

# Body Part Measurements

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<b>Strand:</b>	Measurement and Geometry
<b>Topic:</b>	Estimating and measuring length in U.S. Customary and metric units.
<b>Primary SOL:</b>	4.8 The student will a) estimate and measure length and describe the result in U.S. Customary and metric units; c) given the equivalent measure of one unit, identify equivalent measures of length, weight/mass, and liquid volume between units within the U.S. Customary system

## Materials

- Inch ruler
- Centimeter ruler
- Meter stick
- Yardstick
- Tape measure
- Bulletin board paper or large sheets of paper
- Body Measurements Recording Sheet (with missing units) (attached)
- Estimated Body Measurements Chart activity sheet (attached)
- Body Measurements Chart activity sheet (attached)
- Gallery Walk Recording Sheet (attached)
- U.S. Customary Units of Length Equivalencies Chart (attached)
- Measurement Relationship Cards (U.S. Customary System) (attached)

## Vocabulary

*benchmarks, centimeters, distance, estimate, equivalent measures, feet, inches, length, measure, meters, metric system, miles, millimeters, unit, unit of measure, U.S. Customary system, yards*

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

*Note: Before Grade 4, students had opportunities to measure objects with measurement tools.*

1. Arrange students into pairs. Present students with a scenario similar to the following:

*The principal was fitted by a seamstress for a custom-fitted outfit, including shoes, to wear to a banquet where he/she will receive a Principal of the Year award. Body measurements were recorded using the seamstress' Body Measurements Recording Sheet. However, the seamstress forgot to write in the units she used to measure each body part! What are reasonable guesses for all of the missing units of length, given the recorded lengths for the principal's body measurements?*

Project the Body Measurements Recording Sheet with missing units or distribute to pairs. Allow students to work together for several minutes to make reasonable guesses

for each unit that could have been used for each recorded length. It may be necessary to stop students to discuss one or more of the following:

- At the top of the recording sheet, a U.S. Customary Units heading is noted on the left and a Metric Units heading on the right. What units are possibilities for each of these measurement systems?
  - What are some things to consider when deciding on a unit that would be reasonable, given the number representing the length? Which units are more reasonable for short distances? Long distances?
  - What are some common objects you can visualize that would represent one unit of a U.S. Customary measurement and one unit of a metric measurement?
2. Call students together for a discussion of their estimations. Using a large piece of bulletin board paper, a pencil, and a variety of length measurement tools, create a life-size representation of the principal. Discuss each measurement listed on the recording sheet. Work together as a class to select a reasonable unit and appropriate measuring tool to find the actual measurement for each listed part in both U.S. Customary units and metric units. During this discussion, begin considering that some measurements may have more than one appropriate unit that could be used and connections between equivalent measures may be made.
  3. Keep student pairs, but now merge two pairs into one group of four students. Explain to students that they are going to be determining real-life measurements for a similar list of body parts, and then will use these measurements to create their own life-size representation on craft paper. Distribute a double-sided copy of the Body Measurements Chart. Point out to students that there are three “choice” measurements they can make, from the list of choices at the bottom of the chart. Ask groups to read through the list of measurements they will have to perform. After allowing groups to read through the measurements, answer any questions students may have.
  4. Distribute a variety of measurement tools to each group. Have groups fairly determine which group member will be measured (one of the members may volunteer). Students then work together to pick a body part length, determine an appropriate unit of measure for the body part length, make an estimate for the measurement, then measure the actual body part length of the group member. Remind students there needs to be a measurer, checker, and recorder, and remind students of what appropriate behavior during the activity sounds like and looks like. Monitor students as they complete this task for each of the listed body lengths and record a reasonable estimate for each length on side 1 of the Estimated Body Measurements Chart as well as side 2 (Body Measurements Chart). While students work, be sure to intervene if units selected are not reasonable or if students need remediation of use of measurement tools. Encourage group members to measure as accurately as possible, with two group members having a chance to measure each body part and members conferring after each measurement to ensure there is consensus.
  5. As student groups finish their estimates and actual measurements, provide them with their large pieces of bulletin board paper. Allow them to create a life-size pictorial representation using the measurements. Remind students that the pictorial

representation should include labels for the U.S Customary and metric lengths for each measurement in the chart, including units. Allow students flexibility in how they represent their measurements in their artifacts while ensuring their measurements and labels are accurately drawn. Some students may choose to draw two different models, one with their U.S. Customary measurements and one with their metric measurements.

6. Extend this work to finding equivalencies. Hang the student artifacts. Have students engage in a focused gallery walk. Give each group of students a Gallery Walk Recording Sheet. Gallery walk questions include:
  - a. Which classmate’s foot has a measurement that is closest to 1 foot in length? How do you know?
  - b. Which classmate’s height is closest to 1 yard in length? How do you know?
  - c. If all classmates who were measured laid down in a line head to toe, how many total yards would the distance be? How far away in yards would this distance be from a mile?

Instruct students to travel from poster to poster in search of a measurement to answer the gallery walk questions. Have students use measurement tools, mental mathematics, scaling up or scaling down, calculators, and other methods to determine the measurement equivalencies embedded in the questions. After group work is complete, discuss solutions with all students. The discussion should include modeling how to determine equivalent measurements using measurement tools and the unit equivalencies on the U.S. Customary Units of Length Equivalencies Chart .

7. Bring students back together into a whole group. Ask students to share their solutions to the gallery walk questions. Use the questions to move students into making generalizations about equivalent lengths in inches, feet, yards, and miles. Throughout the discussion, create an anchor chart to note student discoveries, which can be used in future work with U.S. Customary equivalent measures.
  - a. The classmate’s foot with a measurement closest to 12 inches is closest to 1 foot because 12 inches is the same length as 1 foot. Show students a standard 12-inch ruler as a benchmark for remembering the size of 1 foot.
  - b. The classmate’s height with a measurement closest to 1 yard in length is closest to 3 feet, or 36 inches. Show students a standard yardstick as a benchmark for remembering the size of 1 yard. Use three standard rulers laid end to end to model how the lengths of 3 feet, or 36 inches, are equivalent to 1 yard. When all the classmates are laid head to toe in a line, confirm the total distance in yards by having several or all groups share their calculations and calculation methods. Some students may know the unit conversion of 1 mile equals 1,760 yards and may be able to determine the difference of the total length of students in yards and 1 mile in yards. If no one knows the unit equivalency for yards and mile, share the unit conversion with students and have them turn and talk with a partner to determine this difference.

### Assessment

- **Questions**
  - What tool was best for measuring the length of a classmate’s arm? Why?

- What tool was best for measuring the distance around a classmate’s forehead? Why?
- For what body measurement(s) was millimeters a reasonable unit? Was using centimeters also reasonable for any of these measurements? Why, or why not?
- What measurement equivalents were discovered and/or discussed between inches, feet, and yards? Yards and miles?
- How many inches would be equivalent to 2 feet? 2 yards? Explain your problem solving.
- **Journal/writing prompts (include a minimum of two)**
  - For which body part did you and your group have a difficult time deciding which unit of measurement was most reasonable to use? Why was the decision difficult?
  - Name several objects where it may be best to use a tape measure instead of a ruler or yardstick to measure length. Explain why for each object.
  - Explain whether or not each statement below is true or false. Correct any statements that are false.
    - 2 feet is equivalent to 24 inches
    - 9 feet is equivalent to 2 yards
    - One-half mile is equivalent to 1,760 feet divided by 2
- **Other Assessments (include informal assessment ideas)**
  - Set up stations around the room for students to determine the most appropriate unit of length to use to measure a given attribute of the object (i.e., What is the length of the shortest side of a piece of loose-leaf paper? Use a metric unit of length.). Then have students make an estimate of the length in their unit of choice. Next, have students use a measurement tool to find the actual length. Finally, have students write a statement comparing their estimate to the actual length, discussing how they were able to estimate accurately or what they learned from not estimating accurately after the object is measured.
  - Have students go on a scavenger hunt as part of a measurement project they can do both at home and at school. Assess students for reasonableness of the items and/or distances they choose to measure.
  - Have students write several true/false equivalency statements and justify whether they are true or false.

**Extensions and Connections (for all students)**

- Have students use red, white, and blue for the U.S. Customary side and another country’s colors for the metric side. If there are students from other countries in your class, this would be a nice way to acknowledge their heritage.
- Discuss symmetry with students, and ask whether their stick figures would be symmetrical if they used U.S. Customary units or metric units to measure both sides of the body and compared the measurements.

- Have students use the attached Measurement Relationship Cards as a memory game to find equivalent measures within the U.S. Customary system.
- Ask students to keep a unit-of-measurement log for a week. As they go about the daily school (including textbooks, etc.) and home life (sports, shopping, etc.), record situations/objects where measurement is involved and whether the measurement is in U.S. Customary or metric units.

### **Strategies for Differentiation**

- Extend this activity to a multiday activity, having students explore length measurements in U.S. Customary units in separate experiences than when exploring metric measurements.
- Label measuring tools as either U.S. Customary or metric.
- Provide a list of metric units of measure and a list of U.S. Customary units of measure that students may reference at any time.
- Provide a variety of length measurement tools for students to use when measuring to various fractions of one inch, or when measuring to the nearest centimeter or meter. Tools may be used more successfully if only one unit is displayed on a given tool (i.e., a ruler with U.S. Customary units that displays increments only in  $\frac{1}{8}$  of an inch).

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

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## Body Measurements Recording Sheet

Name of Client: \_\_\_\_\_ Date of Fitting: \_\_\_\_\_

### U.S. Customary Measurements

Distance around forehead;  
just above the eyebrows:  
\_\_\_\_\_

Length of neck:  
\_\_\_\_\_

Distance around neck:  
\_\_\_\_\_

Distance from top of  
shoulder to waist:  
\_\_\_\_\_

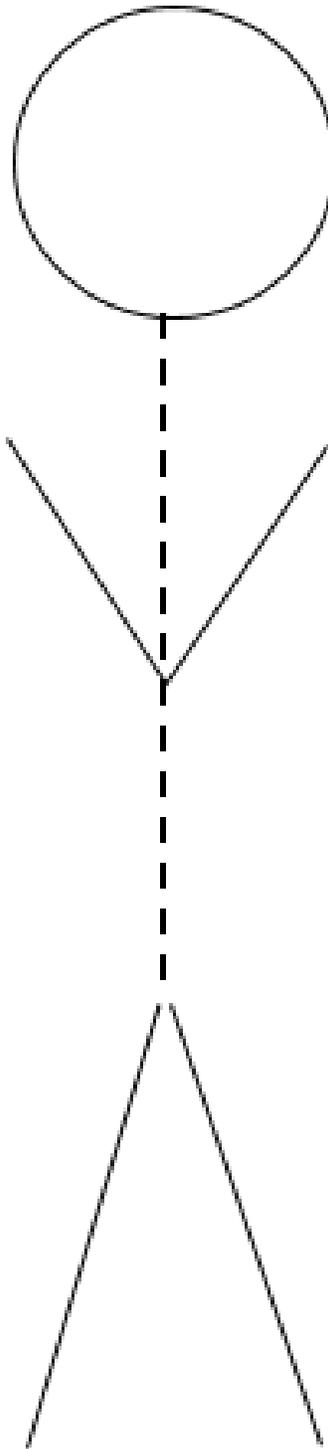
Length of longest finger:  
\_\_\_\_\_

Distance from shoulder to  
wrist:  
\_\_\_\_\_

Distance around the top of  
the arm (the bicep):  
\_\_\_\_\_

Length of leg from hip to  
ankle:  
\_\_\_\_\_

Length of foot from end of  
big toe to back of heel:  
\_\_\_\_\_



### Metric Measurements

Distance around forehead;  
just above the eyebrows:  
\_\_\_\_\_

Length of neck:  
\_\_\_\_\_

Distance around neck:  
\_\_\_\_\_

Distance from top of  
shoulder to waist:  
\_\_\_\_\_

Length of longest finger:  
\_\_\_\_\_

Distance from shoulder to  
wrist:  
\_\_\_\_\_

Distance around the waist  
just below the navel:  
\_\_\_\_\_

Length of leg from hip to  
ankle:  
\_\_\_\_\_

Length of foot from end of  
big toe to back of heel:  
\_\_\_\_\_

## Estimated Body Measurements Chart

Group Members: \_\_\_\_\_

U.S. Customary Measurements		Metric Measurements	
Distance around forehead (just above eyebrows)		Distance around forehead (just above eyebrows)	
Length of neck		Length of neck	
Distance around neck		Distance around neck	
Distance from top of shoulder to waist		Distance from top of shoulder to waist	
Length of longest finger		Length of longest finger	
Distance from shoulder to wrist		Distance from shoulder to wrist	
Distance around the upper arm (the bicep)		Distance around the upper arm (the bicep)	
Length of leg from hip to ankle		Length of leg from hip to ankle	
Length of foot from end of big toe to back of heel		Length of foot from end of big toe to back of heel	
Length from top of head to bottom of foot		Length from top of head to bottom of foot	
<b>CHOICE MEASUREMENTS</b> <i>(Choose three or more)</i>		<b>CHOICE MEASUREMENTS</b> <i>(Choose three or more)</i>	
Width of pointer finger fingernail		Width of pointer finger fingernail	
Length of right ear		Length of right ear	
Total body height (in feet)		Total body height (in feet)	
Length of left eye		Length of left eye	
Length of one nostril		Length of one nostril	
Length of shortest toe		Length of shortest toe	

## Body Measurements Chart

Group Members: \_\_\_\_\_

U.S. Customary Measurements		Metric Measurements	
Distance around forehead (just above eyebrows)		Distance around forehead (just above eyebrows)	
Length of neck		Length of neck	
Distance around neck		Distance around neck	
Distance from top of shoulder to waist		Distance from top of shoulder to waist	
Length of longest finger		Length of longest finger	
Distance from shoulder to wrist		Distance from shoulder to wrist	
Distance around the upper arm (bicep)		Distance around the upper arm (bicep)	
Length of leg from hip to ankle		Length of leg from hip to ankle	
Length of foot from end of big toe to back of heel		Length of foot from end of big toe to back of heel	
Length from top of head to bottom of foot		Length from top of head to bottom of foot	
<b>CHOICE MEASUREMENTS</b> <i>(Choose three or more)</i>		<b>CHOICE MEASUREMENTS</b> <i>(Choose three or more)</i>	
Width of pointer finger fingernail		Width of pointer finger fingernail	
Length of right ear		Length of right ear	
Total body height (in feet)		Total body height (in feet)	
Length of left eye		Length of left eye	
Length of one nostril		Length of one nostril	
Length of shortest toe		Length of shortest toe	

## Gallery Walk Recording Sheet

**Group Members:** \_\_\_\_\_

Which classmate's foot has a measurement that is closest to 1 foot in length? How do you know?

Which classmate's height is closest to 1 yard in length? How do you know?

If all of the classmates who were measured laid down in a line head to toe, how many total yards would the distance be? How far away in yards, would this distance be from a mile?

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If all of the classmates who were measured laid down in a line head to toe, how many total yards would the distance be? How far away in yards, would this distance be from a mile?

**U.S. Customary Units of Length Equivalencies Chart**

12 inches	1 foot
36 inches	1 yard
3 feet	1 yard
1,760 yards	1 mile

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### Measurement Relationship Cards (U.S. Customary System)

12 in.	1 ft.	3 ft.	1 yd.
36 in.	1 yd.	1,760 yd.	1 mile
48 in.	4 ft.	15 ft.	5 yd.
72 in.	2 yd.	84 in.	7 ft.