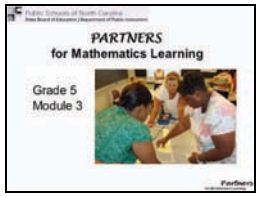
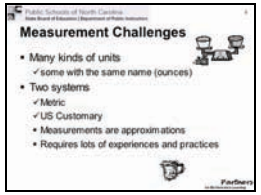
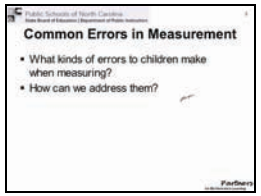
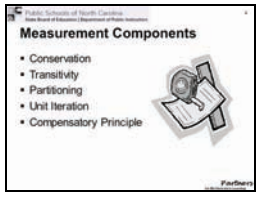
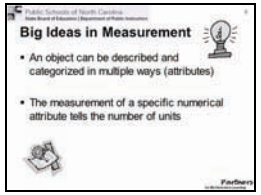
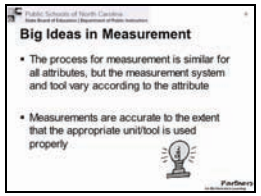
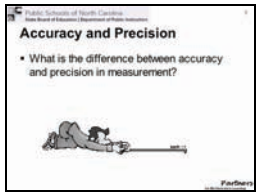
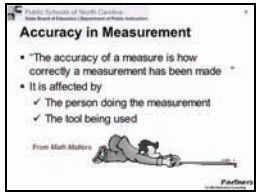
General Materials and Supplies:

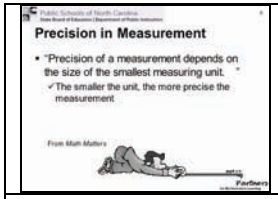
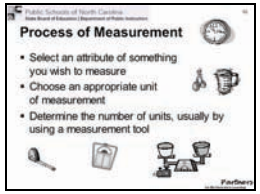
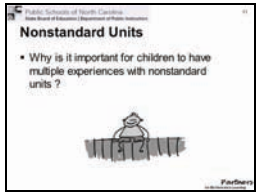
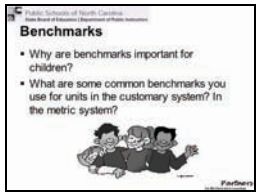
1 cm cube, 10s rod, and meter stick per group	1 set of 50-60 square tiles per group
Pattern blocks (See Handout 11, Tiling the Floor)	12 x 18 paper
Set of	
Assignment cards	

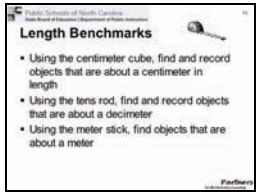
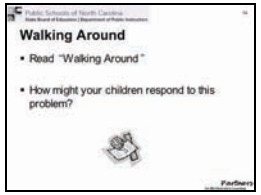
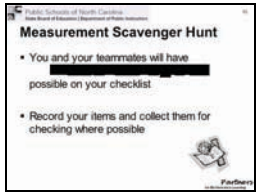
See Scavenger Hunt Handout. Each group will need ruler, measuring tape, and/or yard sticks meter sticks. Depending on time, 5-gram weight, ½ pound weight, 2-pound weight, balance, quart container, etc. may be needed.

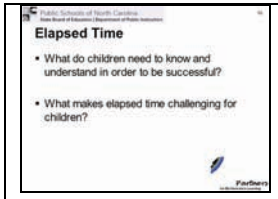
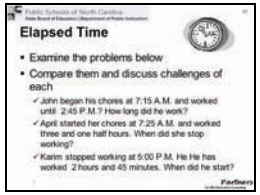
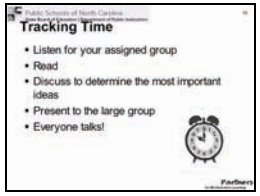
Slide	Tasks/Activity	Personal Notes
	(Slide 1) **Partners Grade 5 Module 3** Measurement; Explain to participants that the fifth grade measurement module has a different approach. Much of the work on measurement is embedded in problem solving activities of varying levels of complexity and structure. <u>If grades 4 and 5 are being presented together, skip to slide 11.</u> With the title slide open, ask participants to take 5 minutes to look through the measurement section of the Essential Standards for 4th and 5th grades and to look briefly back at 3rd grade to see what children coming into 4th grade will have been expected to learn. After spending no more than 5 minutes looking through the Essential Standards, tell participants that we will not formally stop to look at these standards during the module as we have a lot to cover, but to keep them in mind as we work through the module. Then tell them to think about the process standards as you go through this module and to look for problem solving, reasoning and proof, connections to other strands, representations, and opportunities for communication. Remind participants that in spite of how regularly we use measurement, results of local, state, national, and international assessments indicate that students of all ages are significantly deficient in their knowledge of measurement concepts and skills. Ask participants to think about the challenges their students face in measuring, some ideas are offered on the next slide.	

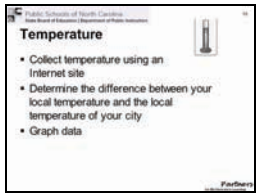
	(Slide 2) **Measurement Challenges** Review the listed reasons if not mentioned with previous slide. Next slide addresses common errors.	
	(Slide 3) **Common Errors in Measurement** Brainstorm a list of common errors children make when measuring. Some possible answers include using the wrong unit, difficulty with a leading edge, improper iteration (overlapping units or placing finger between spaces), counting the units incorrectly, etc We can address them by providing children with multiple opportunities to practice the process of measurement.	
	(Slide 4) **Measurement Components** Have participants work at their table to tell what each is and an example of how each might be encountered in measurement. Then have them share. <u>Conservation:</u> Objects maintain their same size or shape when measured (a string wadded up is the same length it was when stretched out / 8 ounces of water remains 8 ounces whether poured into a tall thin beaker or a short "rotund" beaker) <u>Transitivity:</u> two objects can be compared in terms of a measureable quantity using a third object (using a string to see if one table is longer than another) <u>Partitioning:</u> larger units can be subdivided into smaller equivalent units (yard can be divided into feet, inches) <u>Unit Iteration:</u> the same unit can be repeated to determine a measure (When measuring a desk, one can use a ruler over and over, by picking it up and carefully laying it down again.) <u>Compensatory Principle:</u> There is a relationship between size of the unit and the number of units needed. (The larger the unit, the fewer needed; the smaller the unit the more needed) Ex. When doing conversions such as feet to yards.)	

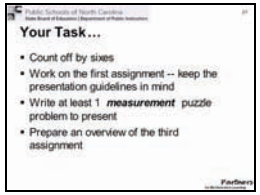
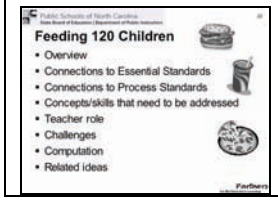
	(Slide 5) **Big Ideas in Measurement** Briefly review the Big Ideas presented last year. Attributes are descriptors/criteria/characteristics. Some of those attributes are measureable. Children need to first identify the attribute they wish to measure---height, mass, length, capacity. When we measure, we are assigning a specific number of units (centimeters, pounds, miles etc.) related to the attribute of the object we are describing.	
	(Slide 6) **Big Ideas in Measurement** After determining the attribute, measurement system and tool are selected. Reiterate that children need lots of practice making these decisions. Note that units can be partitioned into smaller and smaller units.	
	(Slide 7) **Accuracy and Precision** Pose the question; have a brief discussion and then move to the next 2 slides.	
	(Slide 8) **Accuracy in Measurement** Go over the information on the slide. Review previous information on types of errors children may make such as leaving holes or gaps as they measure. The tool itself may cause inaccuracy, such as a scale that is improperly balanced or a broken timer.	
	(Slide 9) **Precision in Measurement** Go over the slide and ask participants to give an example to demonstrate precision. (Measuring length of a table in centimeters would be more precise than measuring it in meters)	

		
	(Slide 10) **Process of Measurement** Note that this is a multi-step process rather than a series of isolated skills. Students need to be clear about what they want to measure (the object's attribute). Objects have many attributes, some of which are measurable. Attributes such as size, weight/mass, volume, and height are measurable but attributes such as color, shape, texture, etc are not measurable.	
	(Slide 11) **Nonstandard Units** In the primary grades teachers work with attributes and non-standard units of measurement. Discuss the importance of using non-standard units (focuses on the measurement process). Overlapping units, leaving gaps between units, lining up the beginning of the first unit with the beginning of the object are addressed as well as iteration, conservation, compensatory principle, and partitioning. Mention that in grade 4, nonstandard units are used to develop the concept of area and perimeter. In addition, nonstandard units will be used in grade 5 to develop understanding of a degree as a unit of measurement of the size of an angle. Focus in both cases is on understanding the concept and the process of measuring.	
	(Slide 12) **Benchmarks** (If doing grades 4 and 5 together, begin here for 5th.) A benchmark is a familiar item that becomes a referent or way to remember the size of a unit. Be sure to bring out the following points: •Measurement sense demands that students are familiar with commonly used units. This enables them to choose appropriate tool and unit during the measurement process. •Students need to use objects they are familiar with and see on a daily basis as their benchmarks. •Benchmarks help children estimate more accurately. They can provide children with a sense of	

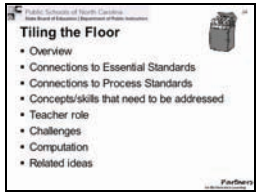
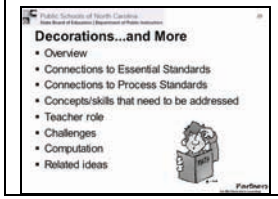
	how metric and customary relate. Have participants briefly share the importance of benchmarks and the benchmarks they use. Direct participants to the "Personal Benchmark" handout.	
	(Slide 13) **Length Benchmarks** (If doing grades 4 and 5 together, skip this slide.) Record on personal benchmarks handout. Share results. Ask how they made their choices for benchmarks. While this may have been done in grade 4, children need to re-establish benchmarks. They may need to repeat this activity for customary units.	
	(Slide 14) **Walking Around** Direct participants to read the handout and discuss how children might approach this problem.	
	(Slide 15) **Measurement Scavenger Hunt** Divide participants into teams and distribute the scavenger hunt sheet from handouts and needed measurement tools. When participants have had some experience with the activity, debrief. Allow about 5-10 minutes for individuals to share their items and their rationale for their selection. Note when doing this with children, teachers will need to make decisions about whether to set a time limit and whether the children will have to collect the actual items or identify/describe them. They will also need to determine how and when to verify the measurements. Note that the teacher should observe students during this activity to gain insight into understandings about the relative size of the units and the measurement process in order to guide instruction.	
	(Slide 16) **Elapsed Time**	

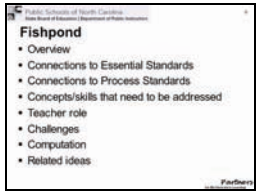
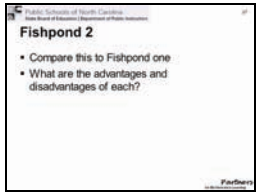
	Begin by asking participants to tell some prerequisites for teaching elapsed time. (Children need to know how many minutes in an hour, the intervals on the clock and what the numbers represent, AM and PM, etc. These should not be paper and pencil computation.) Next, briefly discuss the challenges--- It is multistep. Children need to track minutes both before and after the hour. They also must deal with A.M. and P.M. and counting the intervals. There are different types of problems…the next slide addresses challenges.	
	(Slide 17) **Elapsed Time** Ask participants to read and compare the problems on the slide. #1 The start and end time are given. Children are asked to determine the time passed between the two; an understanding of AM and PM is needed. #2 The start time and the time elapsed are given. Children are asked to find the end time. # 3 Children are asked to find the start time when given the elapsed time and the end time. Ask participants to solve each problem. As they solve, check for the ways they did it. Have strategies shared briefly.	
	(Slide 18) **Tracking Time** Refer participants to the article in the handout titled "Tracking Time" from *Teaching Mathematics*. Tell them this article provides in depth information about elapsed time, actual student thinking, and strategies that children may use. Trainers: Allow participants to read but remember to collect copies. Have the participants count off by 6s and move to common locations. Assign the following to be read by groups and discussed to determine the most important ideas. Tell them that the group will present a summary of their assigned reading but that each member of the group is to speak. Let them know that paper or board may be used to show examples. Group 1 The introduction and Open Number Lines Group 2 Addition Group 3 Subtraction Group 4 Determining Elapsed Time Group 5 Determining end time from start and elapsed times Group 6 Determining start time from end and elapsed times	

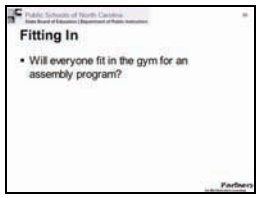
	Early finishers may continue to read the remainder of the article It is *important* to stress that our task is not to provide direct modeling for the different strategies. It is to listen to and help children build on their understandings and expose them to multiple approaches through classroom conversation.	
	(Slide 19) **Temperature** Direct participants to the handout titled "Temperature Activity". Briefly go over the activity. Ask what modifications they might make in this activity and for other activities they have found to be successful in teaching the concept of temperature.	
	(Slide 20) **Farewell to Fifth Grade…** Explain that a problem solving approach has been used for the grade 5 measurement module. The handouts contain several activities around the theme of planning an end of year celebration. The activities incorporate measurement as well as integrating other mathematics. They could be spread out over the course of the school year and supplemented with additional teacher-made activities. They may be used as written or modified to meet the needs of the children. The included activities work on refreshments, decorations, room arrangements, a time schedule etc. Explain that mini lessons will be needed to support student learning. For example, instruction is needed prior to the activity involving surface area, Some participants may relay that the topic of an end of year celebration is not appropriate. Most activities can be presented as class problem solving. They can easily be modified to fundraising activities for a charity, for the school or revised to fit into as class reward system. Example scenario: The class has been hired as mathematicians. As they solve the problems, they earn "class bucks" towards a reward such as a game day, extra recess, fun Friday, etc. Another idea is for the class to be "paid" in token money to see if they can earn one million dollars in math. The class would earn money for problems solved, having homework done, bonuses for extraordinary thinking, etc. Briefly review the topics on the slide, explaining that there are one or more handouts to accompany each topic.	

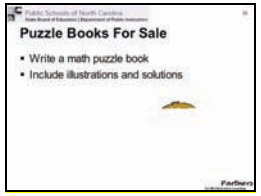
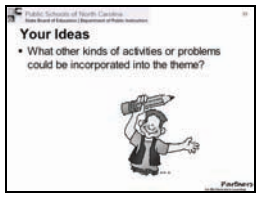
	(Slide 21) **Your Task…** Have the participants count off by 6s to form groups. Explain that time does not allow each of the tasks in this module to be completed in depth so the tasks are going to be divided among the 6 groups. Give one assignment card to each group and have them find the handout for their first task and the one entitled "Guidelines for Problem Presentations". Review the information on the slide (It is also on their card.), stressing the following: Their primary task is to work on their first assigned problem, actually completing some or most of the problem(s) and to prepare a presentation to the group using the "Guidelines for Problem Presentation". The second task for every group is to write at least one measurement puzzle following the procedure on the handout "Math Puzzle Book", and their third task is to review another task, preparing a brief overview of it. (Note that some of the groups have the same task for their third assignment. (Groups 1 and 2 and then groups 3 and 4) that the clues written for the puzzle problems should be related to measurement. Let them know they will have about 5-7 minutes of time for their presentations of the 3 tasks on their cards. <u>Leaders:</u> It is important to circulate and provide guidance and feedback to the groups as they work. Review the leader notes that accompany the slides that follow. They provide information to guide your conversations with the groups as they work as well as during the group presentations. You will also need to monitor the time. When 10 minutes are left, suggest they write their measurement puzzle problem and look over their third task if they have not done so yet in order to be ready for their presentations. The slides that follow may be used as the groups present. Important points are in the leaders' notes to help you as the groups work and present.	
	(Slide 22) **Feeding 120 Children** Below are some important points that are to be made during the discussion of the task. As the groups work on their card assignments, use the information where possible to guide their discussion. If they do not make these points during their presentation, you may want to bring them up.	

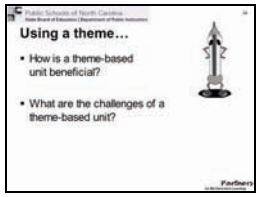
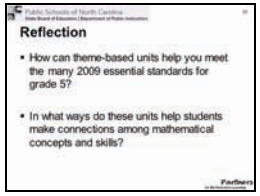
	1. Let participants know that this activity is designed to be done in groups and can vary in complexity. For example, other food items could easily be added or children could conduct a survey of food items and use a collected data rather than the data provided. The Internet could then be used to obtain food prices. 2. It would be good to discuss the first problem. Note that there are multiple approaches to solving it. Sometimes proportional reasoning may be used. For example, students may recognize the patterns in cost of the hot dogs. Students will reason that if 8 cost $2.99, then 16 will cost $5.98, 24 will cost $8.97 and 32 will cost $11.96. Others will reason that 32 is 4 times as large as 8, so 4 X 2.99 is $11.96. Others may use a cost per unit approach, reasoning that 1 would cost $2.99 divided by 8 = $.37375 which they may round to $.37. However, 32 X .37 is $11.84, which is a different answer. Emphasize that discussion of the methods used by students is critical. It provides opportunities for children to see different approaches, to communicate their ideas, and to develop flexibility. Should different approaches not be used, it is worth presenting these as ways you have seen other children work. 3. The teacher's role as the students work on problems like this becomes that of a listener, an observer, and a questioner, gathering critical information to guide future instruction. Teachers will encounter different student approaches to solving these problems and can the select strategies for sharing.	
	(Slide 23) **Banquet Room** Below are some important points that are to be made during the discussion of the task. As the groups work on their assignments on the cards, use the information where possible to guide their discussion. If they do not make these points during their presentation, you may want to bring them up. 1.When doing this with children, there needs to be a purposeful discussion about what happens to the number of tables needed as tables are pushed together and why it happens. Discuss how they might help students understand this. (Using manipulatives so children can see that while 1 table seats 4—perimeter, when the tables are pushed together, 2 tables seat 6 and so on.)	

	2.Note the opportunity for an Algebra connection by continuing to push tables together to see what happens, using a T-chart to record information and look for the pattern. 3. *Spaghetti and Meatballs for All* may be mentioned as a nice literature connection. Marilyn Burns has a banquet table problem in her materials as well. 4. Be sure to discuss how the amount of space needed between tables was determined. 5. Address the variety of measurement children will use as they work and to be specific. (perimeter and area, converting quarts to gallons, etc.) 6. Point out that by adding windows and doors, the problems could become more complex.	
	(Slide 24) **Tiling the Floor** Below are some important points that are to be made during the discussion of the task. As the groups work on their assignments on their cards, use the information where possible to guide their discussion. If they do not make these points during their presentation, you may want to bring them up. 1.This problem can be presented as a fundraiser opportunity for children if they are using the theme of an end of year celebration/charity. 2. Note the connections to other mathematics strands and the open-endedness of this problem as well as it having multiple solutions. 3.Refer to the tiling in the previous Banquet Room activity. Discuss how this is different and which the children might find to be more challenging. 4.Discuss how children might approach this problem.	
	(Slide 25) **Decorations … and More** Below are some important points that are to be made during the discussion of the task. As the groups work on their assignments on their cards, use the information where possible to guide their discussion. If they do not make these points during their presentation, you may want to bring them up.	

	1.Review the first 2 problems. Note that children/teachers may assume that the table arrangement is 4 people per table or go back to their arrangement in previous work and use it. 2.Consider the kinds of challenges. For example, when doing the border, will there be an allowance for a hem? Will the border strips be 36 inches long or will they need to be longer? How might a drawing help with this? 3.Address the computation children will perform. Discuss the value of computation like this versus naked computation. 4.Discuss the flexibility in doing something like this. Children could actually make flowers, measure the amount of paper needed, pursue costs on the Internet to determine the best buy, etc. The amount of money in the last question could be modified.	
	(Slide 26) **Fishpond 1** As previously directed, use the information/questions below to support discussion with the small groups as they work on their presentations. 1.Discuss how they might introduce and structure this task for children. 2.Discuss the benefits of making a model of the fishpond as a strategy. 3.How might this be adapted to meet the needs of your children? 4.What other activities might be linked to this? See next slide for a more loosely structured problem	
	(Slide 27) **Fishpond 2** Make sure the group compares this Fishpond problem and the previous one, discussing the advantages and disadvantages of each.	

	(Slide 28) **Capacity** As previously directed, use the information below to support discussion with the small groups as they work on their presentations. 1. Estimates may vary from group to group. Process and reasonableness as well as accurate computation are important. 2. In the classroom children should work in groups. Groups should share their results and discuss. As groups report, have children provide feedback for the various approaches. (The children may need some direct instruction and practice in providing feedback that is constructive, tactful and helpful) Discussion of accuracy and efficiency, as well as which strategies make sense to them are important. 3. When working the part of the task related to punch, have students complete each lettered part and discuss before moving on to the next part. While this is structured for exact answers, some children may want to make extra punch in case they want more than one serving. This number of cups of punch should be agreed upon prior to working on the parts.	
	(Slide 29) **Elapsed Time** Have the groups quickly present an overview of the two tasks mentioned on the slide. Briefly discuss additional ways to practice elapsed time. Activities might include having the children plan their agenda for a field trip, writing a schedule for an ideal school day, determining how long till recess time, etc.	
	(Slide 30) **Fitting In** Again, this problem is one for fundraising but could be presented as simply a problem to be solved. Have group summarize the problem. Mention that this is a problem that was recently given to a group of children at an elementary school. It was found that children might go in many directions as they work to solve this. They will need to address the size of fifth graders as opposed to kindergarteners, may need to collect data from sample students in the school, etc. Review the specific math the students will practice as they do this. During discussion, ask how	

	this could be readily modified to meet student needs. Example, while some groups are working on fitting the whole school into the gym, others could be working to see if all fifth graders will fit in one classroom. The dimensions of the gym/ room have not been given in the problem to provide for practice measuring a large area. Some groups of students could be assigned to use customary units, while others could use metric. Groups would present their plan, work and answer to the question.	
	(Slide 31) **Buying Carpet** This problem can be presented as a fundraiser opportunity for children if they are using the theme of an end of year celebration/charity. Ask participants to quickly examine the handout, which is another fundraiser sample. If time allows, ask them to answer the question. Ask what they think their students might do. (Students usually simply check the arithmetic and say $3200.88 is half down.)	
	(Slide 32) **Puzzle Books for Sale** Again, this is designed to be part of a fundraiser. As time allows, have groups read their measurement puzzle problem, allowing others to solve it. Note that while measurement clues were part of our directions, they could be more refined for students. For example, some students could be directed to write clues using customary capacity, or using grams and kilograms, etc. Note that clues could readily cross into other content areas…the number of states in the United States, plus the number of Senators in Washington, etc.	
	(Slide 33) **Your ideas** Ask participants to work in groups to brainstorm other real life scenarios that could be used to tie math to the theme of fundraising for a celebration, charity, etc. Have each group share some of their ideas. They could write a book of word problems to be solved, be hired to conduct statistical investigations such as determining foods children like for the cafeteria, hired by an eccentric person to find the total number of feet on all the animals mentioned in the song "The Twelve Days of Christmas." enlarge or reduce recipes for people, etc.	

	As fund raisers, children could write math problems and their solutions for entry in a math book to be sold, create works of art comprised of quadrilaterals for auction, develop nets so that others could make 3-D shapes, collect data about the class members for a presentation at the end of year celebration (2/3 of us will be going to XYZ Middle School while 1/3 will go to ABC Middle, blue is the favorite color of most of the boys, half of us have attended a different elementary school, most of us have at least one sibling, etc.)	
	(Slide 34) **Using a theme…** Ask groups to respond to this. Teachers should see that computational practice is imbedded in a theme-based approach such as this one and such practice provides practical real life situations in which mathematics is used in daily life. Strands, including problem solving, are integrated. Challenges might include classroom management if children have not had much experience working in groups.	
	(Slide 35) **Reflection** Ask participants to respond to the questions on the slide within their table groups.	
	(Slide 36-39) **Closing and credit slides**	