General Materials and Supplies:	Index cards		
Laptop, Projector, Power Cord	*What's the Measure* Handout	Bags of marbles	Bags of beans
Large Sponges	Dish cloths	Paper plates	Straws (not flexible)
Measuring tapes	Rulers	Yardsticks	2 cup measuring cups
Spring scale	Calculators	Masking tape	Graph paper
Markers	Chart paper	Buckets (or dish pans)	Station Direction Cards

Slide	Tasks/Activity	Personal Notes
PARTNERS for Mathematics Learning — Grade 6 Module 4	**(slide 1) Module 4** This module focuses on problem-solving with an emphasis on measurement and statistics. Note to leaders: you must have the measurement stations introduced in slide 4 set up before beginning this workshop.	
What's the Measure?	**(slide 2) What's the Measure?** "In spite of how regularly we use measurement, results of national and international assessments indicate that U.S. students of all ages are significantly deficient in their knowledge of measurement concepts and skills." *Math Matters Grades K-8 Understanding the Math You Teach* *What is the role of the teacher in helping students understand measurement?* • Students need opportunities to measure • Students need to feel, touch, and see measurement in action • Students need to experience using the multiple tools to measure	
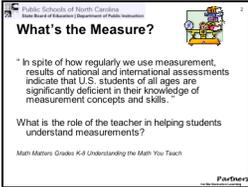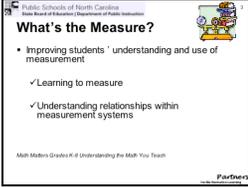
What's the Measure?	**(slide 3) What's the Measure?**
	Share the following information with participants.
	Improving students' understanding and use of measurement
	• Learning to measure
	  1. Select an attribute
	  2. Choose an appropriate unit of measurement
	  3. Determine the number of units (usually with a tool)
	• Understanding relationships within measurement systems
	  1. Investigations that require measurements	

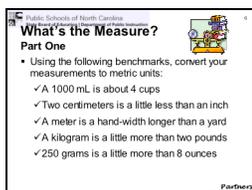|		
	2. Make measurement meaningful *Math Matters Grades K-8 Understanding the Math You Teach* Ask participants where their students have difficulty with measurement.	
	(slide 4) **What's the Measure?** <u>Preparing Ahead of Time</u> Set up the 6 stations ahead of time. Place measurement direction cards at each station. Charts/graphs for recording data need to be made ahead of time. Ask participants to get out the *What's in the Measure?* handout (Module Four, Handout One). Discuss the procedures for each station with the participants. Next, explain the procedures for Part Two: PCAI Model. Ask groups to choose a set of data and pose a question that can be answered from the class data. **P**ose a question example: If your class had the opportunity to win $10,000 in technology by throwing a paper plate exactly 10 feet, would your class get the $10,000 in technology?	
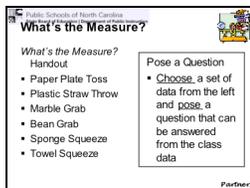
	(slide 5) **What's the Measure? Part One**
	Let's estimate!
	   • On each table, have a straw, paper plate, marble, bean, sponge, and towel. Give the participants an opportunity to estimate what they think the measurements might be as listed on the handout.
	     -The weight of a handful of marbles
	     -The weight of a handful of beans
	     -The distance that you can throw the paper plate
	     -The distance that you can throw a straw
	     -The amount of water that can be squeezed out of full sponge (1 squeeze)
	     -The amount of water that can be squeezed out of a full towel (I squeeze)
	Let's measure!
	   • In a group of four, proceed to each station and follow the set of directions. Assign each group their first station.	
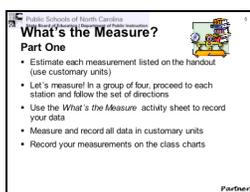
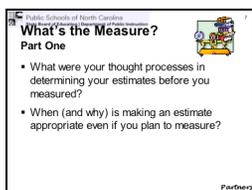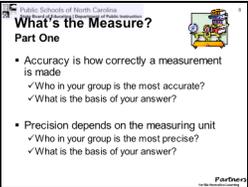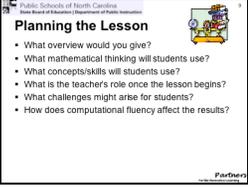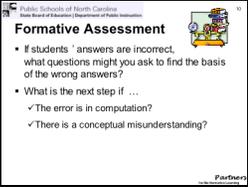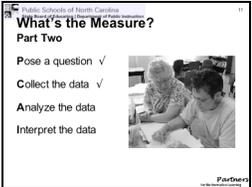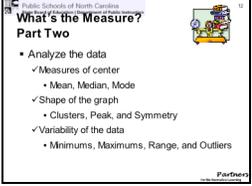|		
	• Use the "What's the Measure" activity sheet to record your data. • Measure and record all data in customary units • Record your measurements on the class charts	
What's the Measure? *Part One* • Using the following benchmarks, convert your measurements to metric units: ✓A 1000 mL is about 4 cups ✓Two centimeters is a little less than an inch ✓A meter is a hand-width longer than a yard ✓A kilogram is a little more than two pounds ✓250 grams is a little more than 8 ounces	(slide 6) **What's the Measure? Part One** Once participants have estimated and collected their measurements, ask them to proceed to the converting column on the handout. Using the benchmarks on this slide, have participants convert their customary measures to metric units. Remind participants that these results are estimates, not exact conversions. • A 1000 mL is about 4 cups • Two centimeters is a little less than an inch • A meter is a hand-width longer than a yard • A kilogram is a little more than two pounds • 250 grams is a little more than 8 ounces *Examples:* Using the benchmarks, let's say one participant squeezed about 1 cup of water, this would be approximately 250mL. A participant throws a paper plate 10 feet; this is about 3 meters. A participant grabs 6 ounces of beans this is about 180 grams. Important to note that having good number sense is essential to estimating conversions from customary to metric.	
What's the Measure? *Part One* • What were your thought processes in determining your estimates before you measured? • When (and why) is making an estimate appropriate even if you plan to measure?	(slide 7) **What's the Measure? Part One** *What were your thought processes in determining your estimates <u>before</u> you measured?* • I know a 5 lb bag of sugar weighs this much, so I knew the marbles were about a fifth of that. • I knew the paper plate was light, so I thought I could only throw it 2 feet. • Answers will vary. *When and why is making an estimate appropriate even if you plan to measure?* Answers will vary.	

(slide 8) **What's the Measure? Part One** • *Accuracy is how correctly a measurement is made.* *Who in your group is the most accurate?* (Participants will share experiences from measuring.) Example: Lining up the "zero" on the measurement tool with the beginning of the object *What's the basis of your answer?* • *Precision depends on the measuring unit* *Who in your group is the most precise?* (Participants will look at the measurement unit.) Example: Who measured to the nearest inch? Who measured to the nearest quarter of an inch? *What's the basis of your answer?*	
(slide 9) **Planning the Lesson** Ask participants to talk with a partner and respond to the questions that are on the slide. *What overview would you give students if you were going to use this activity?* *What mathematical thinking will students use?* *What concepts/skills will students use?* *What is the teacher's role once the lesson begins?* *What challenges might arise for students?* *How can does computational fluency affect the results?*	
(slide 10) **Formative Assessment** Ask participants to share their ideas about the following with the whole group. *When students' answers are incorrect what questions might you ask to find the basis of the wrong answers?* *What is the next step if …* *-The error is in computation* *-There is a conceptual misunderstanding*	

	(slide 11) **What's the Measure? Part Two** Statistics educators complain that traditionally, mathematics educators inappropriately remove the context from statistics problems. Meaning, statistical investigations begin with posing a question and collecting the data as you have just done. The investigation does not begin with calculating a mean. ***Pose a question √*** ***Collect the data √*** ***Analyze the data*** ***Interpret the data***	

	(slide 12) **What's the Measure? Part Two**
	Analyze the data: revisit the question posed at the beginning.
	Choose the appropriate set of data to analyze: paper plate data would be used to answer the example question.
	
	    ✓ *Measures of center*
	        • *Mean, Median, Mode*
	    ✓ *Shape of the graph*
	        • *Clusters, Peak, and Symmetry*
	    ✓ *Variability of the data*
	        • *Minimums, Maximums, Range, and Outliers*
	
	Create a line plot, bar graph, histogram, or stem-and-leaf plot to display your data. (You may want to assign groups a type of graph or give them the choice of which graph to use. You might also suggest that a group create two different graphs for their data.)
	After creating the graph ask participants to find the characteristics of their data that were listed on this slide and to write a statement that explains why they chose (if you let them choose) their particular representation of their data.	
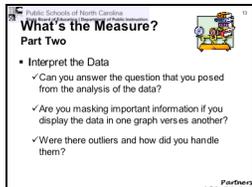
	(slide 13) **What's the Measure? Part Two**
	Give participants a few moments to prepare responses to the questions on this slide. Then have each group share their thoughts.
	
	Interpret the Data
	   ✓ *Can you answer the question that you posed from the analysis of the data?*
	
	   ✓ *Are you masking important information if you display the data in one graph verses another?*
	
	   ✓ *Were there outliers and how did you handle them?*	

(slide 14) **What's the Measure? Part Two**

Why is it important to allow students the opportunity to choose how they display their data verses telling them what to do? Why is it important for students to see different representations of the data?
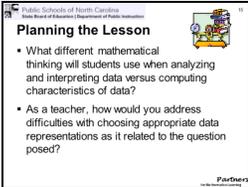
- Students need to make decisions and think about those decisions. Which graph best suits the data?
- Students might choose a graph that mask important data, however this produces good discussion.
- Students have a better analysis and interpretation of graphs used in the media.
- Students need to make their own graphs, in order to interpret graphs and use them for problem-solving.
- Students become better problem-solvers and risk takers.
-

Which Big Ideas was the focus of this activity? Which Essential Standards?
- The attribute to be measured determines the unit and the tool
- Measurements are estimates; the more precise the tools/units, the closer one can get to the actual measure
- Measurements are accurate to the extent that the appropriate units/tools are used properly
- Collection, analysis, and interpretation of univariate data are used to make decisions and solve problems
- Statistical investigations are completed through a process that includes posing a problem, collecting and analyzing data, and interpreting results

May want to discuss with participants classroom management during this activity.
- Parent volunteers
- E.C. teachers and other staff members
- Integrate with the science teacher
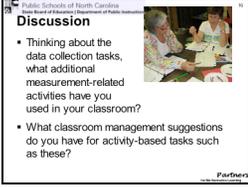
Public Schools of North Carolina — State Board of Education | Department of Public Instruction — 15 **Planning the Lesson** • What different mathematical thinking will students use when analyzing and interpreting data versus computing characteristics of data? • As a teacher, how would you address difficulties with choosing appropriate data representations as it related to the question posed? *Partners*	(slide 15) **Planning the Lesson** *What different mathematical thinking will students use while analyzing and interpreting data verses computing characteristics of data?* Answers will vary. Computing characteristics of data such as mean, median, and mode can be done by knowing and applying the appropriate algorithm. Analyzing and interpreting data involves choosing and synthesizing data characteristics such as the most appropriate measure of center, the shape of the data and the variability of the data, as these things relate to the question posed. *As a teacher, how would you address difficulties with choosing appropriate data representations as it relates to the question posed?* Answers will vary.
Public Schools of North Carolina — State Board of Education | Department of Public Instruction — 16 **Discussion** • Thinking about the data collection tasks, what additional measurement-related activities have you used in your classroom? • What classroom management suggestions do you have for activity-based tasks such as these? *Partners*	(slide 16) **Discussion** Ask participants to share their ideas with the whole group. *Thinking about the data collection tasks, what additional measurement-related activities have you used in your classroom?* *What management suggestions do you have for activity-based tasks such as these?*
Public Schools of North Carolina — State Board of Education | Department of Public Instruction **Reflection** • Think about: How are tasks such as today's professional development rich, rewarding, and revealing? • On the index card provided, write a message to yourself: ✓ Three ways I can make my mathematics lessons more student-engaging *Partners*	(slide 17) **Reflection** Ask participants to think about the first question, but then to place their response to the second question in their lesson plan books. *Think about: How are tasks such as today's professional development rich, rewarding, and revealing?* *On the index card provided write a message to yourself:* *Three ways I can make my mathematics lessons more student-engaging*
	(slides 18-21) **Credits for project and closing slides**