

**Title:** Body Measures

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**Lesson Summary:** Personal units of measure based on one's body measures is a traditional practice for many indigenous groups. In this lesson, students explore using their own personal units (including body measures) to determine and compare their heights.

**Grade:** 1

**Curricular Connections:**

Big Idea:

- Objects and shapes have attributes that can be described, measured, and compared

Curricular Competencies:

- Reasoning and analyzing
  - Use reasoning to explore and make connections
  - Estimate reasonably
  - Model mathematics in contextualized experiences
- Understanding and solving
  - Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
  - Visualize to explore mathematical concepts
  - Engage in problem-solving experiences that are connected to place, story, cultural practices, and perspectives relevant to local First Peoples communities
- Communicating and representing
  - Communicate mathematical thinking in many ways
  - Explain and justify mathematical ideas and decisions
  - Represent mathematical ideas in concrete, pictorial, and symbolic forms
- Connecting and reflecting
  - Connect mathematical concepts to each other and to other areas and personal interests
  - Incorporate First Peoples worldviews and perspectives to make connections to mathematical concepts

Content:

- Direct measurement with non-standard units (non-uniform and uniform)

**Goals:**

- Create a personal tape measure using appropriate and repeating units
- Eliminate misconceptions around measurement: gaps, overlaps, baseline, and equal units
- Compare non-uniform and uniform units: benefits and limitations

**Local Aboriginal Connection:**

Aboriginal people from all over Canada used non-standard measurement units which varied depending on where they lived. On British Columbia's West Coast, the First Nations people built Cedar canoes for travel, fishing and trade. Cedar was the best wood to use because it was easy to carve and easy to bend with steam. The First Nations of the West Coast were known as "master" canoe builders, as they made the fastest and most sophisticated canoes. The shape and size of the canoe varied, depending on its use. How did the West Coast people measure their canoes? How did they know the right thickness for the sides and bottom of a canoe? How would they know if it was a good canoe?

The canoe builder would choose a tall tree with a wide trunk that grew close to the water. Once it is cut down, the branches and bark are removed. The log is then moved to the carving site to be transformed into a canoe.

After hollowing out a log cut from a single cedar tree, "the master canoe maker adzed out the final shape with extraordinary precision, eyeing it for perfect symmetry. When the hull reached an even thickness—two finger widths for the side and three finger widths for the bottom of a larger canoe, is when the canoe maker knew it was ready. Sometimes, more experienced canoe makers knew the right thickness just by feel." (Stewart, Cedar, 1984.) Sometimes, if the canoe builder was not sure, he would use measured wooden pegs to see if he reached the right thickness.

The canoe makers tested the canoes by placing a heavy rock in the finished canoe and pushing it way out in the calm water. If the canoe went straight, he knew it was a good canoe. If someone rushed when making the canoe, it might twist and not travel straight.

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\*Master - being the best or most skilled at something

\*sophisticated - very complex, sleek and modern

\*adze - a tool used to cut and shape wood, and was made from stone and wood

\*symmetry - the same in size and shape

**Resources:**

- "Big John and Little Henry" storybook (ISBN 1-55059-284-X)
- "Yup'ik Body Measurements" [poster](#)

**Materials:**

- Adding machine paper (1 roll)
- Non-standard measurement tools (e.g., paperclips, unifix cubes, string, etc.)
- Tape or adhesive putty (painter's tape works well)
- Sample measuring tape (optional: for demonstration purposes)

## The Lesson:

Before: [about 45 minutes]

- Read *Big John and Little Henry* to give students context for the lesson involving personal body measures. The book highlights the importance of personal body measures in designing a kayak that is that right size for the user. Here are some possible discussion questions from the story:
  - Who are the Yup'ik people?
  - Why is berry picking an important part of Yup'ik culture?
  - How does the elder in the story measure out wood for the kayak he is building? Why do you think he does this?
  - Where did Big John and Little Henry go wrong when building their kayaks? How can they fix the problem?
- Facilitate a discussion on the use of traditional body measures for the Yup'ik people. The story mentions two: **ikuyegarnerek** meaning “two elbow lengths” and **tallineq** which is from the tip of the fingers to the armpit. Refer to the poster for additional Yup'ik body measures.
- Have students practice making these body measures and explore using them by measuring several different items. Discuss and demonstrate the importance of repeated units in measuring objects, as well as what items are appropriate to measure given the size of the unit.

During: [about 45 minutes]

- Tell students they will be creating their own personal measuring tapes (in pairs) using repeated units of measure on adding machine paper. You may choose to show them a sample measuring tape so that they can make connections.
- Hand out the paper for each pair of students and some tape. Students will need paper at least as long as they are tall. The tape will help to secure the paper to a flat surface to make creating the personal measuring tape easier.
- Students can use both uniform units (e.g., paperclips, unifix cubes) and non-uniform units (e.g., body measures, pencils) when creating their personal measuring tapes. Have a variety of materials available for this purpose. Tell students in advance that they will use their measuring tape to measure their height. This will give them context to pick an appropriate unit.
- You may choose to model how to create a measuring tape using your own body measures. Highlight where zero is on the tape, how to avoid gaps/overlaps, using consistent units of measure, and how to number their markings. Alternatively, you can let students explore on their own and discuss the different techniques and problems afterwards.
- Once students have completed their personal measuring tapes, they can share them with their peers in a class discussion. Ask students:
  - Why did you choose your unit? Does it make it easy to measure your height?

- How did you make your measuring tape? Did you line up many copies of the same unit or did you use one unit over and over (iterating)?
- This is an opportunity to address misconceptions and errors that arise, including:
  - Gaps between units and/or overlapping units
  - Space at the beginning or end of the measuring tape
  - Units of unequal size

Based on the discussions, students have an opportunity to fix any mistakes with their measuring tapes.

- Students continue to work in the same pairs. They are asked to determine their height using their personal measuring tape. Take note of how different groups do this.
  - Do students measure using a baseline? (e.g., from the floor)
  - Do students use partial units vs. rounding? (e.g., “15 hands plus half a hand”)
  - Is the measuring tape held taut? (e.g., no bends; straight up and down)

Ask students why they are measuring a particular way. Have them consider how they can be as accurate as possible when measuring.

- When students have determined their heights, have them indicate this on their measuring tape (e.g., use a line with their name above the line). If students haven't already added numbers to their tape measures, ask them:
  - What can we add to each tape to make it easier to know how many units tall each student is?

Have them indicate their heights using a number next to their name.

- Then students will affix their measuring tapes to the wall with tape or adhesive putty in order to compare their heights with one another. Take note of how they do this.
  - Do the measuring tapes go straight to the floor or is there a gap?
  - Are the measuring tapes straight up and down or slanted?
- Other options: You may choose to bring students outside to measure items and record them on their measuring tapes or separate piece of paper (e.g. math journal). Observe whether students are using their tape measures properly (start measuring at zero, tape is taut and straight, measure is read properly).

After: [about 15 minutes]

- Consolidation period. Facilitate a whole group discussion about the measuring tapes on the wall. What questions or conjectures do students have about the data collected? You may need to do some prompting. For example...
  - Who is the tallest/shortest student? How do you know? [The actual height vs. the numbers may send conflicting messages to students and spark discussion.]
  - Student A is 34 paperclips tall. Student B is 12 books tall. Who is taller and how do you know? [Even if Student B is taller, some students might choose Student A because 34 is greater than 12.]
  - If I measured the height of Student A with books instead of paperclips, would I get a smaller number or a larger number? Why? [Have a student stand next to different measuring tapes to show that the measure of their height changes depending on the unit chosen.]

- Which units are always the same (uniform units)? Which units can be different (non-uniform units)? When is each type useful? When is it not?
- Are body measures always the same? Why do we use them? When are useful and when are they not?

This is also an opportunity to go over any common errors (baseline issues, gaps or overlapping unit, unequal units, slanted tapes) by referencing any measuring tapes with these errors or by showing your own incorrect samples.

- If your students measured objects outside, you can ask similar questions to the above. Here are some additional questions...
  - Who would like to show us how to measure \_\_\_\_\_?
    - What did we do well? How can we improve?
  - [Show a different measuring tape] Do you think we'd get the same number with this tape measure? Would you get a lesser or greater amount? Why?

#### **Adaptations:**

- This task is naturally differentiated, as students will pick units that are appropriate for their cognitive level and fine motor abilities. Students with limited fine motor skills can be provided paper copies of units that can be glued onto the adding machine tape to make their personal measuring tape rather than iterating and drawing units themselves.

#### **Extensions:**

- You may wish to extend this lesson by having students graph their height data.

#### **Cross-Curricular Opportunities:**

- Reading the storybooks connects very well to the English Language Arts curriculum. Take this opportunity to have students: make predictions, ask questions, draw inferences, justify their thinking, and communicate their understandings.

#### **Assessment Considerations:**

- This is meant to be an introductory math task, as it explores concepts in measurement. Student discussion and the ways in which they create and use their personal units will help you to plan future lessons and give you a good idea of what level of understanding different students have about measurement, including common misconceptions. This lesson is meant to provide formative assessment and is not meant to be a summative task.