

# Uspelluku—Measure Kodiak Alutiiq Qayat—Kayaks and Maritime Traditions

**Grade:** Middle School (Grades 6-8) **Time:** 4 Days

**Lesson Description:** Students will explore traditional Alutiiq ways of measuring and use the measurements to build a paper *qayaq*—kayak. They will use measuring tools to measure parts of their body, record them on a form, and calculate *qayaq* measurements and ratios for a full-sized boat. Students will transfer these measurements to a sheet of bulletin board paper to create a full-sized paper *qayaq* cutout.



Photo: Model qayaq frame by Alfred Naumoff, AM506

#### **Kit Includes:**

- My Qayaq—Body Measurement Table
- Replica *qayaq* paddle

#### **Materials Needed:**

- Standard (Imperial) measuring tapes or yardsticks & rulers
- Pen or pencil
- Masking or colored tape
- Bulletin board paper (roll)
- Scissors

Vocabulary	Alutiiq Vocabulary	Art Elements	Art Principles	<b>Content Connections</b>
Conversion Ratio Standard measurement units	Qayaq—Kayak Qayat—Kayaks Uspelluku—Measure Qayanguaq—Single- hatched Qayaq	⊠Line ⊠Shape ⊠Color ⊠Value ⊠Texture ⊠Space/ Perspective	<ul> <li>☑Pattern</li> <li>☑Rhythm/</li> <li>Movement</li> <li>☑Proportion/</li> <li>Scale</li> <li>☑Balance</li> <li>☑Unity</li> <li>☑Emphasis</li> </ul>	AK Cultural Standards AK Science Standards AK Mathematical Standards

#### **Objectives and Assessment Criteria:**

Students will learn...

- About the traditional Alutiiq *qayaq*—kayak and the measurement units used to create this boat.
- How to measure appropriate body parts in standard (Imperial) units of measurement using half-inches, inches, and feet.
- How to apply the concept of units of body measurement to discover the student's own single-hatched *qayaq* size.
- How to transfer measurements to bulletin board paper to make a paper *qayaq* outline.

#### **Cultural Standards:**

- E4: Culturally knowledgeable students demonstrate an awareness and appreciation of the relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to determine how ideas and concepts from one knowledge system relate to those derived from other knowledge systems.
- B2: Culturally knowledgeable students are able to build on the knowledge and skills of the local cultural community as a foundation from which to achieve personal and academic success throughout life. Students who meet this cultural standard are able to make effective use of the knowledge, skills and ways of knowing from their own cultural traditions to learn about the larger world in which they live.

## Science Standards:

- MS-PS2-1: Crosscutting Concepts: Influence of Science, Engineering, and Technology on Society and the Natural World: The uses of technologies and any limitations on their uses are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.
- MS-ETSI-4: Science and Engineering Practices: Developing and Using Models. Develop a model to generate data to test ideas about designed system, including those representing inputs and outputs.
- MS-ESS3-4: Crosscutting Concepts: Connections to Engineering, Technology and Applications of Science: Influence of Science, Engineering, and Technology on Society and the Natural World. All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

## Mathematical Standards:

- 6.RP. Understand ratio concepts and use ratio reasoning to solve problems.
- 7.RP Analyze proportional relationships and use them to solve real-world and mathematical problems.

#### **Cultural Relevance:**

For thousands of years, seaworthy boats were one of the most important tools in the Alutiiq toolkit. Carefully crafted and well-maintained boats—including *qayat*—kayaks and *angyat*—open skin boats, were a lifeline. They allowed Alutiiq people to harvest fish and sea mammals, travel and trade great distances, and carry families and supplies in the cold, windy waters of the Gulf of Alaska. *Qayat* could have one, two, or three hatches. A *qayanguaq*—Single-hatched *qayaq* was the most common. People used these boats daily for fishing, traveling, and hunting fast animals like porpoises and whales.

It took time to make a *qayaq*. The driftwood for the frame had to be gathered from beaches, dried to prevent shrinking, and then carved by hand into the many frame parts (bow and stern, stringers and ribs, keel and cockpit) needed for assembly. For example, it took Alutiiq carver Alfred Naumoff nearly two years to craft a sixteen-foot *qayaq* frame. He started learning *qayaq* building as a boy, watching and working beside experienced family carvers.

Each *qayaq* was built to fit its user's body. Alutiiq people carved *qayaq* frame parts from driftwood, using their arms, hands, fists, and fingers to determine the size of each part and where it fit on the frame. Then they secured each part to the frame with sinew and baleen lashings and covered it with sewn sea mammal skins. Since all parts of the *qayaq* were custom-made, each Alutiiq boat was a slightly different size.

All measuring systems rely on uniformity, a standard way to record things like length, weight, and volume. Today we use rulers to measure inches and feet, or a scale to record kilos. Before the adoption of contemporary measuring systems, like the metric system, people relied on relative measurements. Comparisons are the foundation for nonnumeric ways of gauging size. For example, you might compare a fish to the length of a man's arm. Other relative measurements are based on proportions, like knowing the length of Spiridon Bay is twice as long as the length of Larsen Bay.

In classical Alutiiq society, measurements were important for many daily tasks from making clothing and tools to building houses and boats. Alutiiq Elder Bobby Stamp shared techniques for *qayaq* building with relative measurements. His system is based on finger, hand, and arm lengths, which can be combined in many ways. For example, the length of a *qayaq* stern piece is the distance of the lower arm, from the elbow to the tip of the fingers, while the height of this part is the width of an outstretched hand. In contrast, gunnel length is a combination of measurements—three out-stretched arms from fingertip to fingertip, plus one lower arm, plus one outstretched hand. This elegant way of measuring boat parts ensured that every *qayaq* fit the unique proportions of its maker. A taller person's boat was proportionally larger than that of a shorter paddler.

#### Create:

#### <u>Day 1:</u>

- Explain that there are many ways to measure the world standard (Imperial) and metric are common today, but other measurement units have been used for thousands of years.
  - Have students brainstorm different things in nature that could be used as a unit of measurement. For example, a body part (a person's foot, palm, finger digits, or height), an object (a paperclip, a shoe, or a pencil), or a motion (one step).
  - Ask the students, can units of measurement vary? (Yes, greatly—e.g., a person's arm length, or stride). Are varying units useful for all measuring needs?

Examples of body measurements used by Alutiiq carvers



- Inform students they will be learning about how Alutiiq *qayat* were custom-made to fit each Alutiiq hunter. This was done by using the hunter's personal body measurements focusing on hand, finger, and arm length. Share that each student will be determining the size of their own *qayaq* based on their own measurements.
  - The instructor demonstrates the span of their outstretched arms, from fingertip to fingertip. Ask students to stretch out their arms and notice their own outstretched arm length. Without measuring, ask students who they estimate will have the widest arm span.
  - Similarly ask students to notice their own hand length (from wrist edge to fingertip), one arm length (from armpit to fingertip), and across-body span (bent arm length from elbow to elbow with closed fists in the center).
- Ask students if they are familiar with modern-day *qayat*? Have they traveled in one before? If so, what were the major parts of the boat? What is it like to be on the water in a *qayaq*?
- After a classroom discussion, have the students familiarize themselves with aspects of Alutiiq culture by reading the Alutiiq Museum handouts.
  - *Qayaq*—Kayak: <u>https://alutiiqmuseum.org/wp-</u> <u>content/uploads/2024/01/Qayaq2022.pdf</u>
  - o Uspelluku–Measure: https://alutiiqmuseum.org/collection/Detail/word/665

#### <u>Day 2:</u>

• Share the video short Alutiiq Kayak Maker Alfred Naumoff on the Kayak (2:10) https://www.youtube.com/watch?v=EGCOnJwVhq4.

(Video summary - Alutiiq *qayaq* maker Alfred Naumoff spoke about the construction of an Alutiiq/Sugpiaq *qayaq*, the focus of a partnership between the Alutiiq Museum and community and Harvard University's Peabody Museum (recorded during a 2012 visit). In 2023, the college transferred ownership of the *qayaq* to the Alutiiq Museum, a tribal repository and cultural center in Kodiak, Alaska. Made in the mid-19th century, the 14.5-foot, skin-covered boat is a rare example of a complete ancestral *qayaq*. This vessel has been at the center of a long-term collaboration between the institutions and is currently on display at the Alutiiq Museum.)

- Ask students to pay attention to what a *qayaq* frame looks like at 0:48 of the video and notice how many individual wooden parts make up a singlehatched *qayaq* frame.
- Also ask students to notice how Mr. Naumoff shows the arm length measurement at 1:29 of the video.
- Share the video Uncovering Kayaking Traditions (30:26), from the Alutiiq Museum's Fall Lecture series in 2016 <a href="https://vimeo.com/185088462">https://vimeo.com/185088462</a>. (Video Summary Presentation by Susan Malutin, part of the Alutiiq Museum's Fall Lecture Series 2016. An historic Alutiiq qayaq discovered in the collections of Harvard's Peabody Museum provided Alutiiq culture bearers an opportunity to learn more about the construction of ancestral boats. Learn how skin sewer Susan Malutin explored the manufacture of the boat's skin cover)
  - How was the *qayaq* acquired? By whom?
  - What stitch was used to sew the *qayaq*?
  - What type of hair is sewn into the qayaq?
  - What was the seal gut/intestines used to make?
  - Why did men know how to sew?
- Introduce vocabulary terms:
  - <u>Conversion</u> changing one thing into another. Converting units from one measurement system (such as Imperial to metric) to another is done using the ratio between two measurement units.
  - Ratio the relationship between two units, expressed in one of three ways: a fraction (1/2), "1 to 2" or "1:2".
  - <u>Measurement units</u> May be a standard form of measurement or a customized unit of measure, e.g. traditional Alutiiq body measures.
  - <u>Standard measurement units</u> units of measure that are well known, standardized, and agreed upon, e.g., inches, feet, centimeters, meters.
- Review standard (Imperial) units of measurement and how these are recorded feet, inches, and half inches will be used in this exercise.
  - Review with students how to find these measurements on soft measuring tapes or rulers/yardsticks.

- Inform students that they will work with a partner to measure and record their specific body measurements as guided by the My Qayaq Body Measurement Table.
  - These include five specific measurements identified by on the form:
    - A. Arm Span–Open arms from fingertip to fingertip.
    - B. Arm Length–Armpit to closed fist.
    - C. Half Body Width–Center of chest to tip of fingers.
    - D. Elbow Span–Double bent arms from elbow to elbow.



<u>Day 3:</u>

- Students will demonstrate the ability to accurately add and apply measurements. They will also learn about ratios.
- Using whole and half measurements gathered in the previous session students will add the top four body measurements to find their personal total *qayaq* length.
- Concept Explanation (whole group processes data, summarizes results). Poll the students on their *qayaq* measurements. Compile the data on the class whiteboard.
  - Which student has the longest qayaq? The shortest qayaq?
  - What is the class average *qayaq* length?
  - Can they find a classmate with the same *qayaq* length or width? Are these two students about the same height?
- Students will then compute **two** ratios on the My Qayaq Measurement Form (see example).
  - Divide the total qayaq length by height of the student.
  - Then divide total *qayaq* length by *qayaq* width.
- Students will learn that a **ratio** is a relationship between two quantities. Helpful video Khan Academy: <u>Khan Academy Intro to Ratios</u> (3:58)
  - In this case, student height and the *qayaq* length are the two units.
  - Ask students if they think the shortest student and the tallest student will have the same ratios? (Answer: yes, they will)
- Select three students to share their measurements and ratios on the class whiteboard.
  - Students will see that they have the same ratios despite their size differences.
  - Ask students what they think having the same ratio means?

- Share that for all students, the ratio between the student height and the *qayaq* length should be about the same, and the ratio between the *qayaq* length and width should be similar.
- This is because while students' bodies differ, and individual students will have different measures, the ratio of these body measurements in creating their perfectly sized *qayaq* is the same. Alutiiq people knew this and in order to have a balanced *qayaq*, they created boats that were **proportional** to each paddler's body.

## <u>Day 4:</u>

• Have the students select a student's *qayaq* measurement to share in full-size on a roll of bulletin board paper, using masking or colored tape (see design outline in image below). Display on a wall in the classroom or school.



#### Close and Assessment:

- Students understand how Alutiiq craftspeople used units of measurement to create perfectly proportioned *qayat*.
- Students completed their My Qayaq Measurement Form and applied their measurements to create a life-sized *qayaq* cutout from bulletin board paper.
- Students gained a basic understanding of ratios.

## Modification:

- Convert standard (Imperial) units to metric units of measurement using whole numbers and decimal solutions.
- Identify various metric units of measurement, such as millimeters, centimeters, and meters.
- Apply the concept of metric units of measurement conversions.
- Reduce the measurements to 1/10<sup>th</sup> scale and have each student (or pair of students) create proportionate small-scale clay or playdough models based on their measurements.

#### Additional Resources:

- Alutiiq Arts: Carving: <u>https://alutiiqmuseum.org/alutiiq-people/art/arts-blog/carving/</u>
- *Keligcipet* Carving Traditions: <u>https://alutiiqmuseum.org/wp-content/uploads/2023/10/CarvingTraditions2022.pdf</u>
- *Percipet* Bending Traditions: <u>https://alutiiqmuseum.org/wp-content/uploads/2023/12/BendingTraditions2022-copy.pdf</u>
- Alutiiq Arts: Graphic Arts: <u>https://alutiiqmuseum.org/alutiiq-people/art/arts-blog/graphic-arts/</u>
- *Namiutat* Graphic Arts: <u>https://alutiiqmuseum.org/wp-content/uploads/2023/10/GraphicArts2022.pdf</u>
- Amutat Database: Kayak: <u>https://alutiiqmuseum.org/collection/Search/amutatObjects?search=kayak&view</u> <u>=images&l=all</u>
- Alutiiq Word of the Week Archive: Kayak Qayaq https://alutiiqmuseum.org/collection/Detail/word/303
- Alutiiq Word of the Week Archive: Prow, Bow Qayam cuunga <u>https://alutiiqmuseum.org/collection/Detail/word/563</u>
- Alutiiq Word of the Week Archive: Measure Uspelluku https://alutiiqmuseum.org/collection/Detail/word/665
- Alutiiq Word of the Week Archive: Two-hatched Kayak *Qayarpak* <u>https://alutiiqmuseum.org/collection/Detail/word/601</u>

Parts of this lesson were adapted from: Lipka, J., Jones, C., Gilsdorf, N., Remick, K., and A. Richard. 2010. *Kayak Design: Scientific Method and Statistical Analysis.* Part of the Series Math in a Cultural Context: Lessons Learned from Yup'ik Elders. Grade 6. University of Alaska Fairbanks. <u>https://www.uaf.edu/mcc/files/modules/KayakDesign.pdf</u>

## Quyanaa—Thank you.

This lesson plan was produced with generous support from a Maritime Heritage grant from the Alaska Office of History and Archaeology and the National Park Service.



# My Qayaq–Body Measurement Table



#### Student's Name:

Body Measurements	Example	Student's Measurement:
A. Arm Span (x2)—fingertip	2 x 66 inches =	2 x =
to fingertip arms stretched	132 inches	
B. One Arm—hand in a fist		
to armpit	24.5 inches	
C. Half Body Width—center		
of chest to fingertip	33 inches	
Total Kayak Length (L)		
(A+B+C=L)	189.5 inches	
Height of Paddler (H)	68.5 inches	
Ratio (L/H)	189.5/68.5 = 2.7	

Body Measurements	Example	Student's Measurement:	
Total Kayak Length (L)—from			
table above	189.5 inches		
D. Elbow Span—Bent arms			
from elbow to elbow with	29 inches		
fists closed = qayaq width (W)			
Ratio (L/W)	189.5/29 = 6.5		

Note: round measurements to nearest half inch.

# Qayaq - KAYAK

From the Arctic Ocean to Prince William Sound, Alaska's Native people crafted swift, seaworthy boats from wood and animal skins. Each culture had a distinct style of *qayaq* with unique qualities. Alutiiq/Sugpiaq *qayat* were long and slender, built for flexibility in the rough, windy waters of the Pacific Ocean.

Carefully crafted, well-maintained boats allowed men to harvest fish and sea mammals from the ocean, to travel and trade over great distances, and to carry supplies home. In coastal Alaska, every man was a *qayaq* builder and paddler. No man could be a successful provider without his own skin boat. *Qayat* were a lifeline.

#### ALUTIIQ QAYAQ TYPES

• *Qayanguaq* (little kayak)–Single-hatched: For fishing, traveling, and hunting fast animals like porpoise.

Qayarpak (big kayak) - Double-hatched: For team hunting, particularly sea otters. The man in the front hatch hurled weapons while the man in the rear steadied and steered the boat.
Paitalek (has many hatches) - Triple-hatched: Made in the Russian era. A large hatch in the center held a Russian trader, smaller hatches in the bow and stern provided seats for Native paddlers. These larger boats carried quantities of gear and supplies.

#### **BUILT FOR FLEXIBILITY**

Made from natural materials pegged, lashed, and sewn together, Alutiiq *qayat* were light, bendable, and stable. Flexibility kept them from breaking in rough seas or when landing.

It took months to collect the wood for a *qayaq* frame, and different parts of the skeleton required different types of wood. Craftsmen preferred dense, water-resistant spruce for bow, stern, and deck pieces. They chose elastic woods with straight grains, like hemlock and alder, for stringers, ribs, and gunwales.

Alutiiq men used strips of hide and baleen to tie their *qayat* together. They never used nails. Nails



An Alutiiq kayaker. Photo courtesy of Eric Waltenbaugh.

can make the frame stiff or rub a dangerous hole in the skin cover.

One of the most distinctive parts of the Alutiiq *qayaq* is its split, upturned prow. The lower curved part is slightly hollowed on the sides, helping the boat cut through the water. The tall upper part provides buoyancy, helping the boat float through waves.

#### **A SKIN OF SKINS**

A kayak's cover provided protection for the hunter inside. This thin layer of animal skin kept water out and created a smooth surface that slipped though the water. Women created boat covers, a task that required great precision.

Alutiiq people used both seal and sea lion skins to cover their boats. A hunter preparing to cover a boat would collect skins and age each one to remove the hair. When it was time to create a boat cover, women soaked the skins in water to moisten them for cutting and sewing. They laid skins over the *qayaq* frame, positioning them to form a cover. Each skin was marked and then cut to shape. With the cut pieces, sewing could begin. It took at least a week to stitch a *qayaq* cover. Knowledgeable women supervised those with less experience, checking their work carefully, as poor sewing could cost a hunter his life. When the cover was complete, men pulled it over the frame, sometimes using seaweed to help the cover slide into place.

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Alutiiq Traditions
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Produced by the Alutiiq Museum, Kodiak, Alaska

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