

Measuring the Principal

Strand:	Measurement and Geometry
Topic:	Measuring and comparing length with nonstandard units
Primary SOL:	1.10 The student will use nonstandard units to measure and compare length, weight, and volume.
Related SOL:	1.2b

Materials

- Bulletin board paper
- Pencils
- A large supply of square tiles, large paper clips, and craft sticks to use as nonstandard units (other possibilities include cubes, toothpicks, new crayons, unsharpened pencils, etc.)
- Body Parts Recording Sheet drawn on chart paper (sample attached)
- Student recording sheet for measuring length (attached)

Vocabulary

height, length, longer, measure, shorter, taller, unit

Student/Teacher Actions: What should students be doing? What should teachers be doing?

Note: This is a multiday lesson focusing on measuring the length of body parts using nonstandard units and developing the idea that the bigger the unit, the smaller the measure.

Day 1

1. If your school principal is willing, have him/her lie on a piece of bulletin board paper, and have two students trace around his/her outline with pencil. (Alternatively, trace another adult volunteer.)
2. Review the meaning of the term *length* (how long something is). Using the outline of the principal, ask students to visually compare the length of a few body parts to activate students' knowledge about length. (For example: *Which is longer, the length of a finger or the length of an arm?*)
3. Explain that today students are going to measure some of the different body parts using square tiles as the *unit* of measure. (A unit is the length that we keep repeating as we measure.) Explain that to measure means to find out how many units fit along a particular length. Ask: *"How many tiles do you think will fit along an arm?"* Ask one student to measure the length of another student's arm using the tiles. (At this point, do not stress the need for laying the tiles out straight without any gaps. You want students to come to the realization that this is important.) Record that student's measure on the board. Have another student come up to measure the arm. If they get a different number of tiles, ask the students, *"Should our measurements be the same? What might have caused them to be different?"* (One person left gaps and the other one did not,

maybe one person used the outside of the arm and the other used the inside of the arm. Let this discussion lead to the idea of how to measure carefully and accurately.)

4. Show students how to measure using nonstandard units. Show students that when measuring, it is important that each nonstandard unit must touch each other side by side. They shouldn't overlap or have any space in between them. Decide on the starting and ending points for the arm and then get ready to measure. Lay the tiles side by side, carefully making sure not to leave any gaps or overlap any pieces. Have students count the tiles as a class. Ask, "*Would we get the same results if I didn't make sure they were touching, without any spaces or gaps?*" Measure the arm again, this time leaving gaps, and making sure the tiles slanted and overlapping. Count the tiles together again as a class. Ask the class, "*Did we get the same answer? Why or why not?*" Record the correct measure in the table on the chart paper you have prepared.
5. Group students and allow each group to measure a different part of the principal's body using the outline and the tiles as a unit of measure for each. (You may want to place marks to indicate the starting and ending places on each body part to ensure consistency throughout the three-day lesson.) Record their answers on the large chart. You may be able to have several groups of children measure their body part at the same time. It is unlikely that all students will be able to measure the body parts at the same time. If so, allow the other students to use tiles to measure the length of objects in the classroom. The attached recording sheet can be used for measuring the length of objects. Students fill in the name of the unit at the top of the page and then write or draw a picture of the object they are measuring and write the number of units long that object is.
6. When all of the body parts have been measured, call students back together as a class and ask students to make some comparison statements. You may want to write a sentence frame on the board for them to use. (i.e., the arm is 30 tiles long, and the leg is 35 tiles long. The arm is shorter than the leg.)

Day 2

1. Show students the principal's outline and chart from the day before. Review the meaning of the terms *length* and *unit*. Explain that while yesterday they used tiles as the unit of measure, today they will use paper clips as a unit of measure. Ask: "*If we measure the length of the principal's arm with these paper clips, do you think we will get the same measure as we did with the tiles?*" "*Why or why not?*"
2. Call on a student to measure the length of the arm using paper clips. Ask the other students to watch for careful measuring. Record the measure on the chart and discuss using the following questions as a guide: "*Did we use the same number of paper clips as tiles?*" "*Why not?*" "*Why is the number of paper clips greater than/less than the number of tiles?*" "*Did the length of the arm change?*"
3. Similar to Day 1, group students and assign them a body part to measure with the paper clips. Record their answers on the chart. While some groups are measuring body parts, other students can measure the length of various objects in the classroom using paper clips as the unit of measure.

4. When all groups have measured their assigned body part, call students back together. Direct students to look at the chart. Have students turn and talk with a partner about what they notice and why they think the numbers are different.
5. Ask students, “Mr. Wade’s right hand is (e.g., five paperclips long, nine tiles long). Did the length of Mr. Wade’s hand change? Why or why not? What did change?” Allow for a class discussion and then select a few students to lay these two units on the floor side by side for comparison. Ask: “Are the units the same length?” “Why did we have a different number of units when we measured the hand?”
6. As on Day 1, ask students to make some comparison statements about the measures of two body parts.

Day 3

1. Repeat the process from days 1 and 2, but this time use craft sticks as the unit of measure. Prompt discussion by asking questions such as: “If Mr. Wade’s arm is 20 paper clips long, do you think he will be 20 craft sticks long, too? Why, or why not?” “How many popsicle sticks do you think it will take?” Measure the length of the arm together and then group students to measure the length of the other body parts using popsicle sticks.
2. When all groups have finished, discuss the data from the chart. Ask: “What do you notice about the measures using craft sticks?” “Why are all of the measures using craft sticks less than the tiles and paper clips?” “What if I used a pencil to measure the length of Mr. Wade’s arm?” “Would the number of pencils be greater than or less than the number of popsicle sticks?” “What if I told you that I needed a string that was 10 long? Would you know how long to make the string?” (Students need to realize that knowing the unit is just as important as knowing the number.)
3. Conclude the lesson by having students talk with a shoulder partner about what they have learned about measuring length.

Assessment

- **Questions**
 - What do you notice about the measurements we have made? Why do you think we have so many different measurements for the same length?
 - If we measured the length of your body using craft sticks, would it be the same as Mr. Wade’s? Why, or why not? Can you think of another person whose measurements might be close to Mr. Wade’s? Why?
 - If Greta measured Mr. Wade’s arm and found it was 18 paper clips long, and then Will measured Mr. Wade’s arm and found it was 23 paper clips long, could both of them be right? Why, or why not?
- **Journal/writing prompts**
 - Before measuring, estimate how many blocks long your foot is. After measuring, compare your estimate and the actual number of blocks it took to measure your own foot. Was your estimate too large or too small? Why?

- Find two objects in the mathematics or science center and measure their length, using cubes or craft sticks. Draw and write about the objects you measured.
- **Other Assessments**
 - Have students work in pairs to measure the length of the same object with different manipulatives as units. Have pairs explain why they recorded different measurements with each manipulative.
 - Observe as students are measuring. *Are they lining up units without any gaps or overlaps? Do they predict or estimate how many units it might be before beginning? Can they accurately record a measure? Do they communicate the need for telling the unit they are using?*

Extensions and Connections (for all students)

- Have students trace outlines of each other to measure with nonstandard units. These outlines may be rolled up and saved to be used for several days.
- Create a graph to show the data collected. Focus on one part of the body and graph the unit of measure. Discuss how the size of the unit will affect the quantity of that unit.
- Have students work in pairs to make a piece of clothing (i.e., shirt, pants, shoes) out of construction paper that will fit Mr. Wade. Have pairs share with the class the strategies they used to solve this measurement problem.
- Present a measuring length problem to the class, but only provide one copy of the unit. Encourage students to figure out a way they might measure how many units long something is without having multiple copies of the unit to repeat.

Strategies for Differentiation

- Pair students to assist each other with measuring tasks.
- Provide a sentence frame such as, “Mr. Wade is _____ (number of nonstandard units) tall.”
- Provide a poster with the body parts labeled as a reference for naming/spelling body parts.
- Allow students who have difficulty writing to dictate their ideas to the teacher.

Note: The following pages are intended for classroom use for students as a visual aid to learning.

Body Part Lengths
(Sample Recording Chart)

Body Part	Number of _____	Number of _____	Number of _____
Head			
Right Arm			
Left Arm			
Right Leg			
Left Leg			
Right Hand			
Left Hand			
Right Foot			
Left Foot			
Hips			

Name _____

Today I used _____ as the unit to measure the length of some objects. These are the things I measured.

Object	Measure