feet.

Step 3

Review the model question and model conversion questions. Mrs. Rhoan is teaching a group of new learners the basics of weaving. She has 75 feet of rattan in a bundle. If each of the 18 students in her class gets an equal length of rattan, how long will each piece be?

Say:

When we solved for this, we answered—with justification and explanation—that each student will get a piece of rattan that is $4 \frac{1}{6}$ feet. That answer is a whole number and a fraction of that whole number in the same unit, feet. But what if I need to know the length in feet and inches? My new question is [write so it is visible to all]: How many whole numbers of feet and inches is $4 \frac{1}{6}$ feet.

Activity 3 (Continued)

Step 4

Model conversion of $4 \frac{1}{6}$ feet to 4 feet 2 inches either through using a unit bar or other methods. Engage students in discussion of additional strategies to convert and why they may or may not be reliable methods.

Step 5

Model conversion using only inches.

Say:

We've been able to solve this problem using only feet. Now, we have solved in feet AND inches. Finally, let's convert into just inches. So, we know we have the 2 inches already, let's convert the 4 feet. We know that 1 foot is equal to 12 inches, so how many inches in 4 feet?

Convert using a unit bar. Engage students in discussion of additional strategies to convert and why they may or may not be reliable methods.

Step 6

Paired practice: Identify one of the questions developed by students in action 2, step 5. Have students pair up and solve the problem then convert it into smaller units. Monitor, support, and correct pairs as needed.

Step 7

Paired practice: Have student pairs choose one of the student-developed questions. Have them list two additional conversions into smaller units. Have student pairs share their chosen question, solutions, and explanations for problem solving.

Activity 3 *(Continued)*

Step 7

Paired practice: Have student pairs choose one of the student-developed questions. Have them list two additional conversions into smaller units. Have student pairs share their chosen question, solutions, and explanations for problem solving.

Step 8

Independent practice: Identify two of the questions developed by students and list the multiple ways you want students to convert. Have students independently practice, solve, and justify. Review as a class and have students self-correct. Provide additional practice if necessary.

Action 4. Voting, bar graphs, and interpretation

Step 1

Provide students with three sticky notes or dot stickers. Have students place the notes or dot stickers on their top three favorite designs developed in Activity 2.

Step 2

Let students know they will create a bar graph based on this voting. Have students think, pair, and share mathematical questions they can answer from the voting.