OREGON
DEPARTMENT OF
EDUCATION

MATH

Traditional Housing Styles of Native Americans in Oregon

ESSENTIAL UNDERSTANDINGS

- **History**
- **Lifeways**

LEARNING OUTCOMES

By the end of the lesson students will be able to:

- **Describe the traditional housing styles of Native Americans in Oregon**
- **Use the Pythagorean Theorem to solve a problem**
- **Design a problem that can be solved using the Pythagorean Theorem**

ESSENTIAL QUESTIONS

- **What types of traditional housing did Native American tribes in Oregon build?**
- **How can I use math to solve real-world problems?**

LOGISTICS

- **Where does the activity take place?** *Classroom*
- **How are the students organized?**

  ☐ Whole class ☐ Teams: 2 – 4
  ☒ Pairs ☒ Individually

TIME REQUIRED

50 minutes

Overview

This lesson introduces students to the traditional housing styles of Native American tribes in Oregon, while also giving them the opportunity to practice using the Pythagorean Theorem to solve a real-world problem. Students will learn about the diverse materials and building styles tribes used and how their choices were shaped by the natural environments in which they lived and the traditional lifeways they followed.

Studying traditional Native American housing styles will help students begin to grasp the diversity of tribal cultures in Oregon. Too often, Indigenous people in Oregon and across the country are represented as a single, homogeneous group. This does not do justice to the rich diversity of tribal cultures, nor does it honor their individual identities, histories, traditions, and cultural contributions.

Background for teachers

From the rain-drenched coastlands and lush inland valleys to the semi-arid plateau and basin regions east of the Cascades, Native people in Oregon had many different housing needs and many different materials with which to meet those needs. Nearly all tribes in Oregon practiced some form of seasonal rounds—moving from one location to another

based on the availability of natural resources—but their degree of mobility varied widely and influenced the type of housing they needed.

Native people in the Columbia Plateau region of Eastern Oregon, for example, such as the Umatilla Tribe, assembled some of their shelters from large woven tule mats secured over a simple wooden frame. Tule—a type of sedge or reed that grows along rivers and streams throughout Eastern Oregon—was an abundant, lightweight, easily transportable material that suited a mobile lifestyle in a generally arid climate.

Meanwhile, coastal tribes built a variety of structures, also based on their seasonal round traditions, but their winter housing structures were often made from more permanent cedar or redwood planks, which suited a more stationary lifestyle and a wet climate.

A few tribes in the far eastern part of the state even used the familiar tipi structure, covered with buffalo hides, which is more common to tribes of the Great Plains.

Before beginning this lesson, teachers should take some time to review basic information on traditional tribal housing:

- https://ndnhistoryresearch.com/2016/12/31/houses-of-the-oregon-tribes/

- http://www.native-languages.org/houses.htm

Teachers should also consider students' prior knowledge of the Pythagorean Theorem and determine whether extra instruction will be required for Activity 2.

STANDARDS

Oregon math standards

8.G.6 – Explain a proof of the Pythagorean Theorem and its converse.

8.G.7 – Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.8 – Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

MATERIALS

What materials are needed for students to engage in this activity?

- Ability to display PowerPoint slides
- PowerPoint slides
- Pythagorean Theorem: In Practice worksheet (one per student)
- Calculator
- Popsicle or tongue depressors, dowels of varying sizes, scissors or dowel cutters, string, glue

Considerations for teachers

Assessment

Review worksheets for accuracy and completeness

Practices

- Individual work
- Pair work

Learning targets

- I can describe the traditional housing styles of different Native American tribes in Oregon
- I can use the Pythagorean Theorem to solve problems
- I can design a problem that requires the Pythagorean Theorem to solve

Options/extensions

- Extend Activity 2 using Dan Meyer's Three Act Math Taco Cart problem http://threeacts. mrmeyer.com/tacocart/ and have students develop their own math story and explanation.
- Read *What's Your Angle, Pythagoras?* by Julie Ellis and have students write parallel stories in different settings, formats, or contexts to describe the Pythagorean Theorem and its application.[1]

VOCABULARY

Pythagorean Theorem – Mathematical formula that describes the relationship between the three sides of a right triangle.

Long house – A long, narrow, single-room building that provides shelter for several families. Often made of wooden planks. The length could change over time to accommodate more people.

Mat house – A house built of mats woven out of tule or cattail and then draped over a pole frame. Mat houses were typically built in a portable, cone-shaped structure or in a more permanent, large-framed structure similar to a long house.

Tipi – A portable cone-shaped tent built on a pole frame and wrapped with animal skins or cloth. More often associated with tribes of the Great Plains, but occasionally used by a few tribes in Eastern Oregon.

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[1] Ellis, J. (2004). *What's your angle Pythagoras? A math adventure.* Charlesbridge.

- Using materials available to them, ask students to complete a proof of the Pythagorean Theorem to build a plank house.

Reflection/closure

Have students connect in pairs to explain how they used math to plan for the construction of a plank house and the benefits if using it as winter shelter. Why might it have been important for Native Americans who lived in plank houses to have the correct measurements in constructing these buildings?

Activity 1

Traditional Housing Styles of Native American Tribes in Oregon
Time: 20 minutes

Say:

One of the primary purposes of mathematics is to solve real-world problems. For example, people in all parts of the world have used mathematics to help them build structures that could provide shelter and safety, and this includes Native American tribes in Oregon. Today, we're going to look at some of the traditional housing styles used by tribes in Oregon, while also looking at how math can be used to address one of the most essential needs of human beings.

In order to build structures that can withstand the various natural elements, it's important to build strong frames and use high-quality materials. The triangle shape provides one of the strongest frames because any added force is evenly distributed across all three sides. The more stable the triangle, the more stable the building.

Many Native American tribes in Oregon practiced a seasonal lifestyle, moving from one area to another based on the availability of resources. This gave them a deep understanding of the housing needs and available materials in different areas of Oregon and in different seasons. They knew how to use the resources that were available in the area they were in and how to build shelters that provided the most protection and comfort. In this lesson we'll practice using math concepts such as surface area and the Pythagorean Theorem while learning about a few of the traditional housing styles of Native Americans tribes in Oregon.

Display and discuss slides 1 through 5. Explain that even today housing decisions are often based on weather, available materials, and whether a structure needs to be permanent or not.

Say:

Native American tribes in Oregon were experts at problem solving and at using the natural resources available to them for purposes such as food, clothing, housing, tools, storage, and cultural practices. Natural resources include plants, animals, trees, grasses, and stone. You can see these natural resources in traditional Native housing styles, some of which are still constructed today.

Have students view the Chinookan Plank Houses: Native American Domestic Architecture & Culture video, which is available at: https://www.youtube. com/watch?v=q7eDko2Ygzl. Ask them to take note of the natural resources that are used and to think about any mathematical questions that come to mind while watching the video. After viewing, ask students to work in pairs and share two facts they learned while watching the video and one question it raised for them.

Say:

What kinds of materials are used to build houses today?

Ask a few volunteers to share their ideas.

Display slide 6.

Say:

I want you to think about the materials that are available to you in this classroom. If you had to construct a house using only the materials in this room, what would you build? First, think about what materials would be most durable. Next, think about which materials would be the quickest to assemble and take down. Discuss your ideas with a partner.

Allow time for students to discuss and then ask a few volunteers to share their ideas.

Activity 2
Using the Pythagorean Theorem
Time: 20 minutes

Facilitator note: This lesson provides a quick review of the Pythagorean Theorem. If this is a new concept for your classroom, you may need to provide a more in-depth overview before beginning this activity.

Display Slide 7 and give a short review of the Pythagorean Theorem. Ask students for examples of when this might be used in real life.

Display Slide 8 and ask students how the Pythagorean Theorem could be used when building a plank house, reflecting on the video they previously watched.

Display Slide 9 to show how students can bisect a triangle to find the right angle in order to calculate the length of a missing side. This slide is animated so that it will show the isosceles triangle with equal side lengths of six inches. First animation mimics the triangle. Second animation bisects the triangle. Third and fourth animation note the location of the right angles. Have students determine the height of the triangle by using the formula and appropriate variables.

$$a^2 + b^2 = c^2$$
$$3^2 + b^2 = 6^2$$
$$9 + b^2 = 36$$
$$b^2 = 36 - 9$$
$$b^2 = 27$$
$$b \approx 5.2 \text{ inches}$$

Distribute the Pythagorean Theorem: In Practice worksheet and instruct students to solve the problem on the page.

When students have solved the problem, tell them to follow the instructions on the bottom of the page (create a problem that requires the Pythagorean Theorem to solve). Students will then exchange worksheets with a peer and solve each other's problem.